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CORRECTED PUBLICATION

(54) **NUCLEIC ACID AND CORRESPONDING
PROTEIN NAMED 158P1D7 USEFUL IN THE
TREATMENT AND DETECTION OF
BLADDER AND OTHER CANCERS**

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(15) Correction of US 2013/0052667 A1 Feb. 28, 2013
See (60) Related U.S. Application Data.

(65) US 2013/0052667 A1 Feb. 28, 2013

Related U.S. Application Data

(60) Continuation of application No. 12/050,895, filed on
Mar. 18, 2008, now abandoned, which is a division of

application No. 10/776,773, filed on Feb. 10, 2004,
now Pat. No. 7,358,353, which is a continuation-in-
part of application No. 10/280,340, filed on Oct. 25,
2002, now abandoned, which is a continuation-in-part
of application No. 10/277,292, filed on Oct. 21, 2002,
now abandoned, said application No. 10/280,340 is a
continuation of application No. 09/935,430, filed on
Aug. 22, 2001, now Pat. No. 6,863,892, said applica-
tion No. 10/277,292 is a continuation of application
No. 09/935,430, filed on Aug. 22, 2001, now Pat. No.
6,863,892.

(60) Provisional application No. 60/446,633, filed on Feb.
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60/282,739, filed on Apr. 10, 2001.

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G01N 33/566 (2006.01)
(52) **U.S. Cl.**
USPC **435/7.92**; 436/501; 435/7.1

(57) **ABSTRACT**

The invention described herein relates to novel nucleic acid
sequences and their encoded proteins, referred to as 158P1D7
and variants thereof, and to diagnostic and therapeutic meth-
ods and compositions useful in the management of various
cancers that express 158P1D7 and variants thereof.

Figure 1: 158P1D7 SSH sequence (SEQ ID NO:1).

```
1  GATCTGATAA GCTTTCAAATG TTGCGCTCCT GACAATGTAT TAGAAGTCCT GATGGGGATA
51 GGACTTTGCA GTTACAAGGA ATAGGGCAGA AAGGTCTTGG AAGTTGAGTG GATGGCTTTG
121 TAATATAAGG TATCAAACTT GGTGCTTTGG TGGGTAGTTT TAGAATGGAC GTGGTCTTAG
181 TTGACATGCG ACTATCATTT ATTGAAGATG TFGCTGCCAG ATGTAATGAT C
```

Figure 2:

Figure 2A-1. The cDNA (SEQ ID NO:2) and amino acid sequence (SEQ ID NO:3) of 158P1D7 v.1. The start methionine is underlined. The open reading frame extends from nucleic acid 23-2548 including the stop codon.

```
1           M K L W I H L F Y S S L L
1  tcggatttcacatcacatgacacacATGAAGCTGTGGATTTCATCTCTTTTATTCATCTCTCCT
14  A C I S L H S Q T P V L S S R G S C D S
61  TGCCTGTATATCTTTACACTCCCAAACTCCAGTGCCTCTCATCCAGAGGCTCTTGTGATTC
34  L C N C E E K D G T M L I N C E A R G I
121 TCTTTGCAATTGTGAGGAAAAAGATGGCACAATGCTAATAAATTGTGAAGCAAAAGGTAT
54  K M V S E I S V F P S R P F Q L S L L N
181 CAAGATGGTATCTGAAATAAGTGTGCCACCATCACGACCTTTCCAACCTAAGCTTATTAA
74  N G L T M L H T N D F S G L T N A I S I
241 TAACGGCTTGACGATGCTTCACACAAATGACTTTCTGGGCTTACCAATGCTATTTCAAT
94  H L G F N N I A D I E I G A F N G L G L
301 ACACCTTGGATTTAACAATATTGCAGATATTGAGATAGGTGCATTTAATGGCCTTGGCCT
114 L K Q L R I N H N S L E I L K E D T F H
361 CCTGAAACAACCTTCATATCAATCACAATTCTTTAGAAATCTTAAAGAGGATACTTTCCA
134 G L E N L E F L Q A D N N F I T V I E F
421 TGGACTGGAAAACCTGCAATTCTGCAAGCAGATAACAATTTATCACAGTGATTGAACC
154 S A F S K L N R L K V L I L N D N A I E
481 AAGTGCCTTTAGCAAGCTCAACAGACTCAAAGTGTTAATTTTAAATGACAATGCTATTGA
174 S L P P N I F R F V P L T H L D L R G N
541 GAGTCTTCTCCAAACATCTTCCGATTTGTTCTTTAACCOCATCTAGATCTTCGTGGAAA
194 Q L Q T L F Y V G F L E H I G R I L D L
601 TCAATACAAACAFTGCCTTATGTGTGTTTTCTGGAACACATGCCCCGAATATTGCATCT
214 Q L E D N K W A C N C D L L Q L K T W L
661 TCAGTGGAGGACAAACAATGGGCTGCAATTGTGACTTATTCAGTTAAAAACTTGGTT
234 E N M P P Q S I I G D V V C N S P P F F
731 GGAGAACATGCCTCCACAGTCTATAATTGGTGATGTTGTCTGCAACAGCCCTCCATTTT
254 K G S I L S P L K K E S I C F T P P V Y
781 TAAAGGAAGTATACTCAGTAGACTAAAGAAGGAATCTATTTGCCCTACTCCACCAGTGTA
274 E E R E D P S G S L H L A A T S S I N D
841 TGAAGAACATGAGGATCCTTCAGGATCATTACATCTGGCAGCAACATCTTCAATAAATGA
294 S R M S T R T T S I L K L P T K A P G L
901 TAGTCCCATGTCAACTAAGACCACTCCATTCTAAAACCTACCCACCAAGCAACCAGGTTT
314 I F Y I T K P S T Q L P G P Y C F I P C
961 GATACCTTATATTACAAAGCCATCCACTCAACTTCCAGGACCTTACTGCCCTATTTCCTTG
334 H C K V L S P S G L L I H C Q E R N I E
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Figure 2A-2

1021 TAACATGCAAAGTCCTATDCCCATCAGGACTTCTAATACATTGTCAGGAGCGCAACATTGA
354 S L S D L R F P P Q N P R K L I L A G N
1081 AAGCTTATCAGATCTGAGACCTCCTCCGCAAAATCCTAGAAAGCTCATTCTAGCGGGAAA
374 I I H S L M K S D L V E Y F T L E M L R
1141 TATTATTCACAGTTTAAATGAAGTCTGATCTAGTGGAAATATTTCACCTTTGAAATGCTTCA
394 L G N N R I E V L E E G S F M N L T R L
1201 CTTGGCAAAACAATCGTATTGAAGTTCCTTGAAGAAGGATCGTTTATGAACCTAACGAGATT
414 Q K L Y L N G N H L T K L S K G M P L G
1261 ACABAAACTCTATCTAAATGSTAACCACTGACCAAATTAAGTAAAGGCATGTTCTTGG
434 L H N L E Y L Y L E Y N A I K E I L P G
1321 TCTCCATAATCTTGAATACCTTATATCTTGAATACAATGCCATTAAGGAAATACTGCCAGG
454 T F N P M P K L K V L Y L N N N L L Q V
1381 AACCTTTAATCCAATGCCATAAAGCTTAAAGTCTGTATTTAAATAACAACCTCTCCAAGT
474 L P P H I F S G V P L T K V N L K T N Q
1441 TTTAACCACCACATATTTTTCAGGGGTCTCTAAGTAAAGTAAATCTTAAAAACAAACCA
494 F T H L P V S N I L D D L D L L T Q I D
1501 GTTTACCCATCTACCTGTAAGTAATATTTTGGATGATCTTGATTTACTAACCAGATTGA
514 L E D N F W D C S C D L V G L Q Q W I Q
1561 CCTTGAGGATAAACCCTGGGACTGCTCTGTGACCTGCTTGGACTGCAGCAATGGATACA
534 K L S K N T V T D D I L C T S P G H L D
1621 AAAGTTAAGCAAGAACACAGTGACAGATGACATCCTCTGCACTTCCCCCGGGCATCTCGA
554 K K E L K A L N S E I L C P G L V N N P
1681 CAAAAGGAATTGAAAGCCCTAATAGTGAAATTCTCTGTCCAGGTTTAGTAAATAACCC
574 S M P T Q T S Y L M V T T P A T T T N T
1741 ATCCATGCCAACACAGACTAGTTACCTTATGGTCACCACTCCTGCAACAACAACAAATAC
594 A D T I L R S L T D A V P L S V L I L G
1801 GGCTGATACTATTTTACGATCTCTTACGACGCTGTGCCACTGCTCTGTTCTAATATTGGG
614 L L I M F I T I V F C A A G I V V L V L
1861 ACTTCTGATTATGTTTCATCACTATTGTTTCTGTGCTGCAGGGATAGTGGTTCTTGTTCT
634 H R R R R Y K K K Q V D E Q M R D N S P
1921 TCACCCGAGGAGAAGATACAAAAAGAAACAAGTAGATGAGCAAATGAGAGACAACAGTCC
654 V H L Q Y S M Y G H K T T H H T T E R F
1981 TGTGCATCTTCAGTACAGCATGTATGGCCATAAAACCACTCATCACACTACTGAAAGACC
674 S A S L Y E Q H M V S P M V H V Y R S P
2041 CTCTGCCCTCACTCTATGAACAGCACATGGTGAGCCCCATGGTTCATGTCTATAGAAGTCC
694 S F G G P K H L E E E E E R N E K E G S D
2101 ATCCCTTGGTCCAAAGCATCTGGAAGAGGAAGAAGAGAGGAATGAGAAAGAAAGGAAGTGA
714 A K H L Q R S L L E Q E N H S P L T G S
2161 TGCAAAACATCTCCAAAGAAGTCTTTTGGAAACAGGAAAATCATTCACTACTCACAGGGTC
734 N M K Y K T T N Q S T E F L S F Q D A S

Figure 2A-3

```
2221 AAATATGAAATACAAAACCACGAACCAATCAACAGAATTTTATCCTTCCAAGATGCCAG
754 S L Y R N I L E E E E L Q Q L G I T E
2281 CTCATTGTACAGAAACATTTTAGAAAAAGAAAGGGAACCTCAGCAACTGGGAATCACAGA
774 Y L R K N I A Q L Q F D M E A H Y P G A
2341 ATACCTAAGGAAAAACATTGCTCAGCTCCAGCCTGATATGGAGGCACATTATCCTGGAGC
794 H E E L K L M E T L M Y S R P R K V L V
2401 CCACGAAGAGCTGAAGTTAATGCAAAACATTAATGTACTCACCTCCAAGGAAGCTATTAGT
814 E Q T K N E Y F E L K A N L H A E P D Y
2461 GGAACAGACAAAAAATGAGTATTTTGAAGCTAAAGCTAATTACATGCTGAACCTGACTA
834 L E V L E Q Q T *
2521 TTTAGAAGTCTCGAGCAGCAACATAGatggaga
```

Figure 2B-1. The cDNA (SEQ ID NO:4) and amino acid sequence (SEQ ID NO:5) of 158P1D7 v.2. The start methionine is underlined. The open reading frame extends from nucleic acid 23-2548 including the stop codon.

```
1 M K L W I N L F Y S S L L
1 toggattttcatcacatgacaacATGAAGCTTGTGGATTTCATCTCTTTTATTCATCTCTCCT
14 A C I S L W S Q T P V L S S R G S C D S
61 TGCCTGTATATCTTTACACTCCCAAACTCCAGTGTCTCATCCAGAGGCTCTTGTGATTC
34 L C N C E E K D S T M L I N C E A K G I
121 TCTTTGCAATTGTGAGGAAAAAGATGGCACAATGCTAATAAATTGTGAAGCAAAAGGTAT
54 K M V S E I S V P P S R P F Q L S L L N
181 CAAGATGGTATCTGAAATAAGTGTGCCACCATCACGACCTTCCAAGTAAAGCTTATTAATA
74 N G L T M L R T N D F S G L T N A I S I
241 TAACGGCTTGACGATGCTTCACACAAATGACTTTTCTGGGCTTACCAATGCTATTTCAAT
94 R L G P N N I A D I E I G A P N G L G L
301 ACACCTTGGATTAAACAATATTGCAGATATTGAGATAGGTGCATTTAATGSCCTTGGCCT
114 L K Q L R I N H N S L E I L K E D Y F H
361 CCTGAAACAACCTTCATATCAATCACAATTCTTTAGAAATCTTAAAGAGGATACTTTCCA
134 G L E N L E F L Q A D N N F I T V I E F
421 TGGACTGGAAAACTTGAATTCTCTGCAAGCAGATAACAATTTATCAGCTGATTGAACC
154 S A F S K L N R L E V L I L N D N A I E
481 AAGTGCCTTTAGCAAGCTCAACAGACTCAAAGTGTAAATTTAAATGACAATGCTATTGA
174 S L P P N I F R F V P L T H L D L R G N
541 GAGTCTTCTCTCAAAACATCTTCCGATTTGTTCCTTTAACCCTCTAGATCTTGGTGGAAA
194 Q L Q T L P Y V G F L E H I G R I L D L
601 TCAATTACAAACATTGCCTTAATGTTGGTFTTCTCGAACACATTTGGCCGAATATTGSATCT
214 Q L E D N K W A C N C D L L Q L K T W L
661 TCAGTTGGAGGACAACAAATGGGCCTGCAATTGTGACTTATTGCAGTTAAAAACTTGGTT
```

Figure 2B-2

234 E N M E P Q S I I G D V V C N S E P F F F
721 GGAGAACATGCCCTCCACAGTCTATAATTGGTGATGTTGTCTGCAACAGCCCTCCATTTT
254 K G S I L S R L K K E S I C F T F P V Y
781 TAAAGGAAGTATACTCAGTAGACTAAAGAAGGAATCTATTTGCCCTACTCCACCAGTGA
274 E E H E D P S G S L H L A A T S S I N D
841 TGAAGAACATGAGSATCCTTCAGGATCATTACATCTGGCAGCAACATCTTCAATAAATGA
294 S R M S T K T T S I L K L P T K A P G L
901 TAGTCGCATGTCAACTAAGACCACGTCCATTCTAAAACTACCCACCAAAGCACCAGSTT
314 I P Y I T K P S T Q L P G P Y C P I P C
961 GATACCTTATATTACAAAGCCATCCACTCAACTCCAGGACCTTACTGCCCTATTTCCTG
334 N C K V L S P S G L L I H C Q E R N I E
1021 TAACTGCAAAGTCCTATCCCATCAGGACTTCTAATACATTGTCCAGGAGCGCAACATTGA
354 S L S D L R P P P Q N F R K L I L A G N
1081 AAGCTTATCAGATCTGAGACCTCCTCCGCAAAATCCTAGAAAGCTCATTTCTAGCGGGAAA
374 I I H S L M K G D L V E Y F T L E M L H
1141 TATTTATTCACAGTTTAATGAAGTCTGATCTAGTGGAAATATTTCACTTTGGAAATGCTTCA
394 L G N N R I E V L E E G S F M N L T R L
1201 CTTGGCAAAACAATCGTATTTGAAGTCTCTGAAGCAAGCATCCPTTATGAACCTAACCAGATT
414 Q K L Y L N G N H L T K L S K G M F L G
1261 ACAAAACTCTATCTAAATGGTAACCACTGACCAAAATTAAGTAAAGGCATGTTCTCTGG
434 L H N L E Y L Y L E Y N A I K E I L P G
1321 TCTCCATAATCTTGAATFACTTATATCTTGAATACAAATGCCATTAAGGAAATACTGCCAGG
454 T F N P M P K L K V L Y L N N N L L Q V
1381 AACCTTTAATCCAATGCCCTAAACTTAAAGTCCCTGTATTTAAATAACAACCTCCTCCAAGT
474 L P P H I F S G V F L T K V N L N T N Q
1441 TTTACCACCACATATTTTTTTCAGGGGTCTCTCTAACTAAGGTAAATCTTAAACAAACCA
494 F T H L P V S N I L D D L D L L T O I D
1501 GTTTACCCATCTACCTGTAAGTAATATTTTGGATGATCTTGATTGCTAACCCAGATTGA
514 L E D N P W D C S C D L V G L Q Q W I Q
1561 CCTTGAAGGATAACCCCTGGGACTGCTCCTGTGACCTGGTTGGACTGCAGCAATGGATACA
534 K L S K N T V T D D I L C T S P G H L D
1621 AAAGTTAAGCAAGAACACAGTGACAGATGACATCCTCTGCACTTCCCCCGGGCATCTCGA
554 K K E L K A L N S E I L C P G L V N N P
1681 CAAAAAGGAATTGAAAGCCCTAAATAGTGAAATTCCTCTGTCCAGGTTAGTAAATAACCC
574 S M P T Q T S Y L M V T T P A T T T N T
1741 ATCCATGCCAACACAGACTAGTTACCTTATGGTCACCACTCCTGCAACAACAACAATAC
594 A D T I L R S L T D A V P L S V L I L G
1801 GGCTGATACTATTTTACGATCTCTTACGGACGCTGTGCCACTGTCTGTCTAATATTTGGG
614 L L I M F I T I V F C A A G I V V L V L
1861 ACTTCTGATTATGTTTCATCACTATTGTTTTCTGTGCTGCAGGGATAGTGGTTCTTGTTC

Figure 2B-3

```
634 H K R R K Y E K K Q V D E Q M R D N S P
1921 TCACCGCAGGAGAAGATACAAAAAGAAACAAGTAGATGAGCAAATGAGAGACACAGTCC
654 V R L Q Y S M Y G H K T T H H T T E R P
1981 TGTGCATCTTCAGTACAGCATGTATGGCCATAAAACCACTCATCACACTACTGAAAGACC
674 S A S L Y E Q H M V S P M V H V Y R S P
2041 CTCTGCCCTCACTCTATGAACAGCACATGGTGAAGCCCCATGGTTCATGCTATAGAAGTCC
694 S F G P K R L E E E E E R N E K E G S D
2101 ATCCTTTGCTCAAAGCATCTGGAAGAGGAAGAAGAGAGGAATGAGAAAGAAGGAAGTGA
714 A K H L Q R S L L E Q E M R S P L T G S
2161 TGCAAAACATCTCCAAAGAAGTCTTTTGGAACAGGAAAATCAATTCACCACTCACAGGGTC
734 N M K Y K T T N Q S T E F L S F Q D A S
2221 AAATATGAAATCAAAAACCAAGCAACCAATCAACAGAATTTTATCCTTCCAAGATGCCAG
754 S L Y R N I L E K E R E L Q Q L G I T E
2281 CTCATTGTACAGAAACATTTTAGAAAAAGAAAGGGAACTTCAGCAACTGGGAATCACAGA
774 Y L R K N I A Q L Q P D W E A R Y P G A
2341 ATACCTAAGGAAAAACATTGCTCAGCTCCAGCCTGATATGGAGGCACATTATCCTGGAGC
794 H E E L K L M E T L M Y S R P R K V L V
2401 CCACCAAGAGCTGAAGTTAATGGAACATTAAATGTACTCACCTCCAAGGAAGGTATTAGT
814 E Q T K N E Y F E L K A N L H A E F D Y
2461 GGAACAGACAAAAATGAGTATTTTGAACCTTAAAGCTAATTTACATGCTGAACCTGACTA
834 L E V L E Q Q T *
2521 TTTAGAAGTCTCTGGAGCAGCAAAACATAGatggaga
```

Figure 2C-1. The cDNA (SEQ ID NO:6) and amino acid sequence (SEQ ID NO:7) of 158P1D7 v.3. The start methionine is underlined. The open reading frame extends from nucleic acid 23-2221 including the stop codon.

```
1 M K L W I H I F Y S S L I
1 tcggattttcatcacatgacaacATGAAGCTGTGGATTCTCTCTTTTATTTCATCTCTCTCT
14 A C I S L H S Q T P V L S S R G S C D S
61 TGCCCTGTATATCTTTACACTCCCAABCTCCAGTGCCTCTCATCCAGAGGCTCTTGTGATTC
34 L C N C E E K D G T M L I N C E A K G I
121 TCTTTGCAATTGTGAGGAAAAAGATGGCACAATGCTAATAAATTGTGAAGCAAAAGGTAT
54 K M V S E I S V F F S R P F O L S L L N
181 CAAGATGGTATCTGAAATAAGTGTGCCACCATCAGGACCTTTCCAACCTAAGCTTATTAA
74 N G L T M L H T N D F S G L T N A I S I
241 TAACGGCTTGAAGATGCTTCACACAAATGACTTTTCTGGGCTTACCAATGCTATTTCAT
94 H L G F R N I A D I E I G A F N G L G L
301 ACACCTTGGATTTAACAATATTCCAGATATTGAGATAGGTGCATTTAATGGCCCTTGGCCT
114 L K Q L R I N R N S L E I L K E D T F R
```

Figure 2C-2

361 CCTGAAACAACCTTCATATCAATCACAATTCCTTTAGAAATTCCTTAAAGAGGATACCTTTCCA
134 G L E N L E F L Q A D W N F I T V I E F
421 TGGACTGGAAAACCTGGAATTCCTGCAAGCAGATAACAATTTATCACAGTGATTGAACC
154 S A F S K L N R L K V L I L N D N A I E
481 AAGTGCCTTTAGCAAGCTCAACAGACTCAAAGTGTTAATTTTAAATGACAATGCTATTGA
174 S L P P N I F R F V P L T H L D L R G N
541 GAGTCTTCCTCCAAACATCTTCCGATTTGTTCCTTTAACCCATCTAGATCTTCGTGGAAA
194 Q L Q T L F Y V G F L E H I G R I L D L
601 TCAATTACAAACATTGCCTTATGTTGGTTTTCTCGAACACATTGGCCGAATATTGGATCT
214 Q L E D N K W A C N C D L L Q L K F W L
661 TCAGTTGGAGGACAACAAATGGGCCTGCAATTGTGACTTATTGCAGTTAAAACTTCGTT
234 E N M F F Q S I I G D V V C N S P F F F
721 GGAGAACATGCCTCCACAGTCTATAATTGGTGATGTTGTCTGCAACAGCCCTCCATTTTT
254 K G S I L S R L K K E S I C F T P P V Y
781 TAAAGGAAGTATACTCAGTAGACTAAAGAAGGAATCTATTTGCCCTACTCCACCAGTGTA
274 E E H E D P S G S L R L A A T S S I N D
841 TGAAGAACATGAGGATCCTTCAGGATCATFACATCTGGCAGCAACATCTTCAATAAATGA
294 S R M S T K T T S I L K L P T E A P G L
901 TAGTCGCATGTCAACTAAGACCACGTCCATTCTAAAACCTACCCACCAAAGCAACCAGTTT
314 I P Y I T K P S T Q L P G P Y C P I P C
961 GATACCTTATATTACAAAGCCATCCACTCAACTTCCAGGACCTTACTGCCCTATTCCTTG
334 N C K V L S P S G L L I H C Q E R N I E
1021 TAACTGCAAAAGTCCTATCCCCATCAGGACTTCTAATACATTGTTCAGGAGCGCAACATTGA
354 S L S D L R P P P Q N P R K L I L A G N
1081 AAGCTTATCAGATCTGAGACCTCCTCCGCAAAATCCTAGAAAGCTCATTCTAGCGGGAAA
374 I I H S L M K S D L V E Y F T L E M L H
1141 TATTATTACAGTTTAATGAAGTCTGATCTAGTGGAATATTTCACTTTGGAAATGCTTCA
394 L G N N R I E V L E E G S F M N E L T R L
1201 CTTGGGAAACAATCGTATTGAAGTTCTTGAAGAAGGATCGTTTATGAACCTAACGAGATT
414 Q K L Y L N G N H L T K L S K G M F L G
1261 ACAAAAACCTCTATCTAATGGTAACCACCTGACCAAATTAAGTAAAGGCATGTTCCCTTG
434 L H N L E Y L Y L E Y N A I K E I L F G
1321 TCTCCATAATCTTGAATACTTATATCTTGAATACAATGCCATTAAAGGAAATACTGCCAGG
454 T F N F M P K L E V L Y L N N N L L Q V
1381 AACCTTTAATCCAATGCCTAAACTTAAAGTCCTGTATTTAAATAACAACCTCCTCCAAGT
474 L P P H I F S G V P L T K V N L K T N Q
1441 TTTACCACCACATATTTTTTCAGGGGTTCCTCTAACTAAGGTAAATCTTAAACAAACCA
494 F T H L P V S N I L D D L D L L T Q I D
1501 GTTTACCCATCTACCTGTAAGTAATATTTGGATGATCTTGATTTACTAACCACAGATTGA
514 L E D N P W D C S C D L V G L Q Q W I Q

Figure 2C-3

1561 CCTGAGGATAACCCCTGGGACTGCTCTGTGACCTGGTTGGACTGCAGCAATGGATACA
534 K L S K N T V T D D I L C T S P G H L D
1621 AAAGTTAAGCAAGAACACAGTGCAGATGACATCCTCTGCACTTCCCCGGGCATCTCGA
554 K K E L K A L N S E I L C P G L V N N P
1681 CAAAAAGGAATTGAAAGCCCTAAATAGTGAAATTCTCTGTCCAGGTTTAGTAAATAACCC
574 S M P T Q T S Y L M V T T P A T T T N T
1741 ATCCATGCCAACACAGACTAGTTACCTTATGGTCACCACTCCTGCAACAACAACAATAC
594 A D T I L R S L T D A V P L S V L I L G
1801 GGCTGATACTATTTTACGATCTCTTACGGACGCTGTGCCACTGTCTGTTCTAATATTGGG
614 L L I M F I T I V F C A A G I V V L V L
1861 ACTTCTGATTATGTTTCATCACTATTGTTTCTGTGCTGCAGGGATAGTGGTTCTTGTTCT
634 H R R R R Y R K K Q V D E Q M R D N S P
1921 TCACCGCAGGAGAAGATACAAAAAGAAACAAGTAGATGAGCAAATGAGAGACAACAGTCC
654 V H L Q Y S M Y G H K T T H H T T E R P
1981 TGTGCATCTTCAGTACAGCATGTATGGCCATAAAACCACTCATCACACTACTGAAAGACC
674 S A S L Y E Q H N G A R E E L K L M E T
2041 CTCTGCCTCACTCTATGAACACACATGGGAGCCACCAAGAGCTGAAATTAAATGGAABC
694 L M Y S R F R K V L V E Q T R N E Y F R
2101 APTAATGTACTCACGTCCAAGGAAGGTATTAGTGGAAACAGACAAAAATGAGTATTTTGA
714 L K A N L H A E P D Y L E V L E Q Q T *
2161 ACTTAAAGCTAATTTACATGCTGAACCTGACTATTTAGAACTCTGGAGCAGCAACATA
2221 Gatggaga

Figure 2D-1. The cDNA (SEQ ID NO:8) and amino acid sequence (SEQ ID NO:9) of 158P1D7 v.4.

The start methionine is underlined. The open reading frame extends from nucleic acid 23-1210 including the stop codon.

1 M K L W I H L F Y S S L L
1 tggatttcacatcacatgacaaATGAAGCTGTGGATTCATCTCTTTATTCATCTCTCCT
14 A C I S L H S Q T F V L S S R G S C D S
61 TGCCGTATATCTTTACACTCCCAACTCCAGTGCCTCATCCAGAGGCTCTTGTGATTCT
34 L C N C E E E D G T M L I N C E A K G I
121 TCCTTGCAATTGTGAGGAAAAAGATGGCACAATGCTAATAAATTTGTGAAGCAAAAGGTAT
54 K M V S E I S V P P S R P F Q L S L L N
181 CAAGATGGTATCTGAAATAAGTGTGCCACCATCAGGACCTTTCCAACTAAGCTTATTAAA
74 N G L T M L H T N D F S G L T N A I S I
241 TAACGGCTTGACGATGCTTCACACAAATGACTTTTCTGGGCTTACCAATGCTATTTCAT
94 H L G F N N I A D I E I G A F N G L G L
301 ACACCTTGGATTAAACAATATTGCAGATATTGAGATAGGTGCATTAAATGGCCTTGGCCT
114 L K Q L H I N H N S L E I L K E D T F H

Figure 2D-2

361 CCTGAAACAACCTTCATATCAATCACAATTCTTTAGAAAFTCTTAAAGAGGATACTTTCCA
134 G L E N L E F L Q A D N N F I T V I E P
421 TGGACTGGAAAACCTGGAATTCTGCAAGCAGATAACAATTTTATCACAGTGATTGAACC
154 S A F S K L N R L K V L I L N D N A I E
481 AAGTGCCTTTAGCAAGCTCAACAGACTCAAAGTGTTAATTTTAAATGACAATGCTATTGA
174 S L P P N I F R F V F L T H L D L R G N
541 GAGTCTTCCTCCAAACATCTTCCGATTGTTCCTTTAACCCTCTAGATCTTCGTGGAAA
194 Q L Q T L P Y V G F L E H I G R I L D L
601 TCAATTACAAACATTGCCCTTATGTTGGTFTTCTCGAACACATTGGCCGAATATTGGATCT
214 Q L E D N K W A C N C D L L Q L K T W L
661 TCAGTTGGAGGACAACAAATGGGCCTGCAATTGTGACTTATTGCAGTTAAAAACTTGGTT
334 E N M P F Q S I I G D V V C N S P P F F
721 GGAGAACATGCCTCCACAGTCTATAATTGGTGATGTTGTCTGCAACAGCCCTCCATTTT
254 K G S I L S R L K K E S I C P T P P V Y
781 TAAAGGAAGTATACTCAGTAGACTAAAGAAGGAATCTATTTGCCCTACTCCACCAGTGTA
274 E E H E D P S G S L H L A A T S S I N D
841 TGAAGAACATGAGGATCCTTCAGGATCATTACATCTGGCAGCAACATCTTCAATAAATGA
394 S R M S T K T T S I L K L P T K A P G L
901 TAGTCCGATGTCAACTAAGACCACGTCCATTCTAAAACTACCCACCAAAGCACCAGSTTT
314 I P Y I T K P S T Q L P G P Y C P I P C
961 GATACCTTATATTACAAAGCCATCCACTCAACTTCCAGGACCTTACTGCCCTATTTCCTTG
334 N C K V L S P S G L L I H C Q E R N I E
1021 TAACTGCAAAGTCTTATCCCCATCAGGACTTCTAATACATTGTCAGGAGCGCAACATTGA
354 S L S D L R P P P G N P R K L I L A G N
1081 AAGCTTATCAGATCTGAGACCTCCTCCGCAAAATCCTAGAAAGCTCATTCTAGCGGGA
374 I I H S L M K S I L W S K A S G R G R R
1141 TATTATTACAGTTTAAATGAAGTCCATCCTTTGGTCCAAAGCATCTGGAAGAGGAAGAAG
394 E E *
1201 AGAGGAATGAgaaagaaggaagtgatgcaaaacatctccaaagaagtcttttggaaacagg
1261 aaaatcattcaccactcacaggggtcaaatatgaaatacaaaaccacgaaccaatcaacag
1321 aattttttatccttccaagatgccagctcattgtacagaacatttttagaaaaagaagg
1381 aacttcagcaactgggaatcacagaatacctaaggaaaaacattgctcagctccagcctg
1441 atatggagggcacattatcctggagcccacgaagagctgaagttaatggaaacattaatgt
1501 actcacgtccaaggaaggtatttagtggaacagacaaaaaatgagtattttgaacttaaaag
1561 ctaatttacatgctgaacctgactatthagaagtccctggagcagcaaacatagatggaga

Figure 2E-1. The cDNA (SEQ ID NO:10) and amino acid sequence (SEQ ID NO:11) of 158P1D7 v.5.

The start methionine is underlined. The open reading frame extends from nucleic acid 480-3005 including the stop codon.

```
1  gogtgcacaacaagaataactagaaaaaggaggaaggagaaacattggtgcagcttggatct
61  acaacctaagaaagcaagagtgatcaatctcagctctgttaaacatcttgtttacttact
121  gcattcagcagcttgcaaatggttaactatatgcasaaaagtcagcatagctgtgaagta
181  tgcctgaatttttaattgagggaaaaaggacaattgcttcaggatgctctagtatgpaact
241  ctgcttgaatatattttcaatgaaatgctcagatattctatctttgaccagaggttttaact
301  ttatgaagctatgggacttgacaaaaagtgatatttgagaagaaagtaacgagtggttgg
361  tgttttcttttttttaataaaggaattgaattactttgaacaacctcttccagctgtgcat
1                                     M
421  tacagataacgtcaggaagagtgctctgtctttacagaatcggatttccatcacatgacaacA
2   K L W I H L F Y S S L L A C I S L H S Q
481  TGAAGCTGTGGATTTCATCTCTTTTATTCATCTCTCTCTGCTGCTGTATATCTTTACACTCCC
22  T F V L S S R G S C D S L C N C E E N D
541  AAAGCTCCAGTGTCTCTCATCCAGAGGCTCTTGTGATTCCTCTTTGCAATTGTGAGGAAAAAG
42  G T M L I N C E A K G I K M V S E I S V
501  ATGGCACAAATGCTAATAAATTGTGAAGCAAAAGGTATCAAGATGCTATCTGAAATAAGTG
62  F F S R F F Q L S L L N N G L T M L H T
661  TGCCACCATCAGACCTTTCCAATAAGCTTATTAAATAACGGCTTGACGATGCTTCACA
82  N D F S G L T N A I S I N L G F N N I A
721  CAAATGACTTTTCTGGGCTTACCAATGCTATTTCAATACACCTTGGATTTAACAATATTG
102  D I E I G A F N G L G L L E Q L R I N R
781  CAGATATTGAGATAGGTGCATTTAATGGCCCTTGGCCCTCTGAAACAACCTTCATATCAATC
122  N S L E I L K E D T F H G L E N L E F L
841  ACAATTCCTTTAGAAATTCTTAAAGAGGATACTTTCCATGGACTGGAAAACCTGGAATTCC
142  Q A D N N F I T V I E P S A F S K L N R
901  TGCAAGCAGATAACAATTTTATCACAGTGATTGAACCAAGTGCCCTTTAGCAAGCTCAACA
162  L K V L I L N D N A I E S L P P N I F E
961  GACTCAAAGTGTTAATTTTAAATGACAATGCTATTGAGAGTCTTCCTCCAAACATCTTCC
182  F V P L T H L D L K G N Q L Q T L P Y V
1021  GATTTGTTCCTTTAACCCATCTAGATCTTCGTGGAAATCAATTACAAACATTGCCCTTATG
202  G F L E H I G R I L D L Q L E D N K W A
1081  TTGTTTTTCTCGAACACATTTGGCCGAATATTGGATCTTCAGTTGGAGGACAACAAATGGG
222  C N C D L L Q L K T W L E N M P P Q S I
1141  CCTGCAATTGTGACTTATTGCAAGTTAAAACTTGGTTGGAGAACATGCCCTCCACAGTCTA
242  I G D V V C N S P P F F K G S I L S R L
1201  TAATTGGTGATGTTGTCTGCAACAGCCCTCCATTTTTTAAAGGAAGTATACTCAGTAGAC
262  K K S S I C P T P P V Y E E H E D P S G
1261  TAAAGAAAGGAATCTATTGCCCCACTCCACCAGTGTATGAAGAACATGAGGATCCTTCAG
```

Figure 2E-2

282 S L H L A A T S S I N D S R M S T K T T
1321 GATCATTACATCTGGCAGCAACATCTTCAATAAATGATAGTCGCATGTCAACTAAGACCA
382 S I L K L P T K A P G L I P Y I T K P S
1381 CGTCCATTCTAAAAC TACCCACCAAGCACCAGGTTTGATACCTTATATTACAAAGCCAT
322 T Q L P G P Y C P I P C N C K V L S P S
1441 CCACTCAACTTCCAGGACCTTACTGCCCTATTCCCTTGTAAGTGCAGAGTCCCTATCCCCAT
342 G L L I H C Q E R N I E S L S D L R P P
1501 CAGGACTTCTAATACATTGTCAGGAGCGCAACATTGAAAGCTTATCAGATCTGAGACCTC
362 P Q N P R K L I L A G N I I H S L M K S
1561 CTCCGCAAAATCCTAGAAAGCTCATTCTAGCGGGAAATATTATTACAGTTTAATGAAGT
382 D L V E Y F T L E M L H L G N N R I E V
1621 CTGATCTAGTGGAAATATTTCACTTTGGAAATGCTTCACCTGGGAAACAATCGTATTGAAG
402 L E E S S F M N L T R L Q K L Y L N G N
1681 TTCTTGAAGAAGGATCGTTTATGAACCTAACGAGATTACAAAACTCTATCTAAATGGTA
422 R L T K L S R G M F L G L H N L E Y L Y
1741 ACCACCTGACCAAAATTAAGTAAAGGCATGTTCCCTGGTCTCCATAATCTTGAATACTTAT
442 L E Y N A I K E I L P G T F N P M P K L
1801 ATCTTGAATACAATGCCATTAAGCAAAATACTGCCAGCAACCTTTAATCCAATGCCATAAC
462 K V L Y L N N R L L Q V L P P H I F S G
1861 TTAAAGTCTGTATTTTAAATAACAACCTCCTCCAAGTTTACCACCACATATTTTTTCAG
482 V P L T K V N L K T N Q F T R L P V S N
1921 GGGTTCTCTAACTAAGGTAAATCTTAAACAAACCAGTTTACCCATCTACCTGTAAGTA
502 I L D D L D L L T Q I D L E D N P W D C
1981 ATATTTTGGATGATCTTGATTTACTAACCCAGATTGACCTTGAGGATAACCCCTGGGACT
522 S C D L V G L Q Q W I Q K L S K N T V T
2041 GCTCCTGTGACCTGGTTGGACTGCAGCAATGGATACAAAAGTTAAGCAAGAACACAGTGA
542 D D I L C T S P G H L D K K E L K A L N
2101 CAGATGACATCCTCTGCACTTCCCCGGGCATCTCGACAAAAGGAATTGAAAGCCCTAA
562 S E I L C P G L V N N P S M P T Q T S Y
2161 ATAGTGAAATTCTCTGTCCAGGTTTAGTAAATAACCCATCCATGCCAACACAGACTAGTT
582 L M V T T P A T T T N T A D T I L R S L
2221 ACCTTATGGTCACCACTCCTGCAACAACAACAAATACGGCTGATACTATTTTACGATCTC
602 T D A V F L S V L I L G L L I M F I T I
2281 TTACGACGCTGTGCCACTGTCTCTTCTAATATTGGGACTTCTGATTATGTTTCATCACTA
622 V F C A A G I V V L V L H R R R R Y K K
2341 TTGTTTTCTGTGCTGCAGGGATAGTGGTTCTTGTTCCTTCACCGCAGGAGAAGATACAAAA
642 K Q V D E Q M R D N S P V H L Q Y S M Y
2401 AGAAACAAGTAGATGAGCAATGAGAGACAACAGTCCCTGTGCATCTTCAGTACAGCATGT
662 G H K T T H N T T E R P S A S L Y S Q H
2461 ATGGCCATAAAACCACTCATCACACTACTGAAAGACCTCTGCCCTCACTCTATGAACAGC

Figure 2E-3

```

602   M V S P M V M V Y R S P S F G P K H L E
2521 ACATGGTGAGCCCCATGGTTCATGTCTATAGAAGTCCATCCTTGGTCCAAAGCATCTGG
702   E E E E R N E K E G S D A K H L Q R S L
2581 AAGACGAAGAAGAGAGGAATGAGAAAGGAAGTGAUCAAAACATCTCCAAAGAAGTC
722   L E Q E N H S P L T G S N M K Y K T T N
2641 TTTTGGAACAGGAAATCATTCCCACTCACAGGGTCAAATATGAAATACAAAACCACGA
742   Q S T E F L S F Q D A S S L Y R N I L E
2701 ACCAATCAACAGAAATTTTATCCTTCCAAAGATGCCAGCTCATGTACAGAAACATTTTAG
762   K E R E L Q Q L G I T E Y L R K N I A Q
2761 AAAAAGAAAGGGAACCTCAGCAACTGGGAATCACAGAATACCTAAGGAAAAACATTGCTC
782   L Q P D M E A H Y P G A H E E L K L M E
2821 AGCTCCAGCTGATATGGAGGCGCATTATCCTGGAGCCACGAAGAGCTGAAGTTAATGG
802   F L M Y S B P R K V L V E Q T K N E Y F
2881 AAACATTAAATGTACTCAGCTCCAAGGAAGGTATTAGTGAACAGACAAAAATGASTATT
822   E L K A N L R A B P D Y L E V L E Q Q T
2941 TTGAACCTTAAAGCTAATTTACATGCTGAACCTGACTATTTAGAAGTCTTGGAGCAGCAAA
842   *
3001 CATAGatggagaggttgagggttttcgcccagaatgctgtgattctgttattaaagtcacata
3061 ccttgtaastaagtgcccttacgtgagtggtgtcatcaatcagaacctaaagcacagagttaaa
3121 ctatgggggaaaaaaaagaagacgaaacagaaactcagggatcactgggagaagccatgg
3181 cataactcttcagggaattttagtctgtcccaataaacatacatccttggtcatgtaaatca
3241 tcaagggtaatagtaataattcatataccctgaacgtgtctcataggagtcctctctgcac

```

Figure 2F-1. The cDNA (SEQ ID NO:12) and amino acid sequence (SEQ ID NO:13) of 158PID7 v.6.

The start methionine is underlined. The open reading frame extends from nucleic acid 23-1612 including the stop codon.

```

1           M K L W I H L F Y S S L L
1  toggattttcatcacatgacaacATGAACCTGTGGATTCACTCTCTTTTATTCATCTCTCTCT
14  A C I S L H S Q T P V L S S R G S C D S
61  TGCTTGATATCTTTACACTCCCAAACTCCAGTCTCTCATCCAGAGGCTCTTGATTC
34  L C N C E E K D G T M L I N C E A K G I
121 TCTTTGCAATTGTGAGGAAAAAGATGGCACAATGCTAATAAATTGTGAAGCAAAAGGTAT
54  K M V S E I S V P P S B P F Q L S L L N
181 CAAGATGGTATCTGAAATAAGTGTGCCACCATCAGACCTTTCCAACCTAAGCTTATTAAA
74  N G L T M L H T N D F S G L T N A I S I
241 TAACGGCTTGACGATGCTTCACACAAATGACTTTTCTGGGCTTACCAATGCTATTTCAAT
94  H L G F N N I A D I E I G A F N G L G L
301 ACACCTTGGATTTAACAAATATTGCAGATATTGAGATAGGTGCATTAAATGGCCTTGGCCT
114 L K Q L H I N H N S L E I L K E D T F H

```

Figure 2F-2

361 CCTGAAACAACCTTCATATCAATCACAATTCTTTAGAAATTCTTAAAGAGGATACTTTCCA
134 G L E N L E F L Q A S N N F I T V I E P
421 TGGACTGGAAAACCTGGAATTCCTGCAAGCAGATAACAATTTTATCACAGTGATTGAACC
154 S A F S K L N R L K V L I L N D N A I E
481 AAGTGCCTTTAGCAAGCTCAACAGACTCAAAGTGTTAATTTTAAATGACAATGCTATTGA
174 S L P P N I F R F V P L T H L D L R G N
541 GAGTCTTCCTCCAAACATCTTCGGATTGTTCCTTTAACCCATCTAGATCTTCGTGGAAA
194 Q L Q T L P Y V G F L E H I G R I L D L
601 TCAATTACAAACATTGCCTTATGTTGGTTTTCTCGAACACATTGGCCGAATATTGGATCT
214 Q L E D N K W A C N C D L L Q L K T W L
661 TCAGTTGGAGGACAACAAATGGGCCTGCAATTGTGACTTATTGCAGTTAAAAACTTGGTT
234 E N M P F Q S I I G D V V C N S P F F F
721 GGAGAACATGCCTCCACAGTCTATAATTGGTGATGTTGTCTGCAACAGCCCTCCATTTTT
254 K G S I L S R L K K E S I C F T P P V Y
781 TAAAGGAAGTATACTCAGTAGACTAAAGAAGGAATCTATTGCOCTACTCCACCAAGTGA
274 E E H E D P S G S L S L A A T S S I N D
841 TGAAGAACATGAGGATCCTTCAGGATCATTACATCTGGCAGCAACATCTTCAATAAATGA
294 S R M S T K T T S I L K L P T K A P G L
901 TAGTCGATGTCAACTAAGACCACGTCCATTCTAAAACCTACCCACCAAGCACCAGGTTT
314 I P Y I T K P S T Q L P G P Y C P I P C
961 GATACCTTATATTACAAAGCCATCCACTCAACTTCCAGGACCTTACTGCCCTATTCCCTTG
334 N C K V L S P S G L L I H C Q E R N I E
1021 TAACTGCAAAGTCCTATCCCCATCAGGACTTCTAATACATTGTCAGGAGCGCAACATTGA
354 S L S D L R P P P Q N P R K L I L A G N
1081 AAGCTTATCAGATCTGAGACCTCCTCCGCAAAATCCTAGAAAGCTCATTCTAGCGGGAAA
374 I I H S L M N P S F G P K H L E E E E E
1141 TATTATTCACAGTTTAAATGAATCCATCCTTTGGTCCAAAGCATCTGGAAGAGGAAGAAGA
394 R N E K E G S D A K H L Q R S L L E Q E
1201 GAGGAATGAGAAAGAAGGAAGTGATGCAAAACATCTCCAAAGAAGTCTTTTGGAAACAGGA
414 N H S P L T G S N M K Y K T T N Q S T E
1261 AAATCATTCACTCACTCACAGGGTCAAATATGAAATACAAAACCACGAACCAATCAACAGA
434 F L S F Q D A S S L Y R N I L E K E R E
1321 ATTTTATCCTTCCAAGATGCCAGCTCATTGTACAGAAACATTTTAGAAAAAGAAAGGGA
454 L Q Q L G I T E Y L R K N I A Q L Q P D
1381 ACTTCAGCAACTGGGAATCACAGAATACCTAAGGAAAAACATTGCTCAGCTCCAGCCTGA
474 M E A H Y P G A H E E L K L M E T L M Y
1441 TATGGAGGCACATTATCCTGGAGCCACGAAGAGCTGAAGTTAATGGAAACATTAATGTA
494 S R P R K V L V E Q T K N E Y F E L K A
1501 CTCACGTCCAAGGAAGGTATTAGTGGAAACAGACAAAAAATGAGTATTTTGAACTTAAAGC

Figure 2F-3

514 N L H A E P D Y L E V L E Q Q T *

1561 TAATTACATGCTGAACCTGACTATTTAGAAAGTCCTGGAGCAGCAAACATAGatggaga

Figure 3:

Figure 3A. Amino acid sequence 158P1D7 v.1 (SEQ ID NO:14). The 158P1D7 v.1 protein has 841 amino acids.

```
1 MKLWIHLFYS SLACISLHS QTPVLSSRGS CDSLNCCEEK DGTMLINCEA KGIKMOVSEIS
61 VPPSRPFQLS LLNNGLTMLH TNDFSGLTNA ISIHGFMNI ADIEIGAFNG LGLLKQLHIN
121 HNSLEILKED TFHGLENLEF LQADNNFITV IEPSAFSKLN RLKVLILNDN AIESLPPNIF
181 RFVPLTHLDL RGNQLQTLPY VGFLERIGRI LQLQLEDNHW ACNCDLIQLK TWLENMPPQS
241 IIGDVVCNSP PFFKGSILSR LKESICPTP PVYEEHEDPS GSLHLAATSS INDSRMSTKT
301 TSILKLPYKA PGLIPYITKP STQLPGPYCP IPCNCKVLSP SGLLINCQER NIESLSDLAP
361 PFQNPRLIL AGNIHSLMK SDLYEYFTLE MLHLGNRRIE VLEEGSFNNL TRLOKLYLNG
421 NHLTRLSKGM FLGLHNLEYL YLEYNAIKEI LPTFTNPMFK LKVLYLNNNL LQVLPPHIFS
481 GVPLTKVNLK TNQFTHLFVS NILDLDLLT QIDLEDNPDW CSCDLVGLQQ WIQKLSKNTV
541 TDDILCTSPG HLDKKEIKAL NSEILCPGLV NNPSMPTQTS YLMVTTPATT TNTADTILAS
601 LTDAVPLSVL ILGLLIMFIT IVFCAAGIVV LVLHRRRBYK KKQVDEQMRD NSPVHLQYSM
661 YGHKTHHTT ERPSASLYEQ HMVSPMVHVV RSPSFGPKHL EEEERNEKE GSDAKHLQRS
721 LLEQENHSFL TGSNMKYNTT NQSTFLSPQ DASSLYRNIL EKEKELQQLS ITEYLKKNIA
781 QLQPDMEAHY PGAHEELKLM ETLMYSRPRK VLVEQTKNEY FELKANLHAE PDYLEVLEQQ
841 T
```

Figure 3B. Amino acid sequence 158P1D7 v.3 (SEQ ID NO:15). The 158P1D7 v.3 protein has 732 amino acids.

```
1 MKLWIHLFYS SLACISLHS QTPVLSSRGS CDSLNCCEEK DGTMLINCEA KGIKMOVSEIS
61 VPPSRPFQLS LLNNGLTMLH TNDFSGLTNA ISIHGFMNI ADIEIGAFNG LGLLKQLHIN
121 HNSLEILKED TFHGLENLEF LQADNNFITV IEPSAFSKLN RLKVLILNDN AIESLPPNIF
181 RFVPLTHLDL RGNQLQTLPY VGFLERIGRI LQLQLEDNHW ACNCDLIQLK TWLENMPPQS
241 IIGDVVCNSP PFFKGSILSR LKESICPTP PVYEEHEDPS GSLHLAATSS INDSRMSTKT
301 TSILKLPYKA PGLIPYITKP STQLPGPYCP IPCNCKVLSP SGLLINCQER NIESLSDLAP
361 PFQNPRLIL AGNIHSLMK SDLYEYFTLE MLHLGNRRIE VLEEGSFNNL TRLOKLYLNG
421 NHLTRLSKGM FLGLHNLEYL YLEYNAIKEI LPTFTNPMFK LKVLYLNNNL LQVLPPHIFS
481 GVPLTKVNLK TNQFTHLFVS NILDLDLLT QIDLEDNPDW CSCDLVGLQQ WIQKLSKNTV
541 TDDILCTSPG HLDKKEIKAL NSEILCPGLV NNPSMPTQTS YLMVTTPATT TNTADTILAS
601 LTDAVPLSVL ILGLLIMFIT IVFCAAGIVV LVLHRRRBYK KKQVDEQMRD NSPVHLQYSM
661 YGHKTHHTT ERPSASLYEQ HMGAEELKL METLMYSRPR KVLVEQTKNE YFELKANLHA
721 EPDYLEVLEQ QT
```

Figure 3C. Amino acid sequence 158P1D7 v.4 (SEQ ID NO:16). The 158P1D7 v.4 protein has 395 amino acids.

```
1  MKLWIHLFYS  SLLACISLHS  QTPVLSSRGS  CDSLNCCEEK  DGTMLINCEA  KGIKMVSEIS
61  VPPSRPFQLS  LLNNGLTMLH  TNDPSGLTNA  ISIHLSGFNNI  ADIEIGAFNG  LGLLKQLHIN
121 HNSLEILKED  TFHGLENLEF  LQADNWFITV  IEPsAFSKLN  RLKVLILNDN  AIESLPPNIF
181 RFVPLTHLDL  RGNQLQTLFY  VGFLERIGRI  LDLQLEDNKW  ACNCDLLQLK  TWLENMPPQS
241 IIGDVVCNSP  PFFKGSILSR  LKESICPTP  PVEEHEDPS  GSLHLAATSS  INDSRMSTKT
301 TSILKLPTKA  PGLIPYITKP  STQLPGPYCP  IPCNCKVLSP  SGLLIHCQER  NIESLSDLRF
361 PPQNPRKLIL  AGNIHSLMK  SILWSKASGR
```

Figure 3D. Amino acid sequence 158P1D7 v.6 (SEQ ID NO:17). The 158P1D7 v.6 protein has 529 amino acids.

```
1  MKLWIHLFYS  SLLACISLHS  QTPVLSSRGS  CDSLNCCEEK  DGTMLINCEA  KGIKMVSEIS
61  VPPSRPFQLS  LLNNGLTMLH  TNDPSGLTNA  ISIHLSGFNNI  ADIEIGAFNG  LGLLKQLHIN
121 HNSLEILKED  TFHGLENLEF  LQADNWFITV  IEPsAFSKLN  RLKVLILNDN  AIESLPPNIF
181 RFVPLTHLDL  RGNQLQTLFY  VGFLERIGRI  LDLQLEDNKW  ACNCDLLQLK  TWLENMPPQS
241 IIGDVVCNSP  PFFKGSILSR  LKESICPTP  PVEEHEDPS  GSLHLAATSS  INDSRMSTKT
301 TSILKLPTKA  PGLIPYITKP  STQLPGPYCP  IPCNCKVLSP  SGLLIHCQER  NIESLSDLRF
361 PPQNPRKLIL  AGNIHSLMN  PSPGPRLEE  EERNEKEGS  DAKHLQRSLL  EQENNSPLTG
421 SNMKYKTTNQ  STEFLSFQDA  SSLYRNILEK  ERELQQLGIT  EYLAKNIAQL  QPDMEAHYPG
481 AHEELKLMET  LMYSRPRKVL  VEQTKNEYFE  LKANLHAEFD  YLEVLEQQT
```

Figure 4: 158P107 v.1 amino acid (SEQ ID NO:18) BLAST homology to hypothetical protein FLJ22774 (SEQ ID NO:19).

Identities = 798/798 (100%)

```
Query: 44  MLINCEAKGIKVMSEISVPPSRPFQSLNNGLTMLHTNDFSGLTNAISIHGPNNIADI 103
          MLINCEAKGIKVMSEISVPPSRPFQSLNNGLTMLHTNDFSGLTNAISIHGPNNIADI
Sbjct: 1  MLINCEAKGIKVMSEISVPPSRPFQSLNNGLTMLHTNDFSGLTNAISIHGPNNIADI 60

Query: 104  EIGAFNGLGLLKQLHINHNLSLEILKEDTFHGLENLFLQADNNFITVIEPSAFSKLNRLK 163
          EIGAFNGLGLLKQLHINHNLSLEILKEDTFHGLENLFLQADNNFITVIEPSAFSKLNRLK
Sbjct: 61  EIGAFNGLGLLKQLHINHNLSLEILKEDTFHGLENLFLQADNNFITVIEPSAFSKLNRLK 120

Query: 164  VLIINDNAIESLPPNIFRFVPLTHLRLGNQLQTLPPYVGFLHIGRILDQLQLEDNKWACN 223
          VLIINDNAIESLPPNIFRFVPLTHLRLGNQLQTLPPYVGFLHIGRILDQLQLEDNKWACN
Sbjct: 121  VLIINDNAIESLPPNIFRFVPLTHLRLGNQLQTLPPYVGFLHIGRILDQLQLEDNKWACN 180

Query: 224  CDLLQLKTWLENMPPQSIIGDVVCNSPPFFKGSILSRLLKESICPTFPVYEEHEDFSGSL 283
          CDLLQLKTWLENMPPQSIIGDVVCNSPPFFKGSILSRLLKESICPTFPVYEEHEDFSGSL
Sbjct: 181  CDLLQLKTWLENMPPQSIIGDVVCNSPPFFKGSILSRLLKESICPTFPVYEEHEDFSGSL 240

Query: 284  HLAATSSINDSRMSTKTTTSLKLPTEKAGLIPIYITKPSQTLPGEYCPICNCKVLSFSGSL 343
          HLAATSSINDSRMSTKTTTSLKLPTEKAGLIPIYITKPSQTLPGEYCPICNCKVLSFSGSL
Sbjct: 241  HLAATSSINDSRMSTKTTTSLKLPTEKAGLIPIYITKPSQTLPGEYCPICNCKVLSFSGSL 300

Query: 344  LIHCQERNIESLSDLRPPFQNPRLILAGNIHSLMKSDIVEYFTLEMLHLGNNRIEVL 403
          LIHCQERNIESLSDLRPPFQNPRLILAGNIHSLMKSDIVEYFTLEMLHLGNNRIEVL
Sbjct: 301  LIHCQERNIESLSDLRPPFQNPRLILAGNIHSLMKSDIVEYFTLEMLHLGNNRIEVL 360

Query: 404  EGSFNNLTRLQKLYLNGNHLTKLSKGMFLGLNLELYLYLEYNAIKEILPGTFNPMFKLV 463
          EGSFNNLTRLQKLYLNGNHLTKLSKGMFLGLNLELYLYLEYNAIKEILPGTFNPMFKLV
Sbjct: 361  EGSFNNLTRLQKLYLNGNHLTKLSKGMFLGLNLELYLYLEYNAIKEILPGTFNPMFKLV 420

Query: 464  LYLNMMNLQVLPPHIFSGVFLTKVNLKTNQFTHLPVSNILDDLTLTQIDLEDNFWDCSC 523
          LYLNMMNLQVLPPHIFSGVFLTKVNLKTNQFTHLPVSNILDDLTLTQIDLEDNFWDCSC
Sbjct: 421  LYLNMMNLQVLPPHIFSGVFLTKVNLKTNQFTHLPVSNILDDLTLTQIDLEDNFWDCSC 480

Query: 524  DLVGLQQWIQKLSKNTVTDDILCTSPGHLDKKELKALNSEILCPGLVNNPMSMPTQTSYIM 583
          DLVGLQQWIQKLSKNTVTDDILCTSPGHLDKKELKALNSEILCPGLVNNPMSMPTQTSYIM
Sbjct: 481  DLVGLQQWIQKLSKNTVTDDILCTSPGHLDKKELKALNSEILCPGLVNNPMSMPTQTSYIM 540

Query: 584  VTPPATTTNTADTILRSLTDAVPLSVLILGLLIMFITIVFCAAGIVVLVLRKRRRYKKKQ 643
          VTPPATTTNTADTILRSLTDAVPLSVLILGLLIMFITIVFCAAGIVVLVLRKRRRYKKKQ
Sbjct: 541  VTPPATTTNTADTILRSLTDAVPLSVLILGLLIMFITIVFCAAGIVVLVLRKRRRYKKKQ 600

Query: 644  VDEQMRDNSFVHLQYSMYGHKTTHTTTERPSASLYEQHMVSPMVHVYRSPSPGPKHLEE 703
          VDEQMRDNSFVHLQYSMYGHKTTHTTTERPSASLYEQHMVSPMVHVYRSPSPGPKHLEE
Sbjct: 601  VDEQMRDNSFVHLQYSMYGHKTTHTTTERPSASLYEQHMVSPMVHVYRSPSPGPKHLEE 660

Query: 704  EERNEKEGSDAKHLQRSLLLEQENHSPLTGSNMKYKTTNQSTEFLSFQDASSLYRNILEKE 763
          EERNEKEGSDAKHLQRSLLLEQENHSPLTGSNMKYKTTNQSTEFLSFQDASSLYRNILEKE
Sbjct: 661  EERNEKEGSDAKHLQRSLLLEQENHSPLTGSNMKYKTTNQSTEFLSFQDASSLYRNILEKE 720

Query: 764  RELQQLGITEYLAKNIAQLQPDNEAHYPGAHEELKLMETIMYSRPRKVLVEQTKNEYFEL 823
          RELQQLGITEYLAKNIAQLQPDNEAHYPGAHEELKLMETIMYSRPRKVLVEQTKNEYFEL
Sbjct: 721  RELQQLGITEYLAKNIAQLQPDNEAHYPGAHEELKLMETIMYSRPRKVLVEQTKNEYFEL 780

Query: 824  KANLHAEPDYLEVLEQQT 841
          KANLHAEPDYLEVLEQQT
Sbjct: 781  KANLHAEPDYLEVLEQQT 798
```

Figure 5:

Figure 5A: Alignment of 158P1D7 v.1 (SEQ ID NO:20) with human FLJ22774, CLONE KAIA1575.[Homo sapiens] (SEQ ID NO:21).

Identities = 405/415 (97%), Positives = 405/415 (97%)

```

158P1D7: 44 MLINCEARGIKMVSEISVPPSRPFQSLNNGLTMLHTNDFSGLTNAISIHGFMNIADI 103
                MLINCEARGIKMVSEISVPPSRPFQSLNNGLTMLHTNDFSGLTNAISIHGFMNIADI
Sbjct: 1      MLINCEARGIKMVSEISVPPSRPFQSLNNGLTMLHTNDFSGLTNAISIHGFMNIADI 60

158P1D7:104 EIGAFNGLGLLQQLHNNHNSLEILKEDTFHGLENLFLQADNNFITVIEPSAFSKLNRLK 163
                EIGAFNGLGLLQQLHNNHNSLEILKEDTFHGLENLFLQADNNFITVIEPSAFSKLNRLK
Sbjct: 61     EIGAFNGLGLLQQLHNNHNSLEILKEDTFHGLENLFLQADNNFITVIEPSAFSKLNRLK 120

158P1D7:164 VLILNDNAIESLFPNIFRFVPLTHLDLRGNQLQTLFVVGFLSHIGRILDQLEDNKWACN 223
                VLILNDNAIESLFPNIFRFVPLTHLDLRGNQLQTLFVVGFLSHIGRILDQLEDNKWACN
Sbjct: 121    VLILNDNAIESLFPNIFRFVPLTHLDLRGNQLQTLFVVGFLSHIGRILDQLEDNKWACN 180

158P1D7:224 CDLLQLKTWLENMPPQSIIGDVVCNSPFFFKGSILSRKKESICPTFPVYEEHEDPSGSL 283
                CDLLQLKTWLENMPPQSIIGDVVCNSPFFFKGSILSRKKESICPTFPVYEEHEDPSGSL
Sbjct: 181    CDLLQLKTWLENMPPQSIIGDVVCNSPFFFKGSILSRKKESICPTFPVYEEHEDPSGSL 240

158P1D7:284 HLAATSSINDSRMSTKTTTILKLPTKAPGLIPYITKPSQTLPGPYCPICNCKVLSPSGL 343
                HLAATSSINDSRMSTKTTTILKLPTKAPGLIPYITKPSQTLPGPYCPICNCKVLSPSGL
Sbjct: 241    HLAATSSINDSRMSTKTTTILKLPTKAPGLIPYITKPSQTLPGPYCPICNCKVLSPSGL 300

158P1D7:344 LIHQERNIESLSLDRFPFQNPRLILAGNIHSLMKSDLVVEYFTLEMLHLGNRIEVL 403
                LIHQERNIESLSLDRFPFQNPRLILAGNIHSLMKSDLVVEYFTLEMLHLGNRIEVL
Sbjct: 301    LIHQERNIESLSLDRFPFQNPRLILAGNIHSLMKSDLVVEYFTLEMLHLGNRIEVL 360

158P1D7:404 EGSFNNLTALQKLYLNGNHLTKLSKGMFLGLHXXXXXXXXXXAIKEILPGTFNPM 458
                EGSFNNLTALQKLYLNGNHLTKLSKGMFLGLH AIKEILPGTFNPM
Sbjct: 361    EGSFNNLTALQKLYLNGNHLTKLSKGMFLGLHNNLEYLYLEYNAIKETLPGTFNPM 415

```

Figure 5B-1: Alignment of 158P1D7 v.1 protein (SEQ ID NO:22) with a human protein similar to IGFALS (SEQ ID NO:23).

Identities = 316/864 (36%), Positives = 459/864 (52%)

```

158P1D7:1  MKLWIRLPHYSSLLACISLHSQTPVLSRRSCDSLCNCEKSDGTMLINCEARGIKMVSEIS 60
                M LW+ L S+L++ + S V +C+C + + +NCE + +++
Sbjct: 17  MFLWLFILSALISSTNADSDISV-----EICNVCSVSENVLYVNCERKVSRYRPNQLR 71

158P1D7:61  VPPSRPFQSLNNGLTMLHTNDFSGLTNAISIHGFMNIADIEIGAFNGLGLLQQLHNN 120
                P S + L+ NN L +L+ N F ++A+S+HLG N + +IE GAF GL LKQLH+N
Sbjct: 72  PPGSNFYHLNFQNNELNLYPNTPLNFSEAVSLHLGNKQLQRIEGGAFGLSALNQLHNN 131

158P1D7:121 HNSLEILKEDTFHGLENLFLQADNNFITVIEPSAFSKLNRLKVLILNDNAIESLFPNIF 180
                +N L+IL+ DTF G+ENLE+LQAD N I IE AP+KL++LKVLIINDN I LP NIF
Sbjct: 132 HNELKILRADTFHGLENLKXIQAYNLIYIEKAFNNLHKLKVLILNDNLISPLVDNIF 191

158P1D7:181 RFVPLTHLDLRGNQLQTLFVVGFLSHIGRILDQLEDNKWACNCDLLQLKTWLENMPPQS 240
                RF LTHLD+RGN++Q LFY+G LEHIGR+++LQLEDN W C+CDLL LK WLENMP
Sbjct: 192 RFASLTHLDLRGNRIQKLYPYIGVLEHIGRIVVELQLEDNFWNCSCDLLPIKAWLENMEYNI 251

158P1D7:241 IIGDVVCNSPFFFKGSILSRKKESICP-----TPFVYEEHEDPSGSLHLAATS 283
                IG+ +C +P G +L K+ +CP PP E+ + + H TS
Sbjct: 252 YIGSAICETPSDLYGKLLKETNQLCENGTGSDFDVRILPFSQLENGYTTFNHGTQTS 311

158P1D7:290 SINDSRMSTKTTTILKLPTKAPGLI-----PYITKPSQTLPG-PYCPICNCKV- 337
                RTT+ P+K G++ I T++P CP PC CK
Sbjct: 312 LHRIVTKRPKTTN-----PSKIGGIVAGKALGNRNLSQIVSYQTRVPLTPCPADCFCKTH 367

158P1D7:338 LSPSGLLIHQERNIESLSLDRFPFQNPRLILAGNIHSLMKSDLVVEYFTLEMLHLGN 397
                S GL ++CQE+NI+S+S+L P P N +KL + GN I + SD ++ L++LHLO+N

```

Figure 5B-2

Sbjct: 368 FSDLGLSVNCQEKNIQSMSELIPKPLNAEKLHVNGNSIKDVPDVSDFDTDFEGLDLLHLGSN 427

158FID7:398 RIEVLEEGSPMNLTRIQKLYLNGMHLTKLSKGMFLGLHXXXXXXXXXXAIKBIPLPGIFNF 457
+I V++ F NLT L++LYLNGN + +L +F GLR IKBI GTF+

Sbjct: 428 QITVIKGDVFRNLTLNRRLYLNGNQIERLVPEIFSGLHNLQYLYLEVNLKEISAGTFDS 487

158FID7:458 MXXXXXXXXXXXXXXXXXHI FSGVPLTEVNLKTNOFTLFPVMIXXXXXXXXXXXXXXXXXN 517
M +IFSS PL ++NL+ N+F +LPVS + N

Sbjct: 488 MPNLQLLYLNNLLKSLPVYIFSGAPLARNLRNNKFMVLPVSGVLDQLQSLTQIDLEGN 547

158FID7:518 FWDCCDLVGLQQWIKLSKNTVTDILCTSPGHLDKKELKALMSEILCPGLVNNPSMPT 577
FWDCCDLV L+ W++KLS V ++ C +F ELK+L +EILCP L+N PS P

Sbjct: 548 FWDCTCDLVALKLWVEKLSDEGIVVKELCETPVQFANIELKSLKNEILCPKLLNKPEAP- 606

158FID7:578 QTSYLMVXXXXXXXXXXXXXILRSLTDAVFLSVLILGLLIMFITIVFCAAGIVVLVLRHK 637
+ I VFLS+LIL +L++ I VF A ++V VL R +

Sbjct: 607 ---FTSPAPAITFTTFLGPIRSPPGGFVFLSILILSVLVLILTTFVAFCLLVFLVRNK 663

158FID7:638 RYKKKQVDEQMRDNSPVHLQYSMYGKHTHTTTERPSASLYEQHMVSPMVHVYRSPSFGF 697
+ K D + LQ + HK T + E + + +S + G

Sbjct: 664 KPTVKHEGLGNFDCGSMQLQLKHDHK-----TNKKDGLSTEAFIPQTIQMSKSHTCGL 718

158FID7:698 KHLXXXXXXXXXXGSDAKHLQRSLLQENHSPLTGSNMKYKTTNQSTEFLSFQDASSLYK 757
K G K + R++ ++E + + T ++ E +D++ +

Sbjct: 718 RESETGPMFSDPFGQ--KVMRNVDKEDLLHVDTRKRLSTIDELDELFFSRDSNVFIQ 776

158FID7:758 NILEKERELQQLGITEYLRKNIAQLQPDNEAHYFGAHEELKLMETLMYSRFRKVLVEQTK 817
N LE ++E +G++ + E XF + K ++L+ M++VEQ K

Sbjct: 777 NFLESKKKEYNSIGVSGF-----EIRYFEMQPDKKSKKSLIGNRSKIVVEQKK 824

158FID7:818 NEYFELKANLHASPDLLEVLEQQT 841
+EYFELKA L + PDYL+VLE+QT

Sbjct: 825 SEYFELKAKLQSSPDYLQVLEBQT 848

Figure 6. Expression of 158P1D7 by RT-PCR

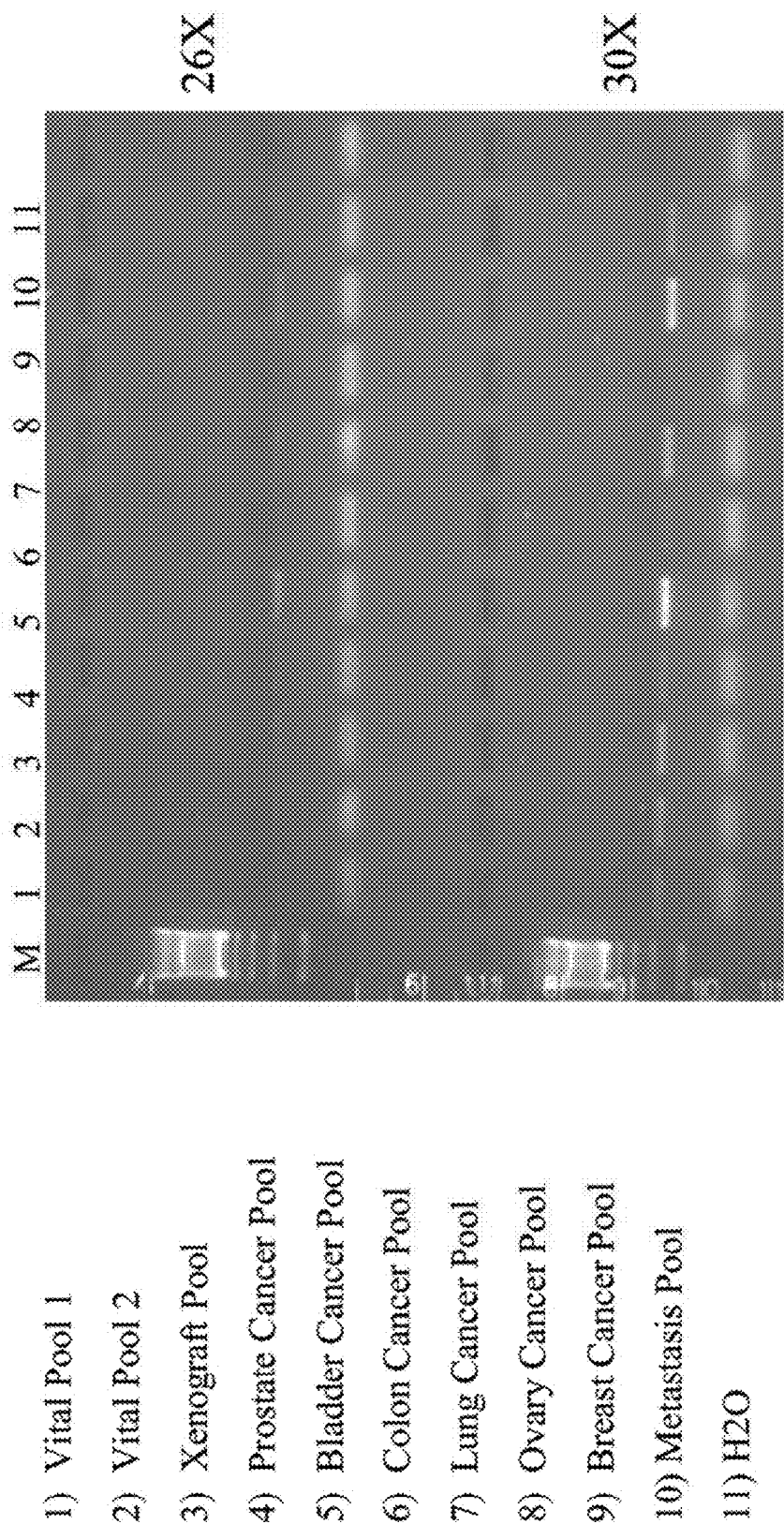


Figure 7. Expression of 158P1D7 in Normal Tissues

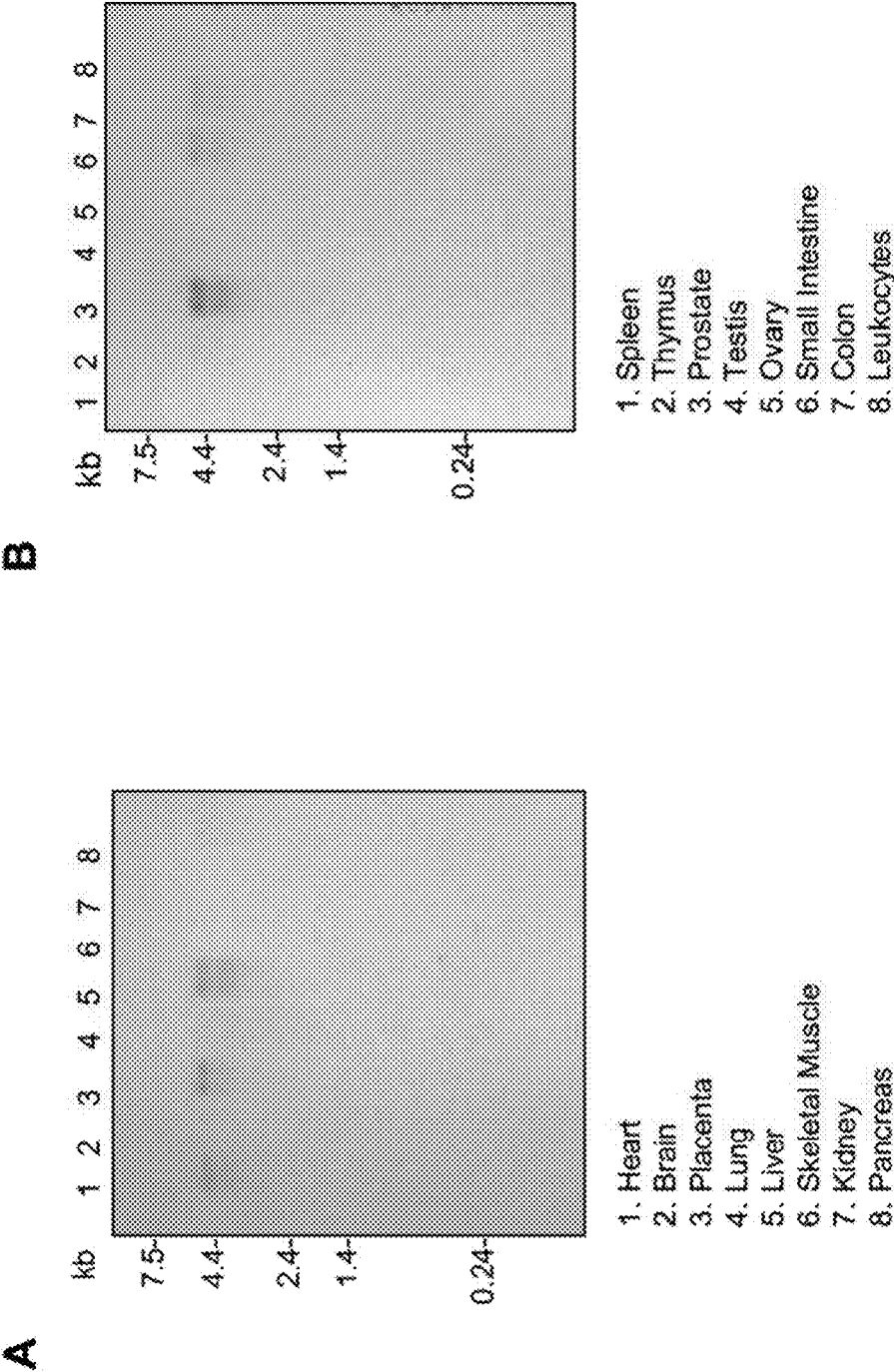


Figure 8A. Expression of 158P1D7 in Bladder Cancer Patient Specimens

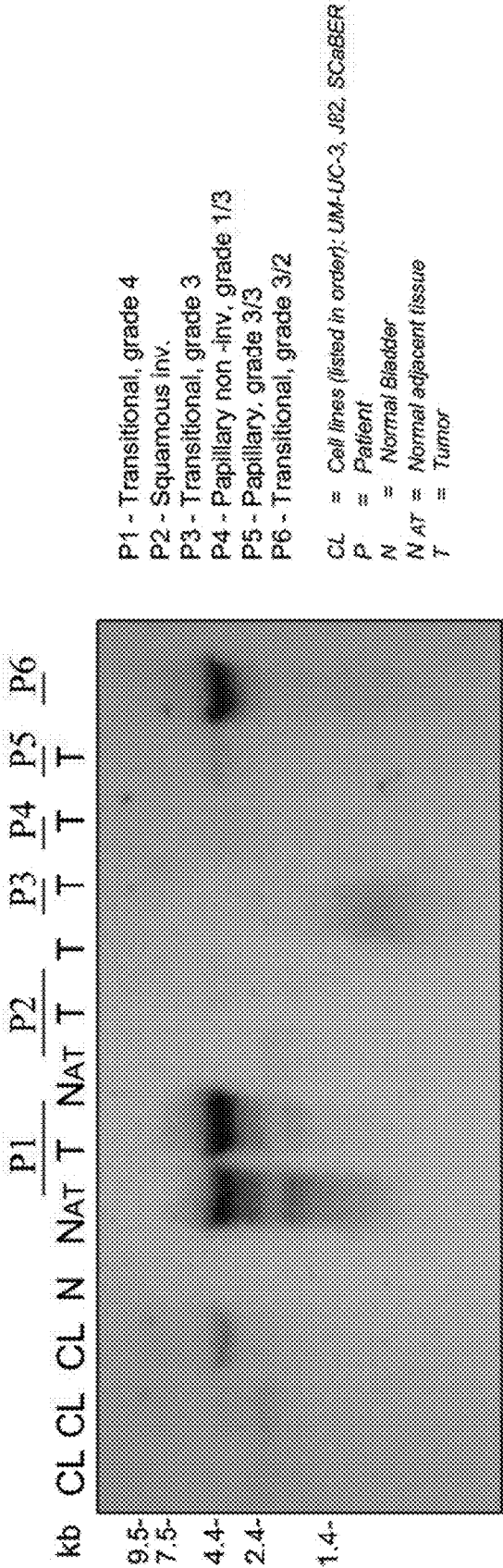


Figure 8B. Expression of 158P1D7 in Bladder Cancer Patient Specimens

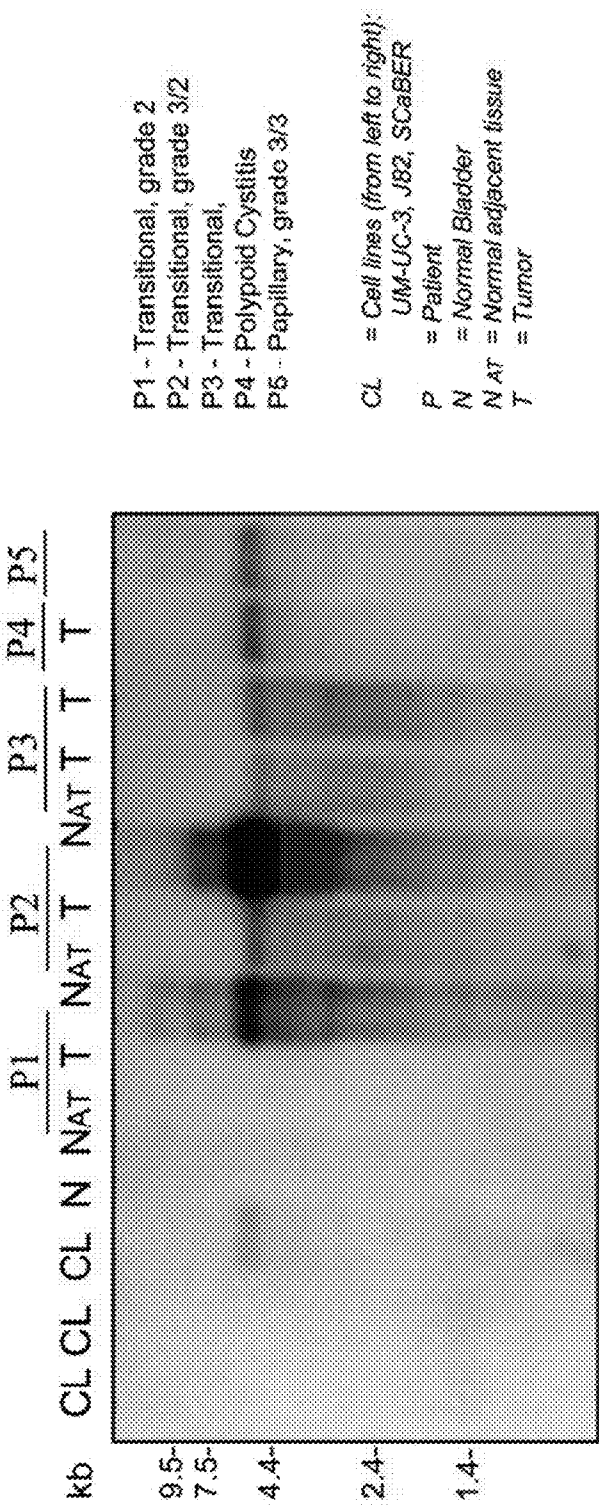


Figure 9. Expression of 158P1D7 in Lung Cancer Patient Specimens

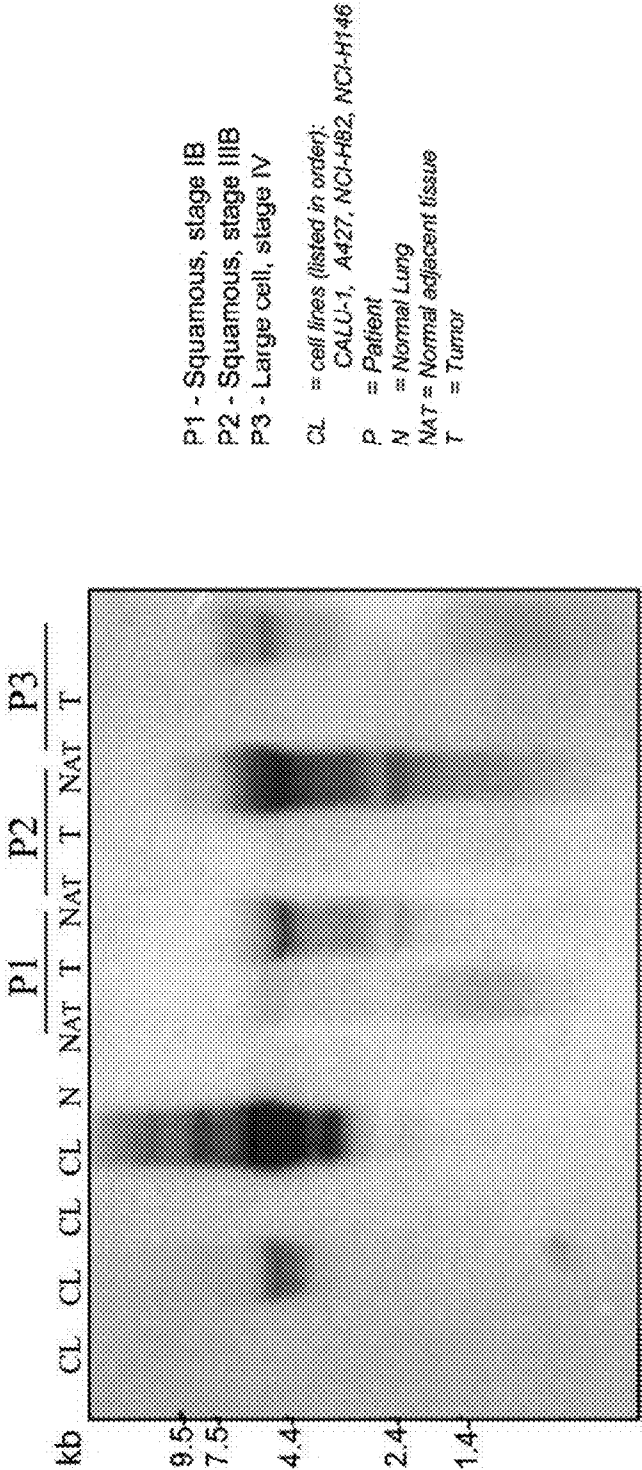


Figure 10. Expression of 158P1D7 in Breast Cancer Patient Specimens

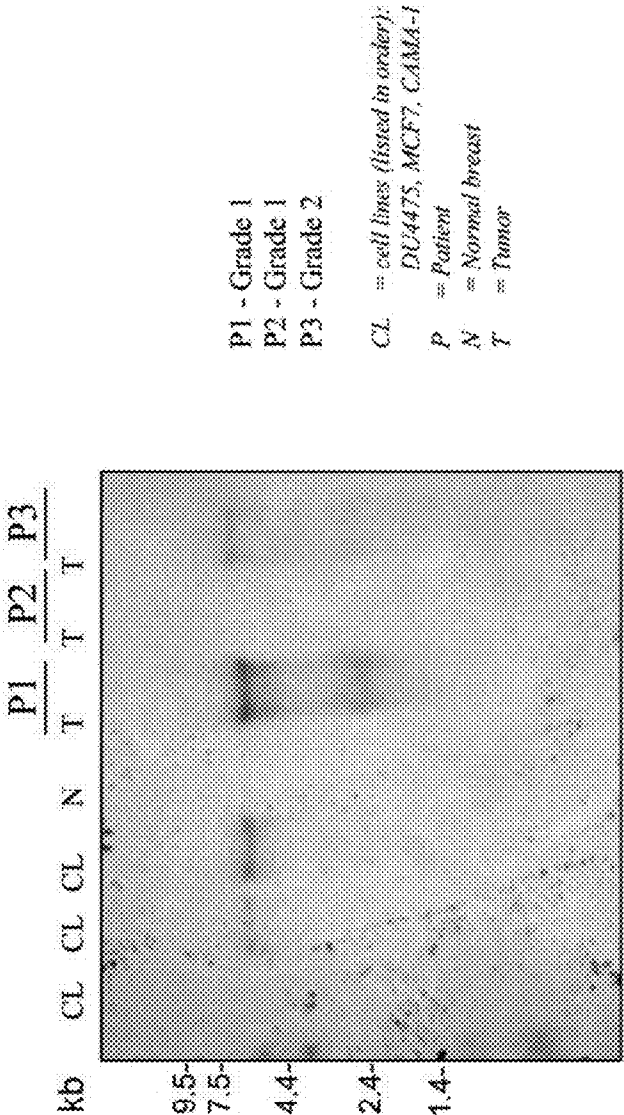


Figure 11a - 158P1D7 variant 1

Hydrophilicity profile

(Hopp T.P., Woods K.R., 1981.

Proc. Natl. Acad. Sci. U.S.A. 78:3824-3828)

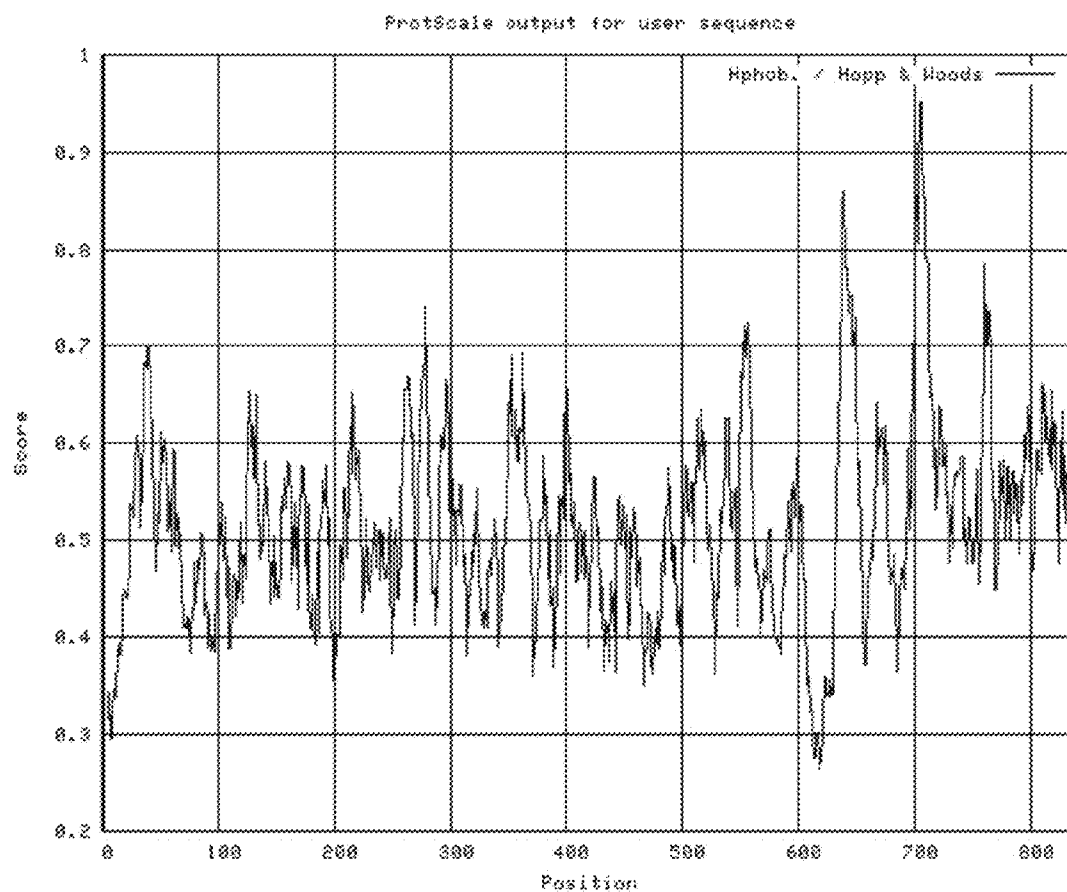


Figure 11b - 158P1D7 variant 3

Hydrophilicity profile

(Hopp T.P., Woods K.R., 1981.

Proc. Natl. Acad. Sci. U.S.A. 78:3824-3828)

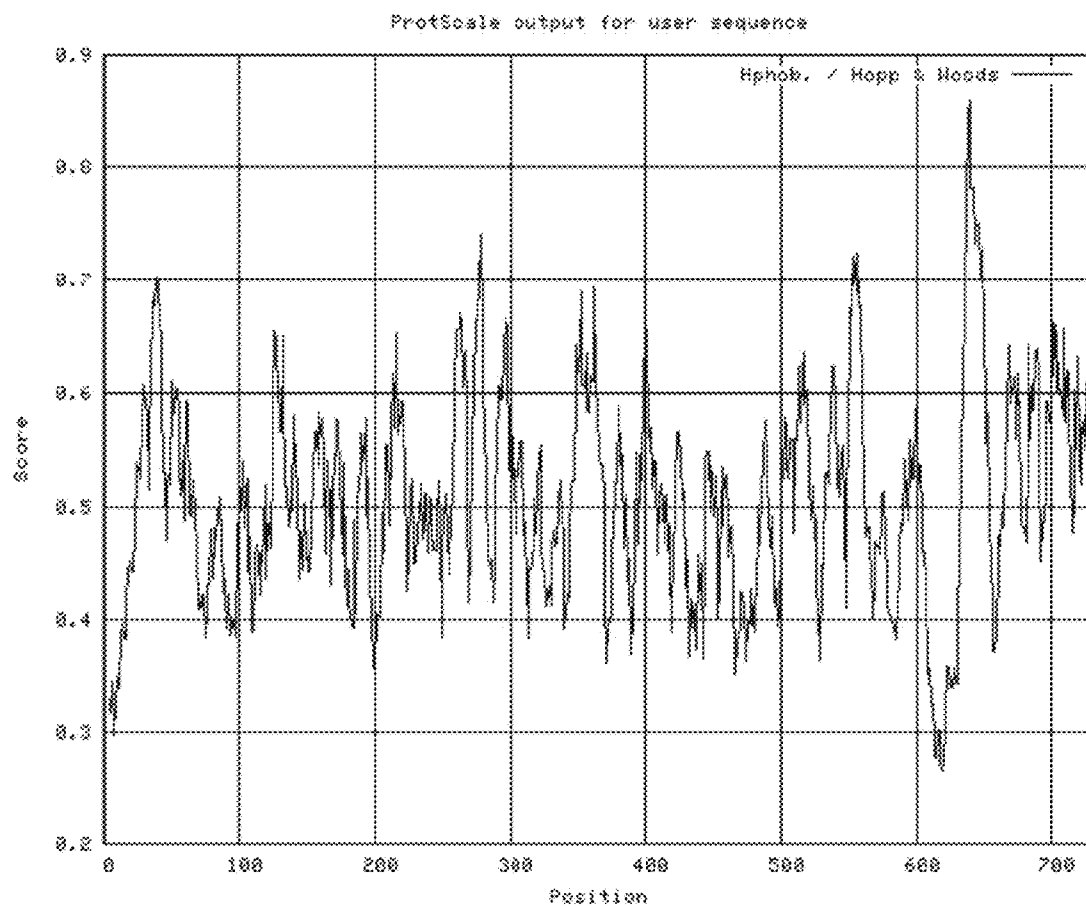


Figure 11c - 158P1D7 variant 4
Hydrophilicity profile
(Hopp T.P., Woods K.R., 1981.
Proc. Natl. Acad. Sci. U.S.A. 78:3824-3828)

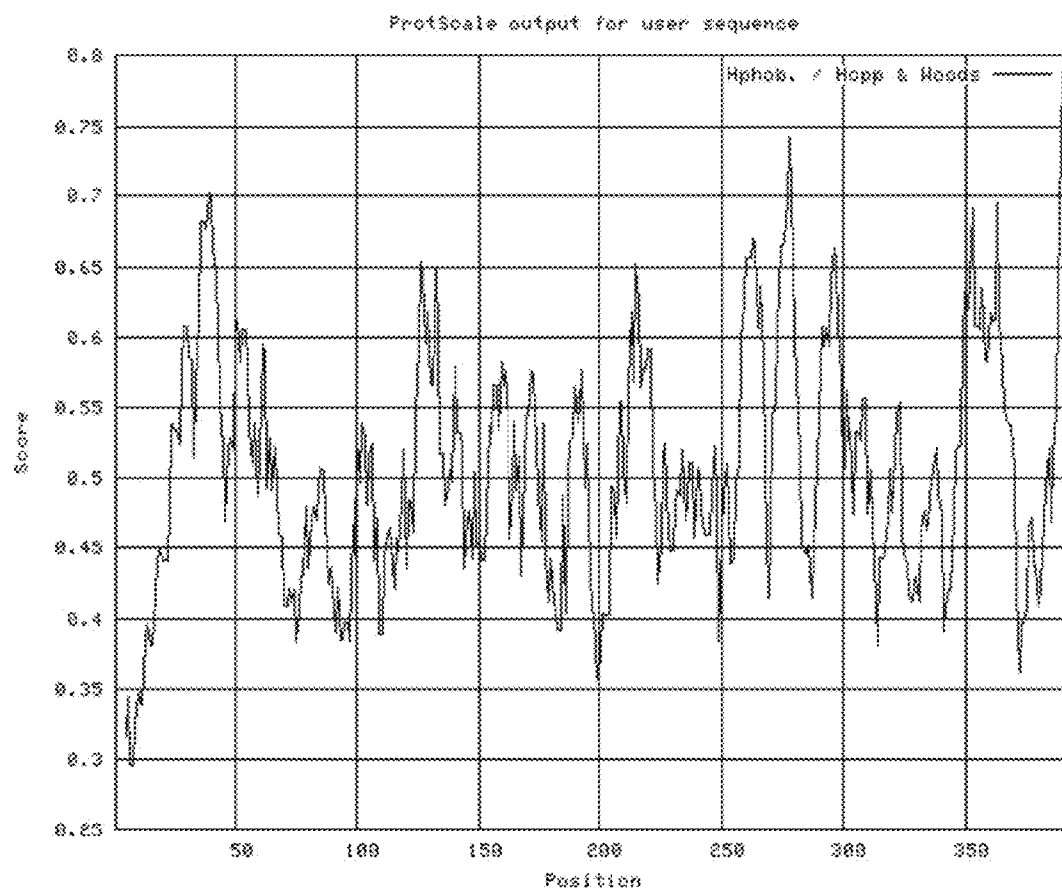


Figure 11d - 158P1D7 variant 6
Hydrophilicity profile
(Hopp T.P., Woods K.R., 1981.
Proc. Natl. Acad. Sci. U.S.A. 78:3824-3828)

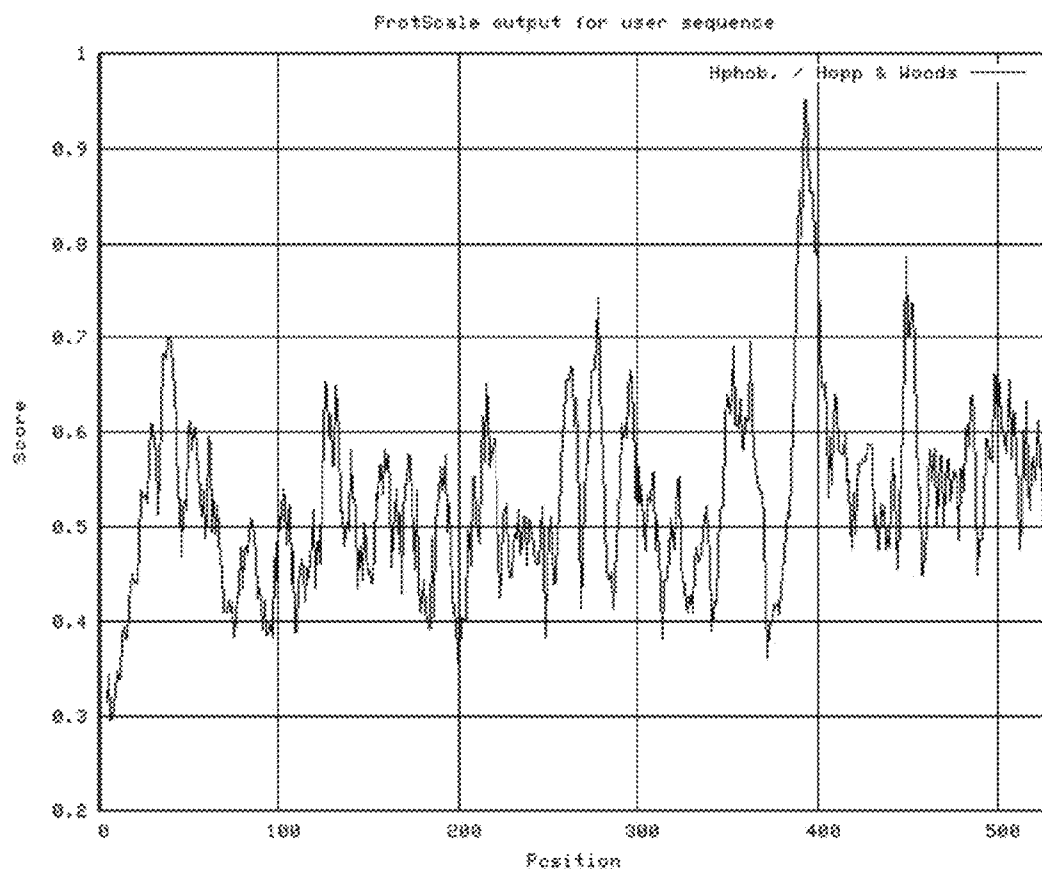


Figure 12a - 158P1D7 variant 1
Hydropathicity Profile
(Kyte J., Doolittle R.F., 1982. J. Mol. Biol. 157:105-132)

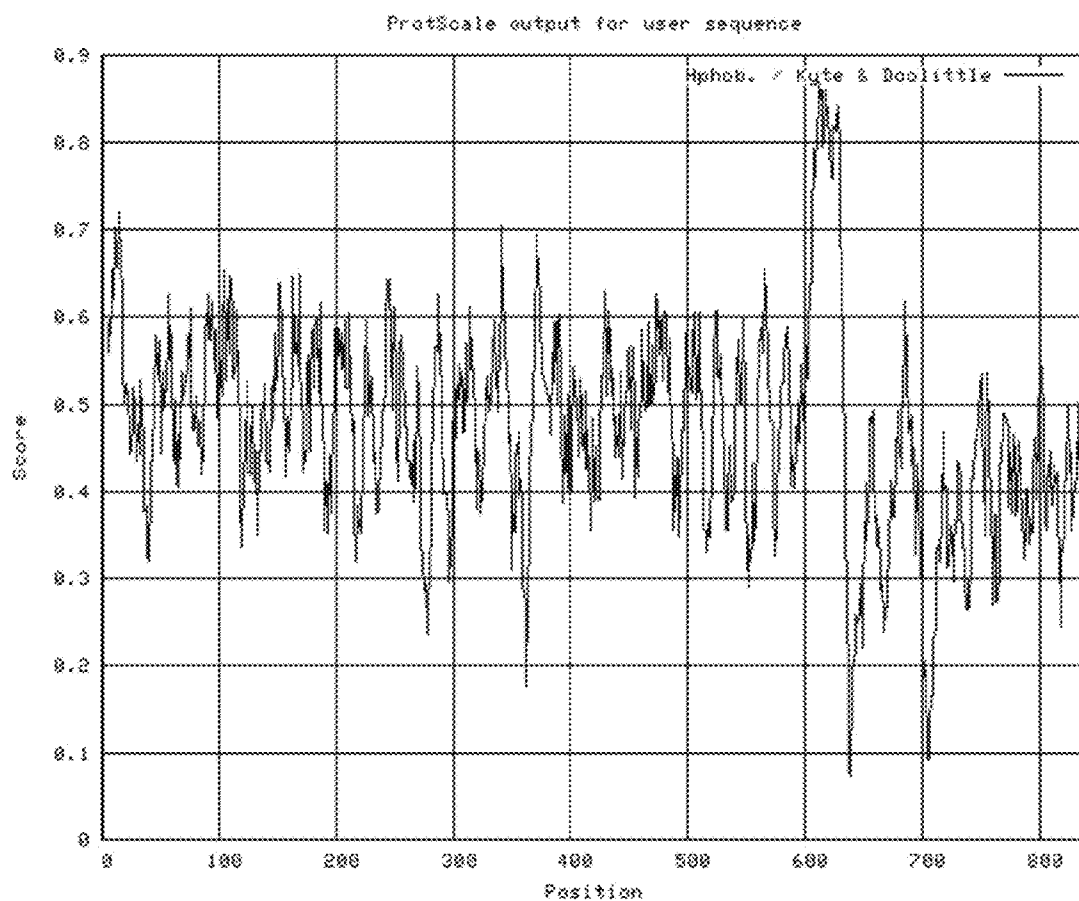


Figure 12b - 158P1D7 variant 3
Hydropathicity Profile
(Kyte J., Doolittle R.F., 1982. J. Mol. Biol. 157:105-132)

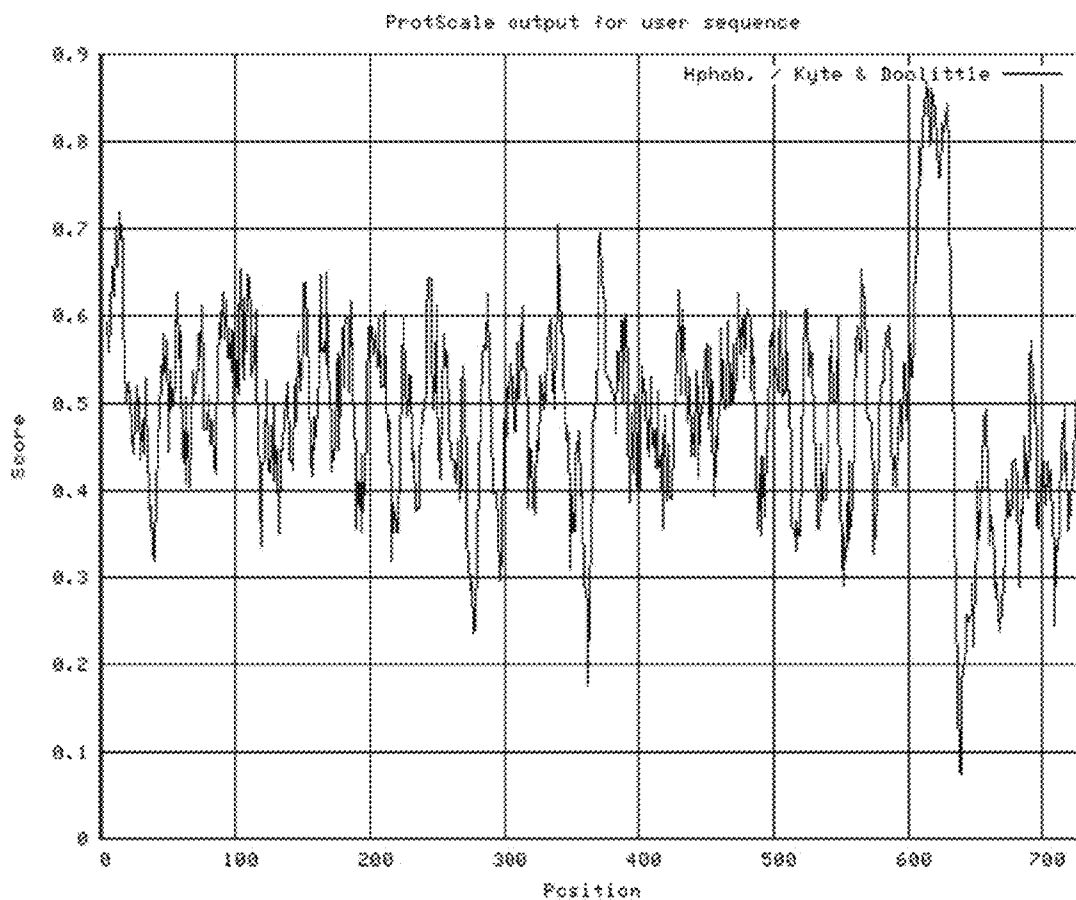


Figure 12c - 158P1D7 variant 4
Hydropathicity Profile
(Kyte J., Doolittle R.F., 1982. J. Mol. Biol. 157:105-132)

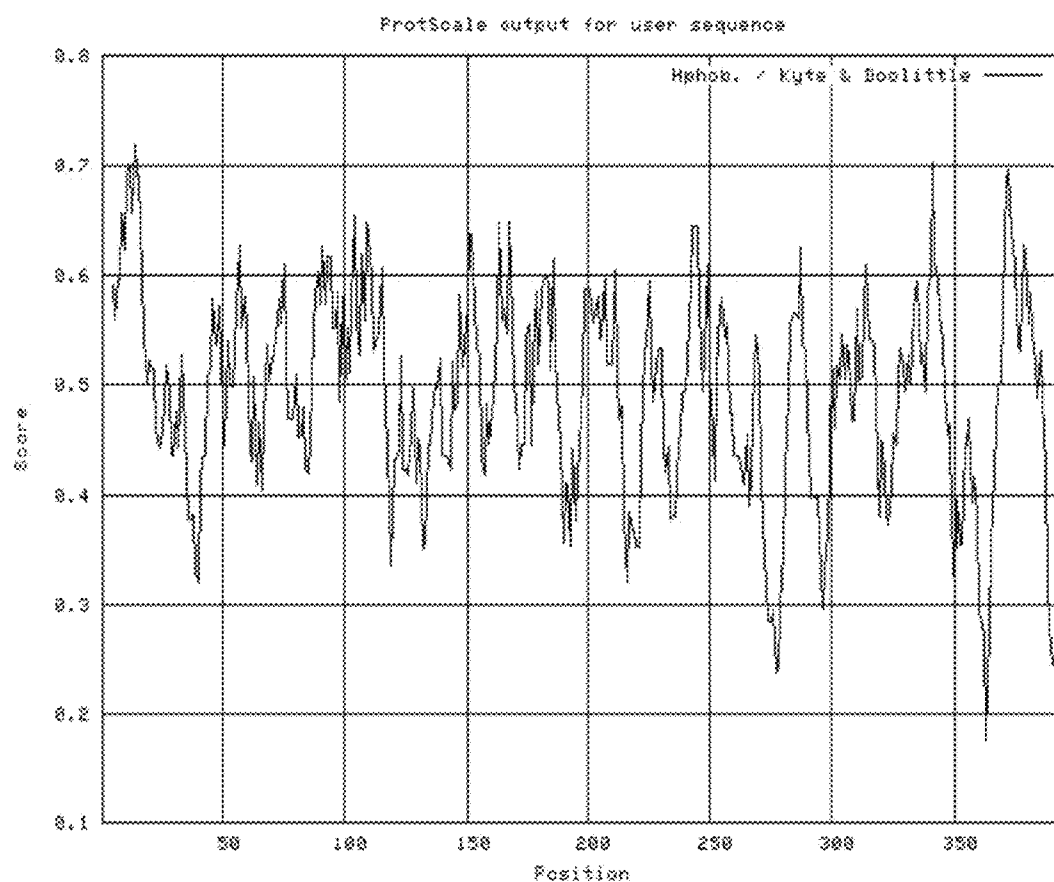


Figure 12d - 158P1D7 variant 6
Hydropathicity Profile
(Kyte J., Doolittle R.F., 1982. J. Mol. Biol. 157:105-132)

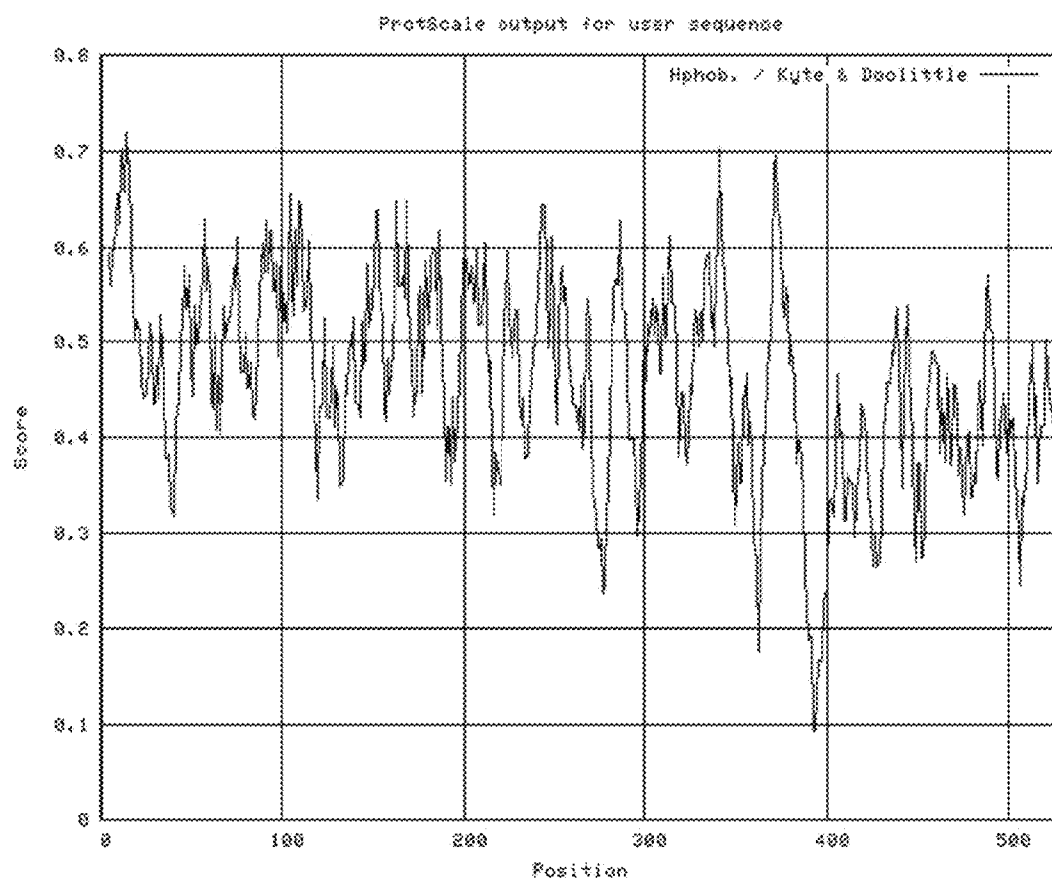


Figure 13a - 158P1D7 variant 1 %
Accessible Residues Profile
(Janin J., 1979. Nature 277:491-492)

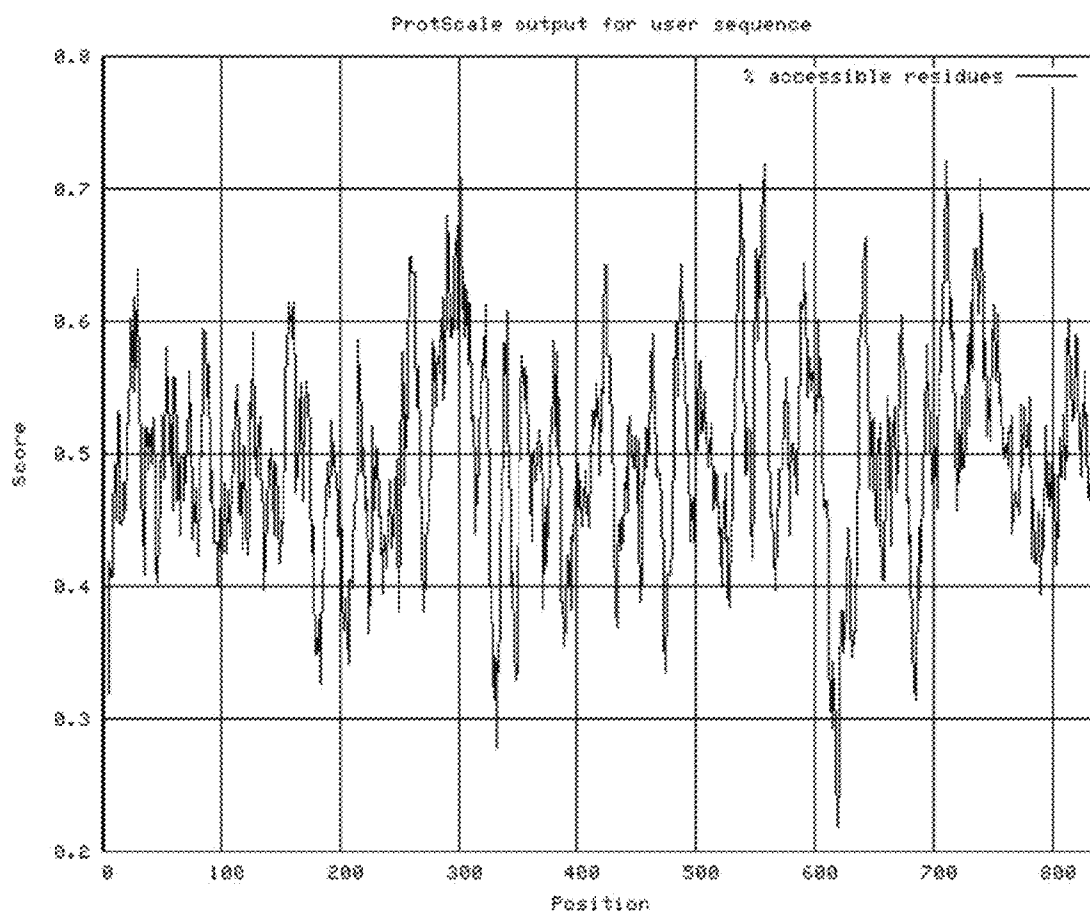


Figure 13b - 158P1D7 variant 3 %
Accessible Residues Profile
(Janin J., 1979. Nature 277:491-492)

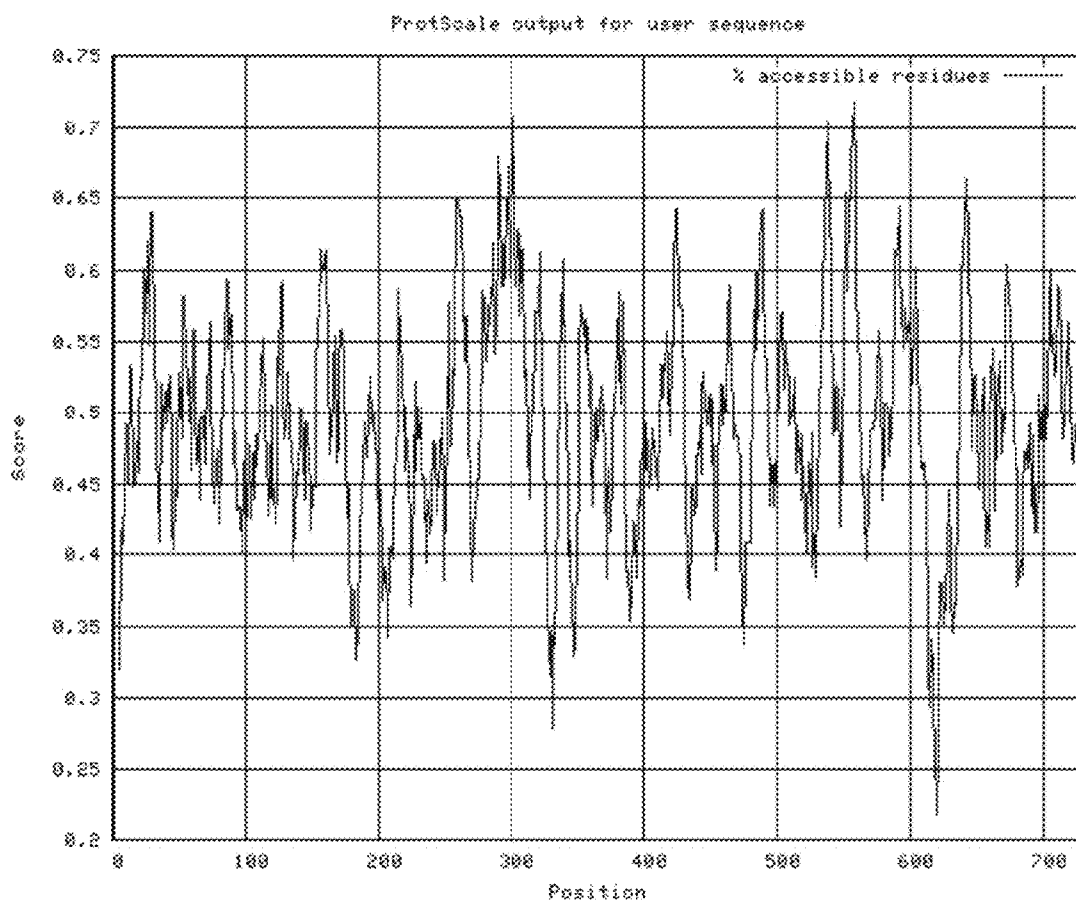


Figure 13c - 158P1D7 variant 4 %
Accessible Residues Profile
(Janin J., 1979. Nature 277:491-492)

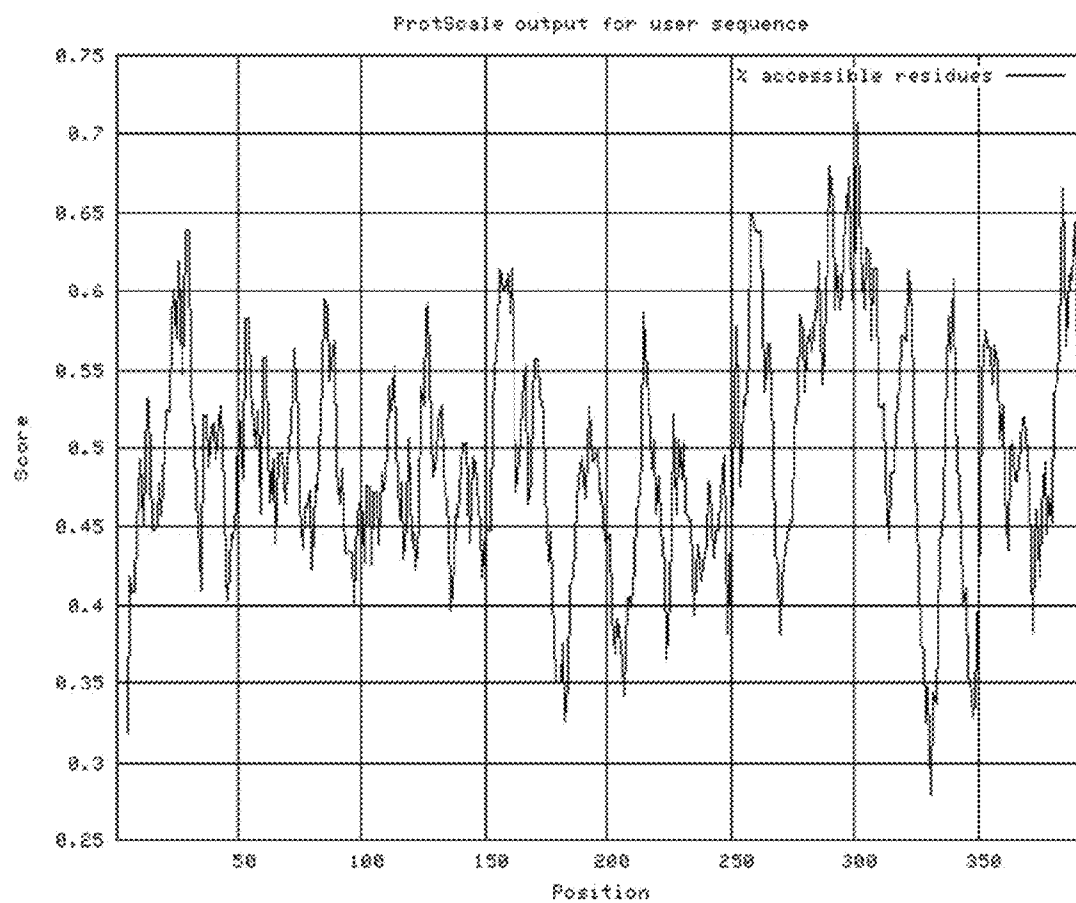


Figure 13d - 158P1D7 variant 6 %
Accessible Residues Profile
(Janin J., 1979. Nature 277:491-492)

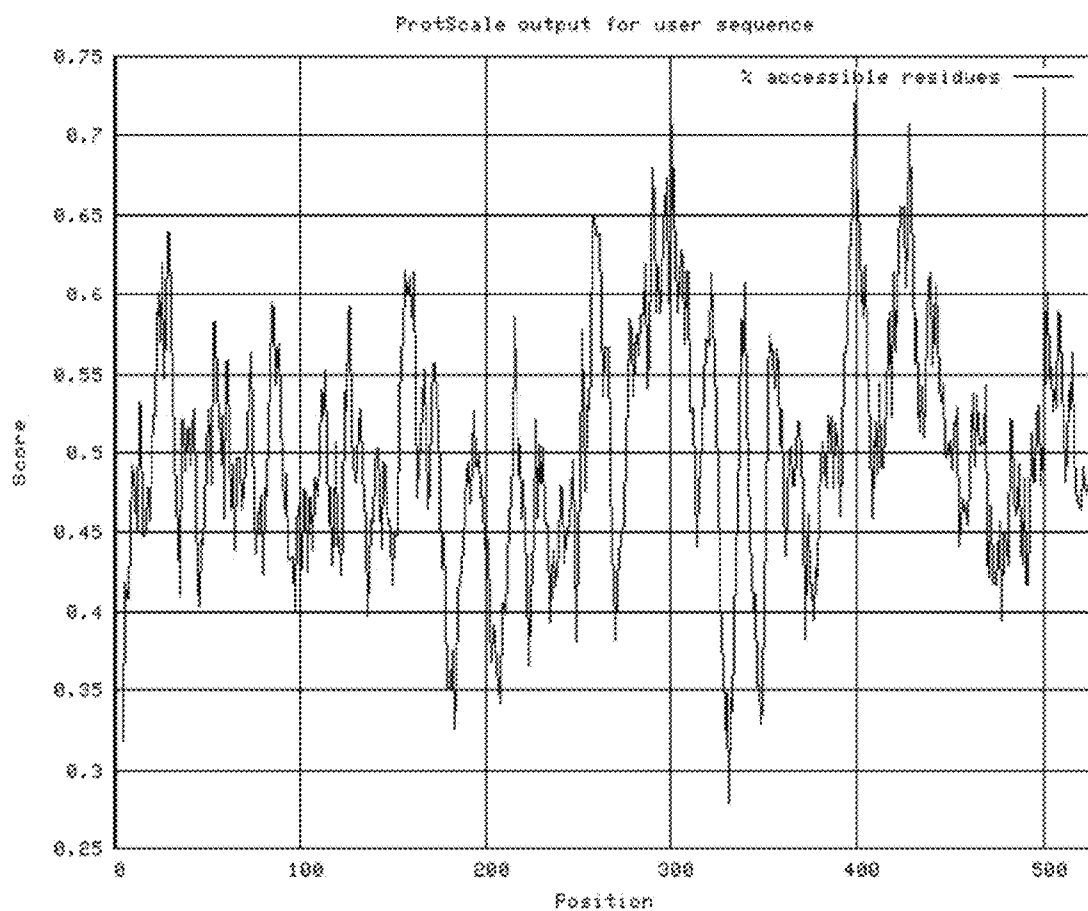


Figure 14a - 158P1D7 variant 1

Average Flexibility Profile

(Bhaskaran R., Ponnuswamy P.K., 1988.

Int. J. Pept. Protein Res. 32:242-255)

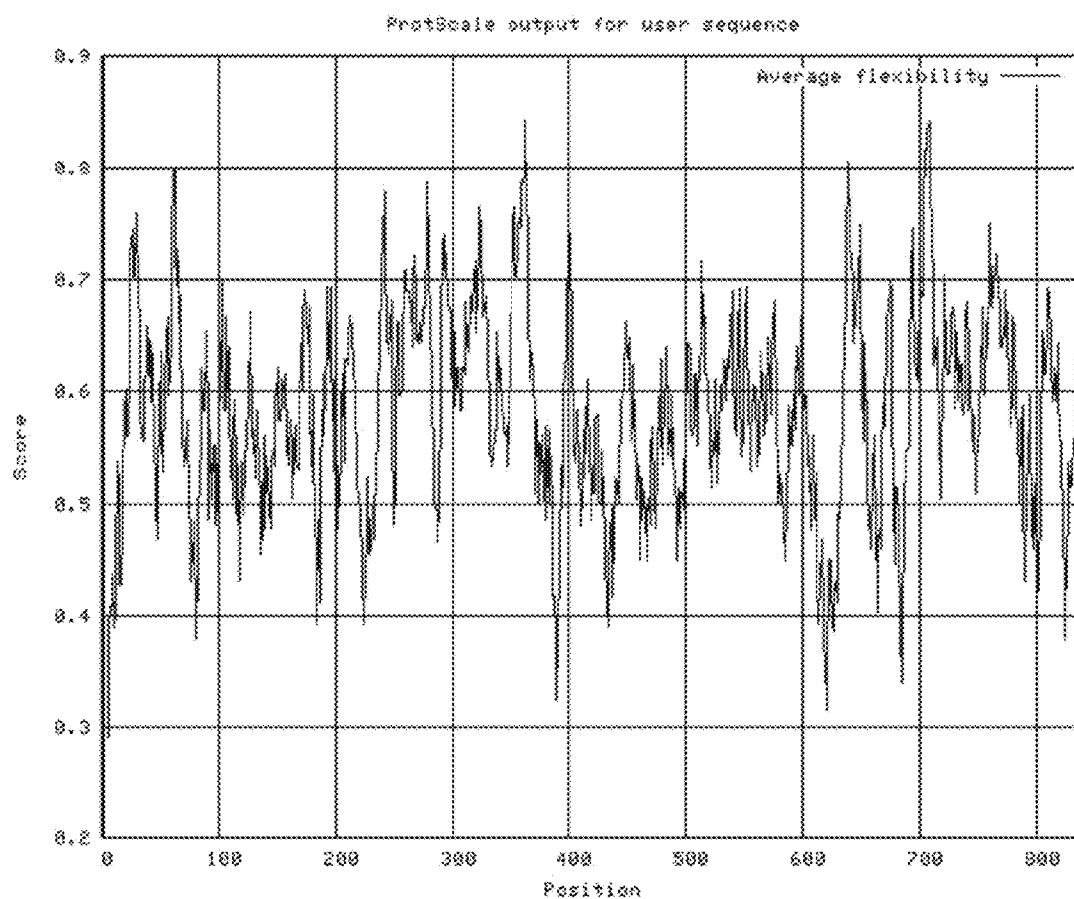


Figure 14b - 158P1D7 variant 3

Average Flexibility Profile

(Bhaskaran R., Ponnuswamy P.K., 1988.

Int. J. Pept. Protein Res. 32:242-255)

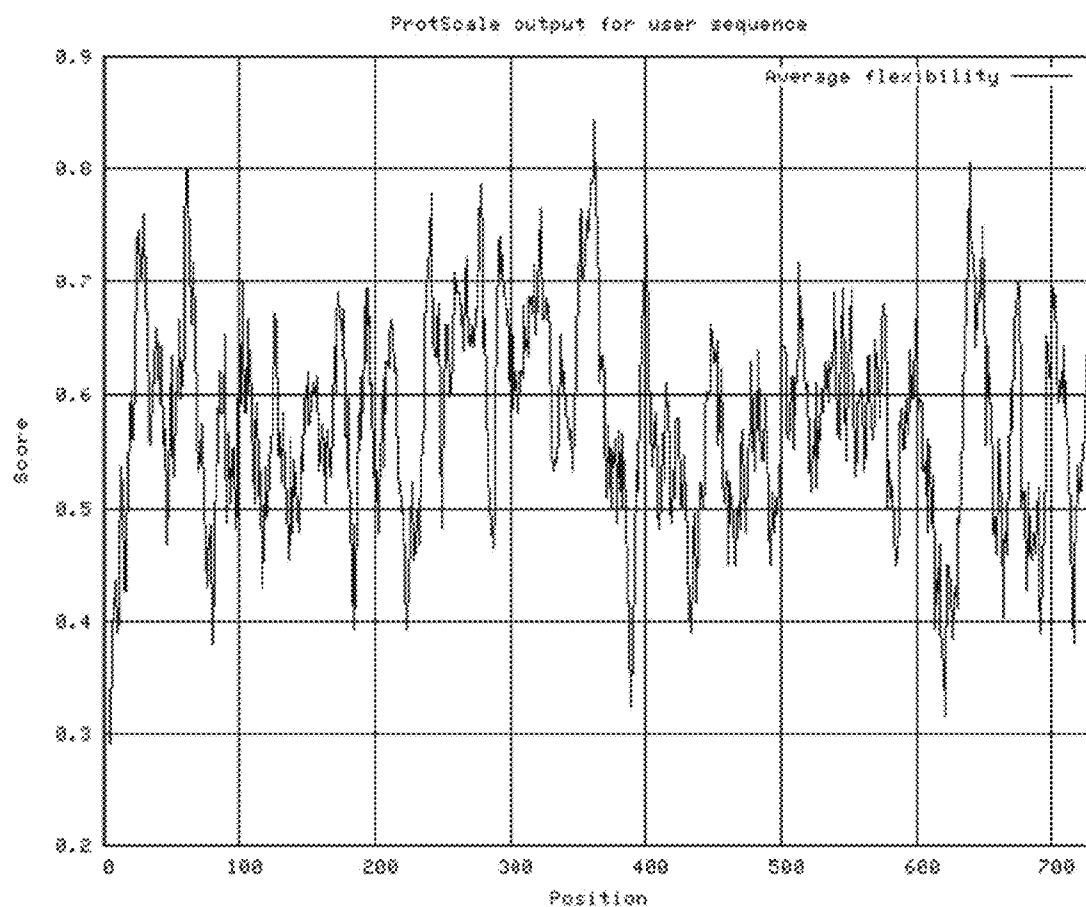


Figure 14c - 158P1D7 variant 4

Average Flexibility Profile

(Bhaskaran R., Ponnuswamy P.K., 1988.

Int. J. Pept. Protein Res. 32:242-255)

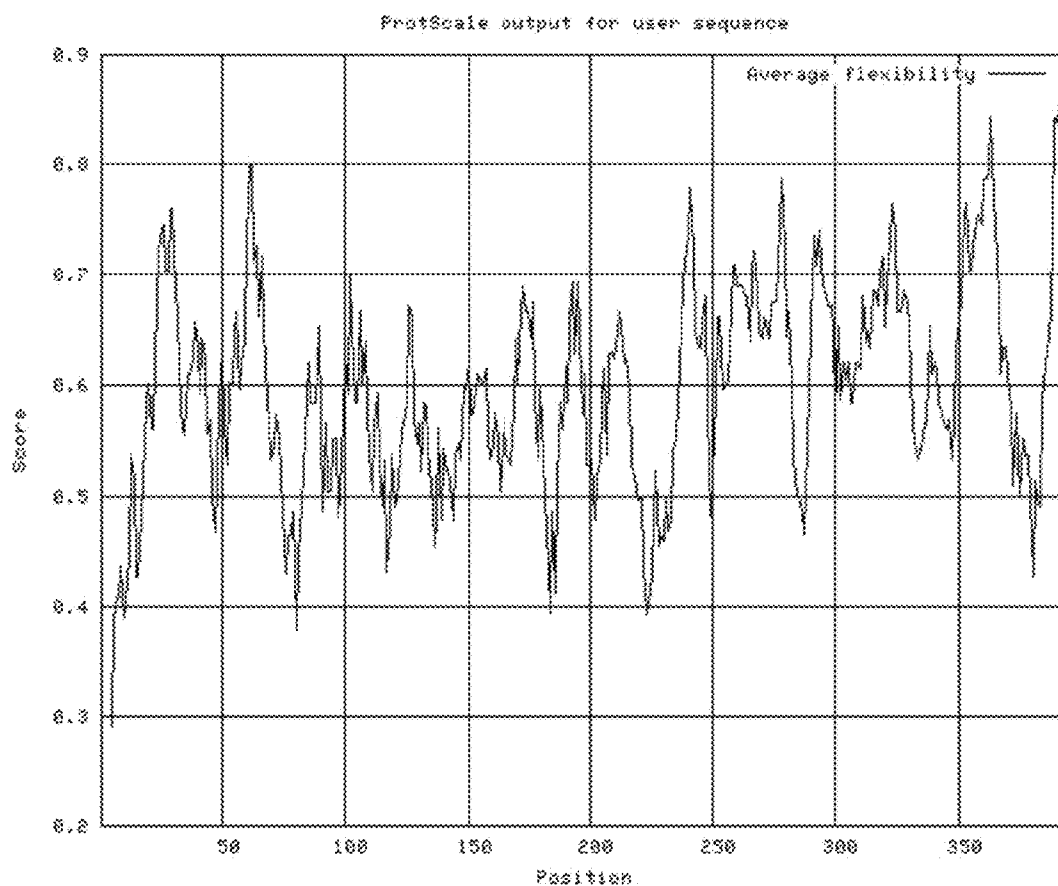


Figure 14d - 158P1D7 variant 6

Average Flexibility Profile

(Bhaskaran R., Ponnuswamy P.K., 1988.

Int. J. Pept. Protein Res. 32:242-255)

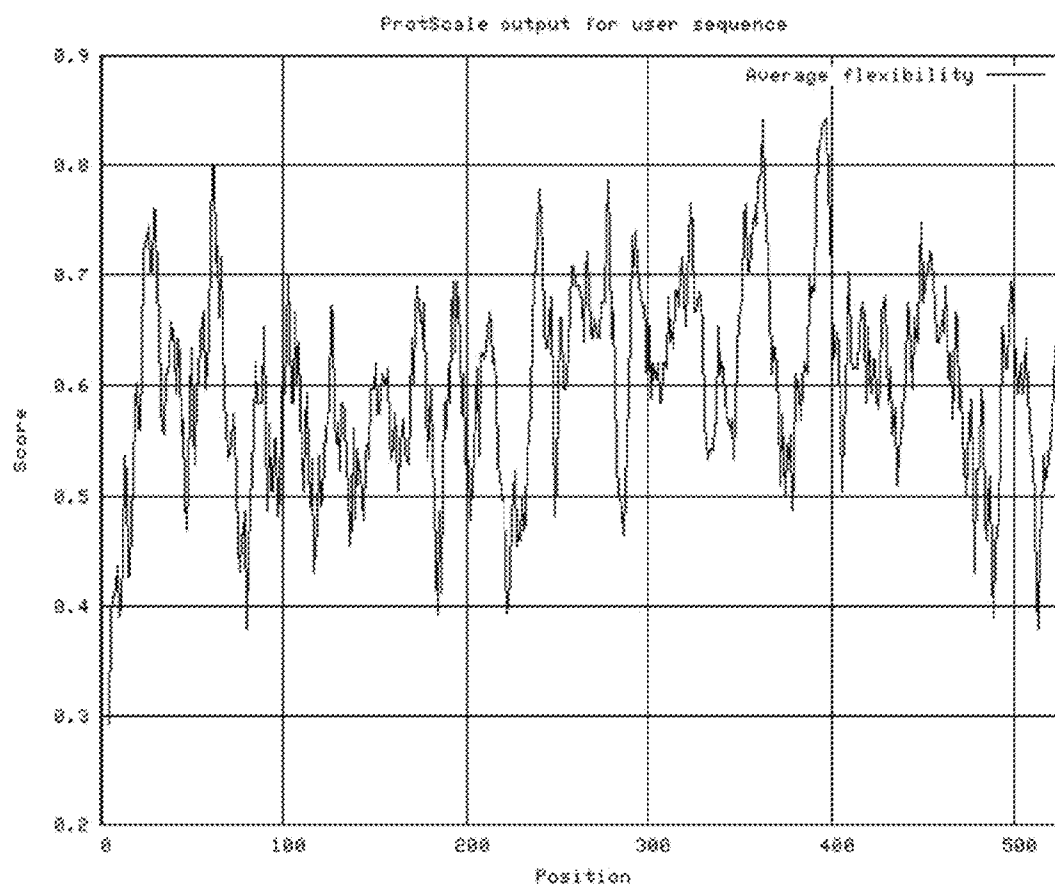


Figure 15a - 158P1D7 variant 1

Beta-turn Profile

(Deleage, G., Roux B. 1987.
Protein Engineering 1:289-294)

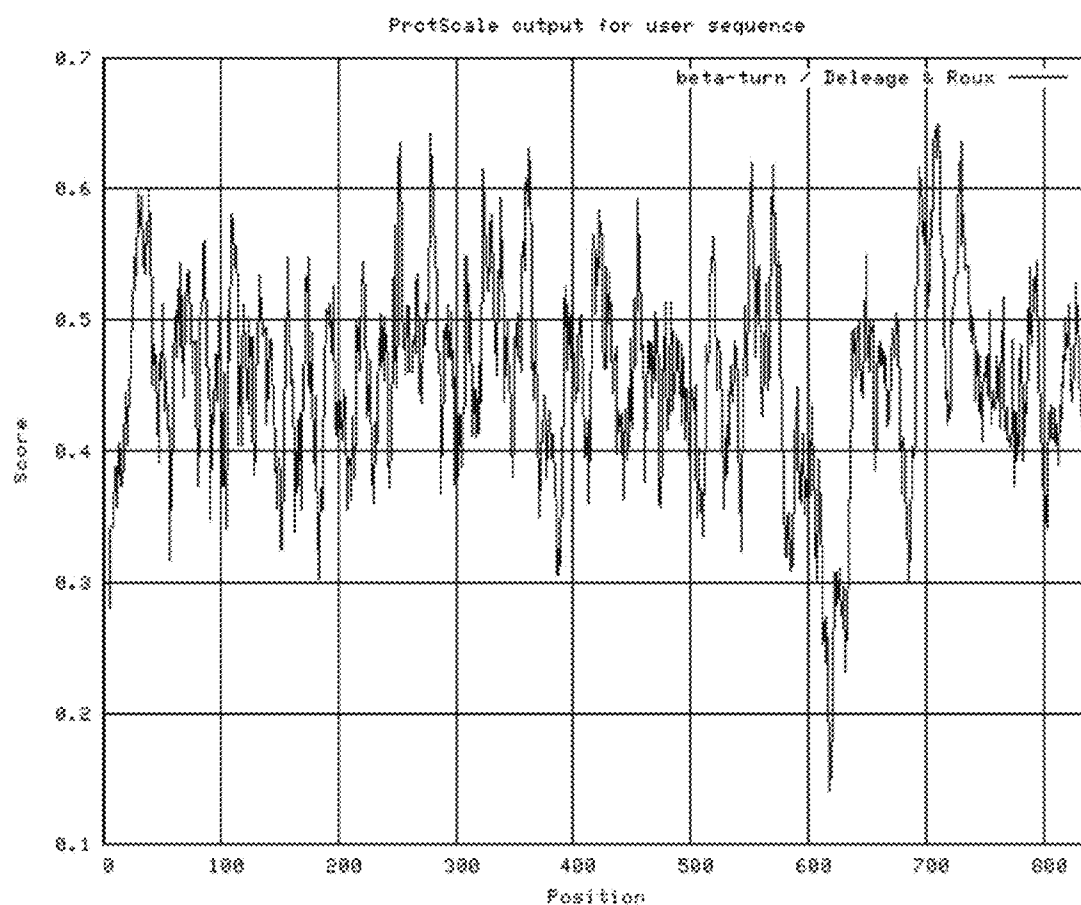


Figure 15b - 158P1D7 variant 3

Beta-turn Profile

(Deleage, G., Roux B. 1987.
Protein Engineering 1:289-294)

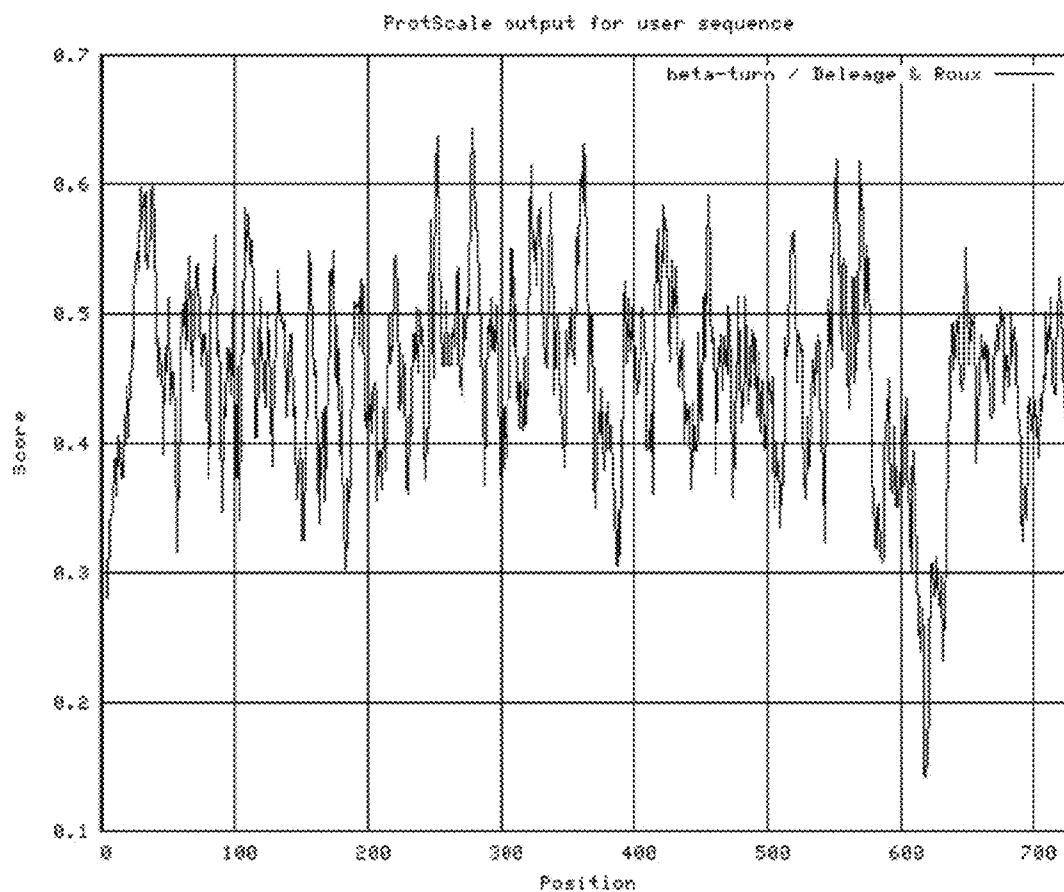


Figure 15c - 158P1D7 variant 4

Beta-turn Profile

(Deleage, G., Roux B. 1987.
Protein Engineering 1:289-294)

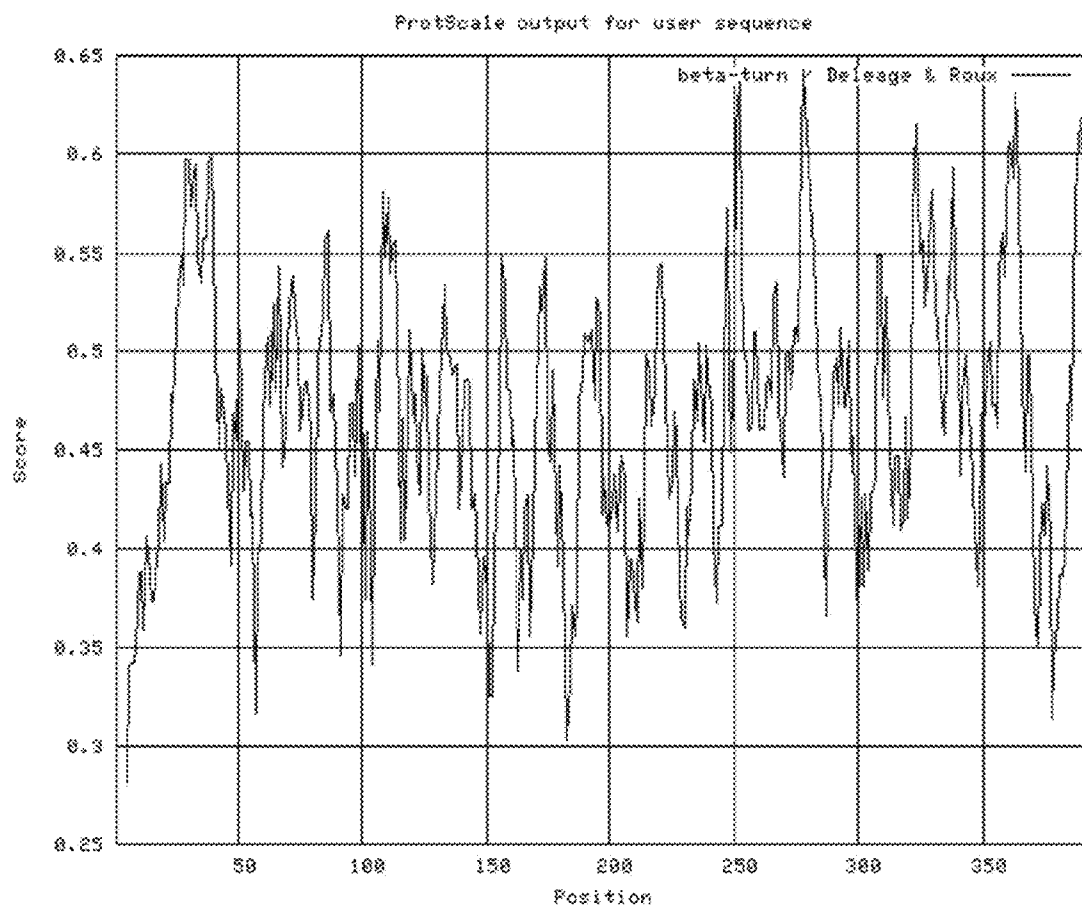


Figure 15d - 158P1D7 variant 6

Beta-turn Profile

(Deleage, G., Roux B. 1987.
Protein Engineering 1:289-294)

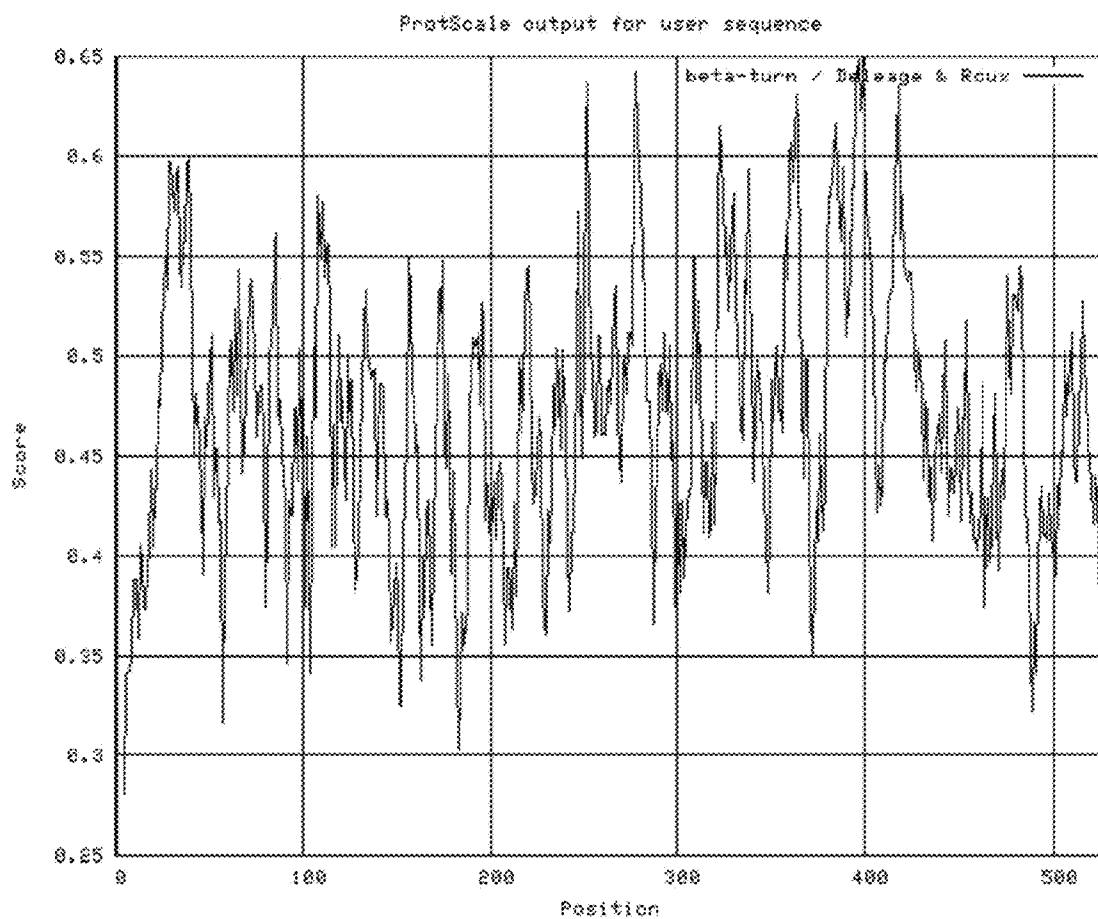


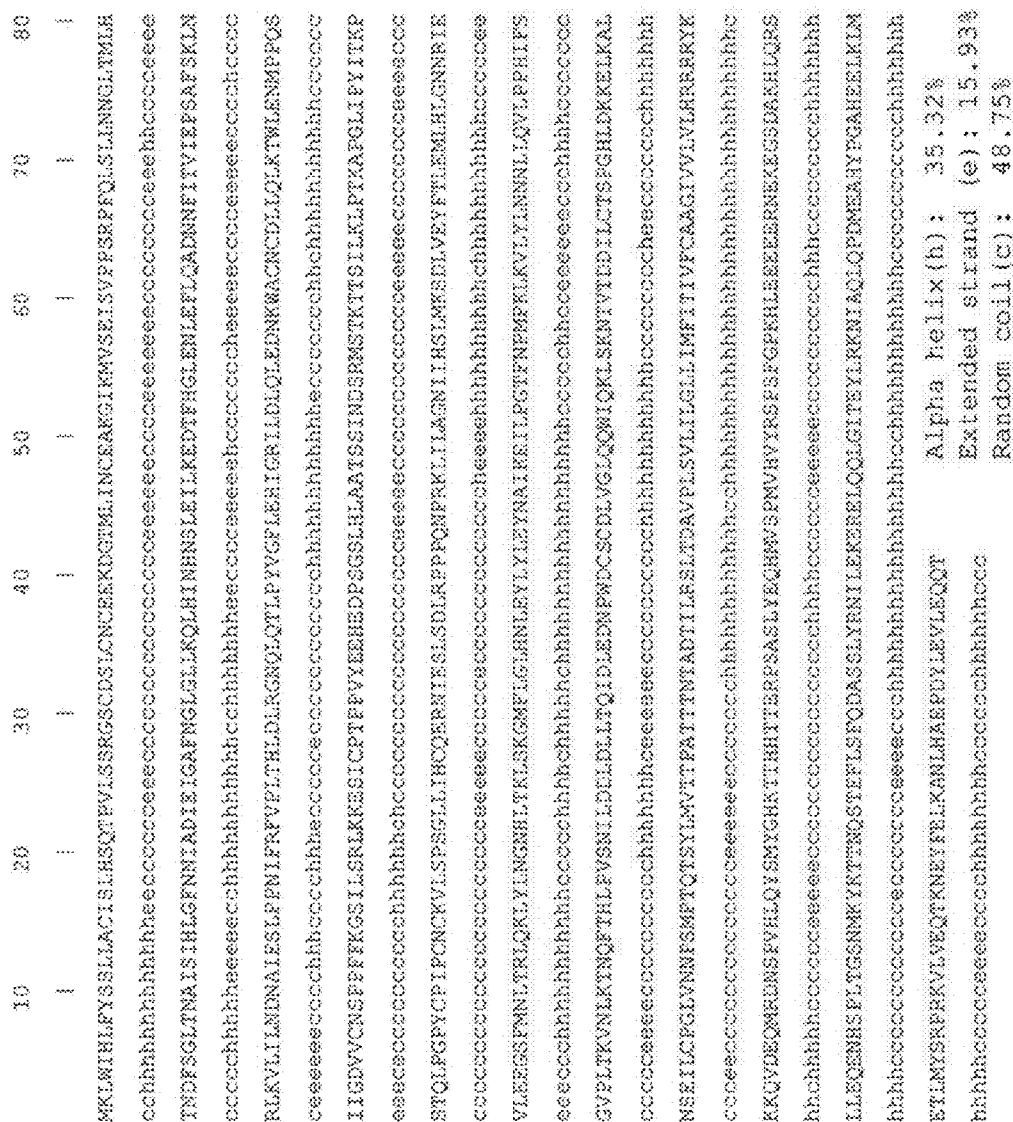
Fig 16A **Secondary structure prediction of 158P1D7 variant 1**

Fig 16B Secondary structure prediction of 158P1D7 variant 3

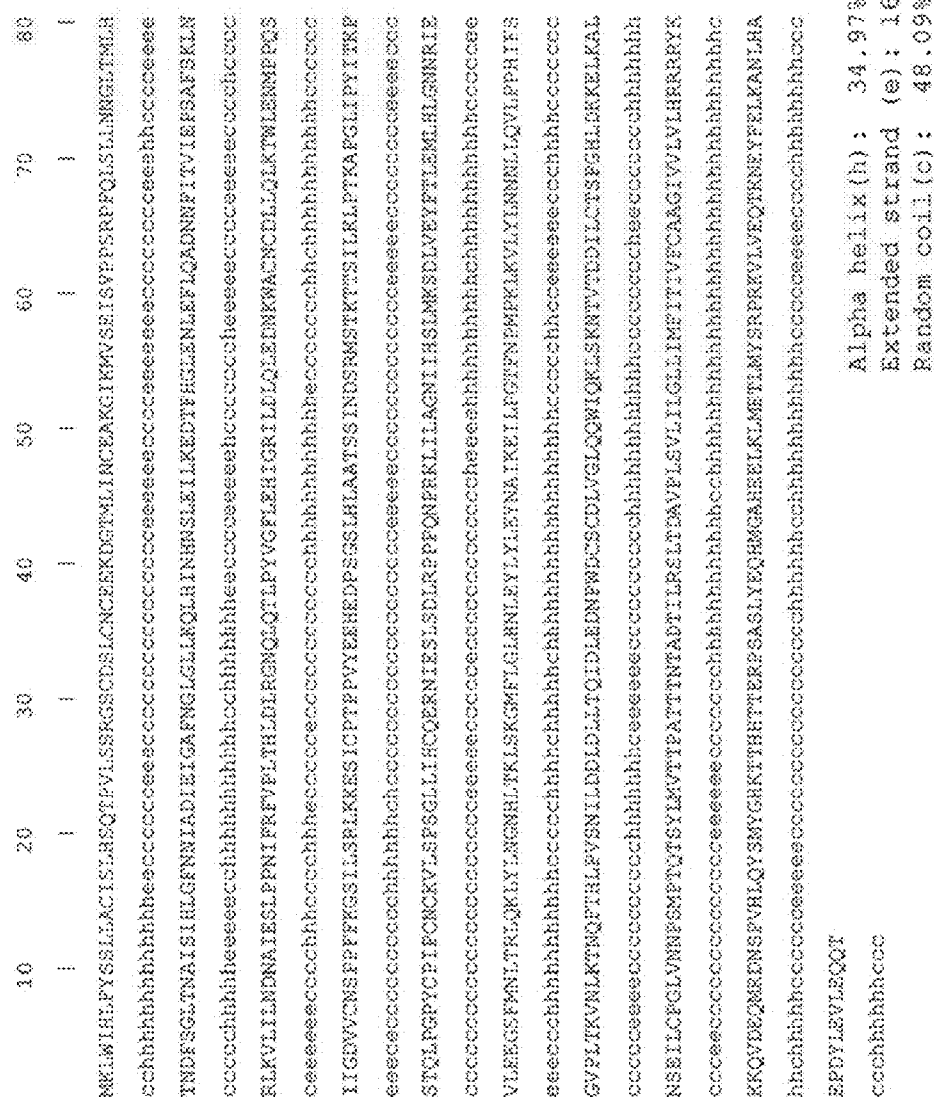


Fig 16C Secondary structure prediction of 158P1D7 variant 4

```

10      20      30      40      50      60      70      80
|      |      |      |      |      |      |
MKLWHLFYSSLLACISLSHSQTPVLSRRGSCDLSLONCEKDGTMLINCEAKGIKMYSEISVPPSRPFQLSLNGLTMLH
cchhhhhhhhhhhhecccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
TNDPSGLTNAISIHLCFNNTADIEIGAFNGLGLKQLHINHNLSLEILKEDTFHGLENLEFLQADNNFITVIEPSAFSKLN
ccccchhhheeeeeccchhhhhhhhhhhcchhhhhhhhecccccccccccccccccccccccccccccccccccc
RLKVLILNDNAIESLPENIFRFVFLTHLDLGNQLQTLPIYVGFLEHIGRIIDLQLSDNKWACNCDLLQKLTWLENMPQS
ceeeeeccccchhccccchhhheccccccccccccccccchhhhhhhhhheccccccccchhhhhhhhhhhcccccc
IIGDVVCSPPFFKGTLSLKKESICTPPVYEEHEDPSGLHLAATSSINDSRMSTTTTSILKLPTRAFSLIPYITKP
eececcccccccccccchhhhhhhccccccccccccccccccccccccccccccccccccccccccccccccccc
STQLPGPYCTIPCNCKVLSFSGLLINCGERNIESLSLRLPPQNPRKLLAGNIINSIMKSILWSKASGRREE
cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc

```

Alpha helix(h): 24.56%
 Extended strand (e): 20.76%
 Random coil(c): 54.68%

Fig 16D Secondary structure prediction of 158P1D7 variant 6

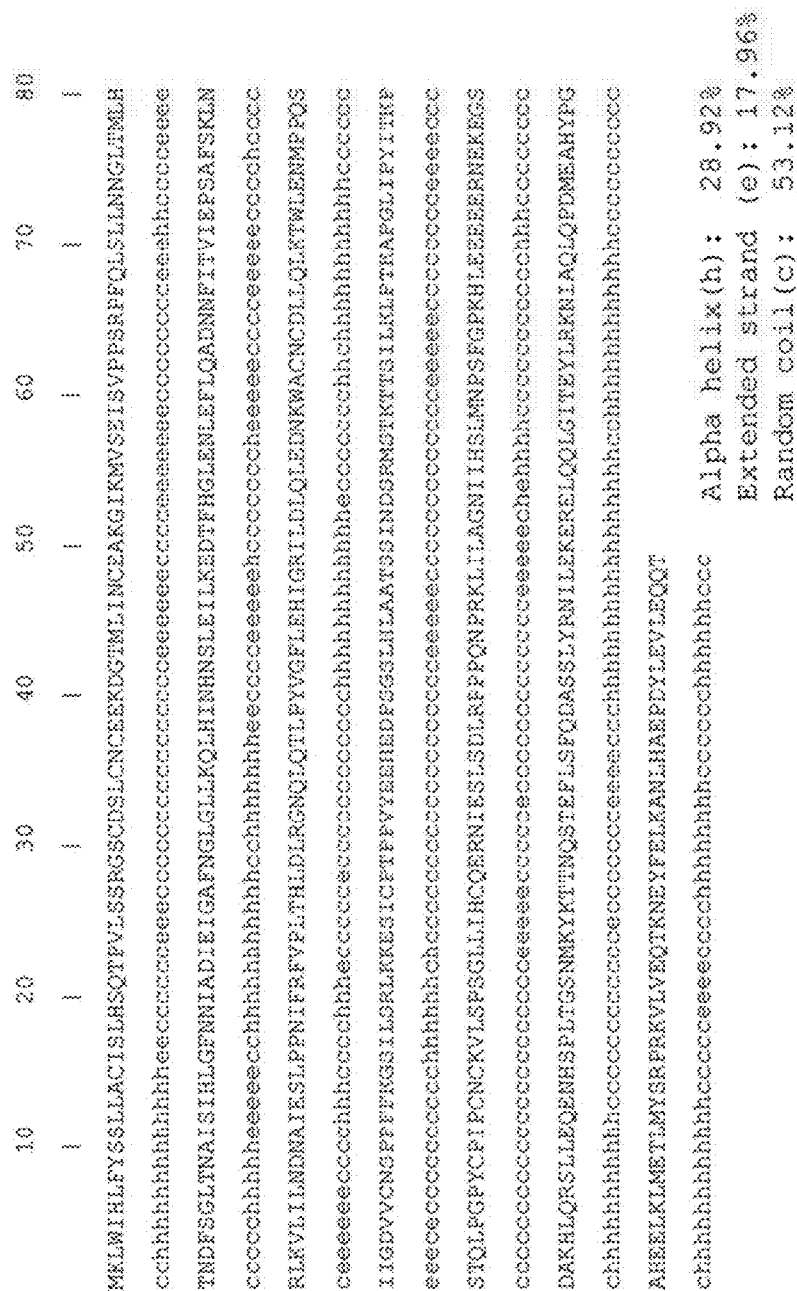


Fig 16E

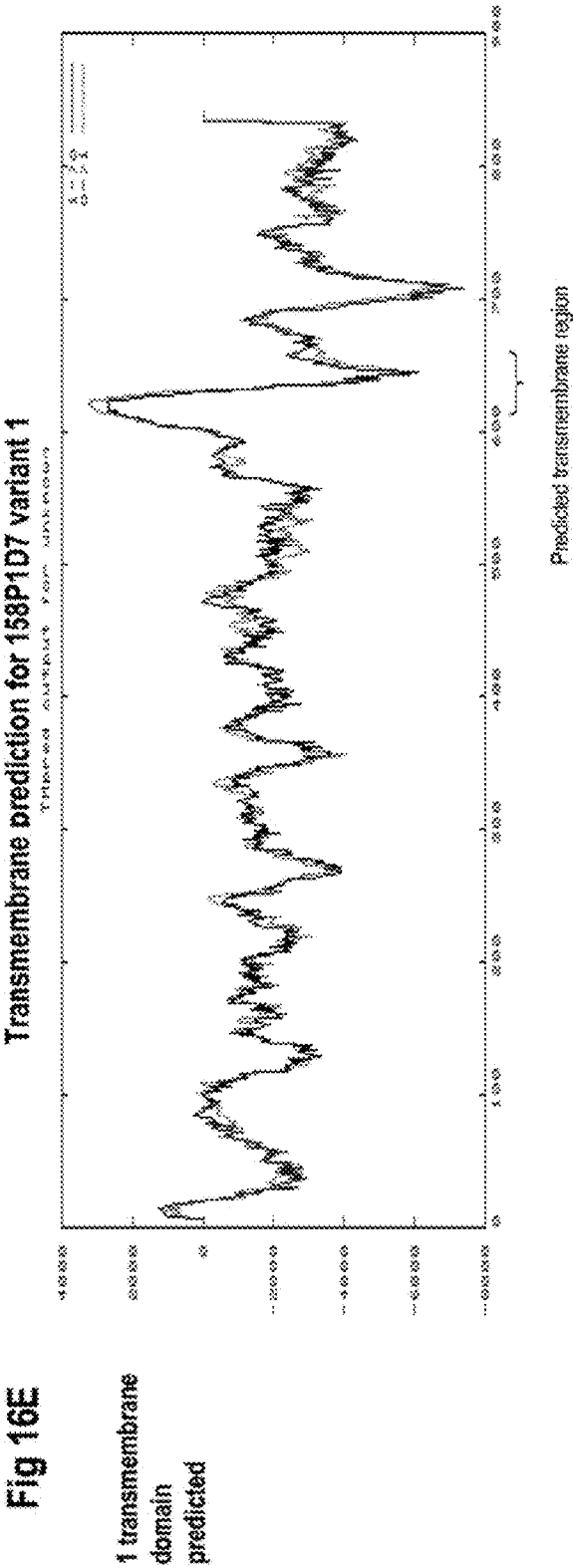
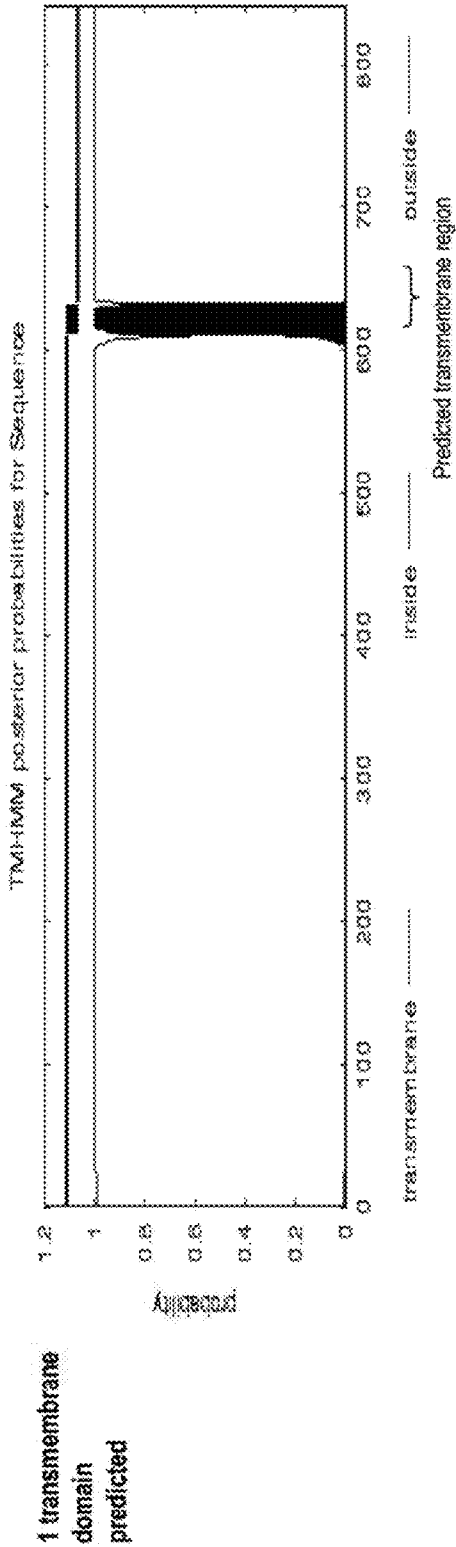


Fig 16F



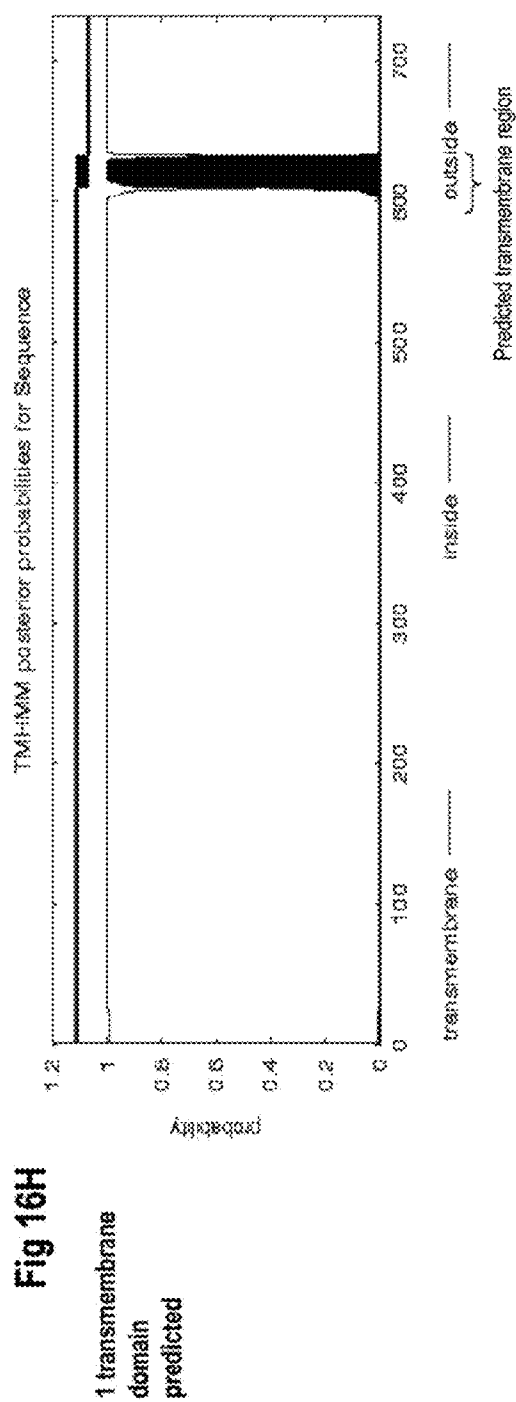
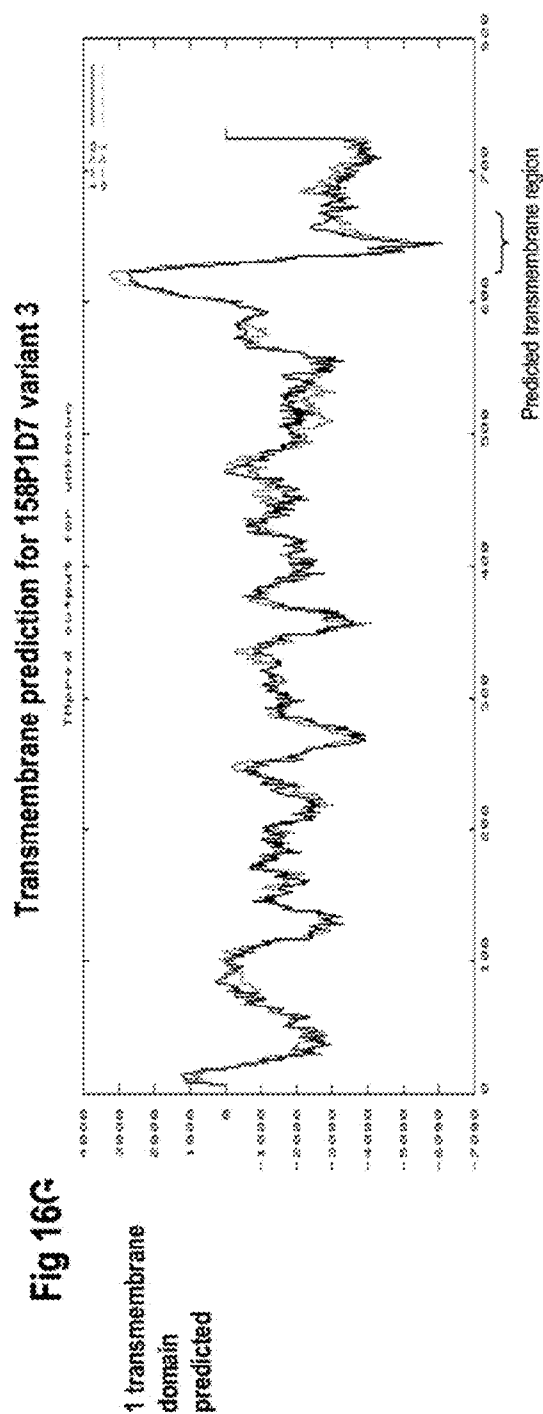


Fig 16I

No transmembrane
domain,
Potential signal peptide

Transmembrane prediction for 158P1D7 variant 4

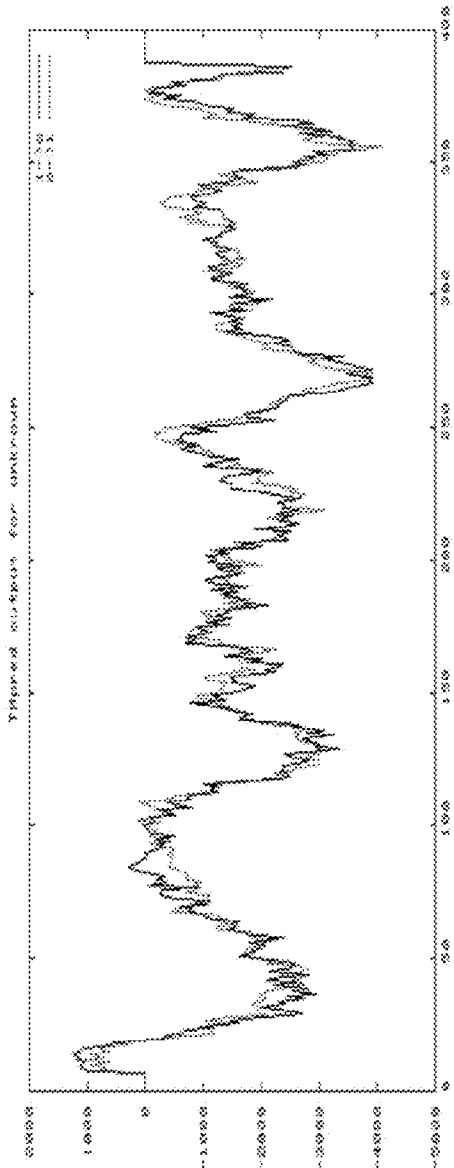


Fig 16J

No transmembrane
domain

TMHMM posterior probabilities for Sequence

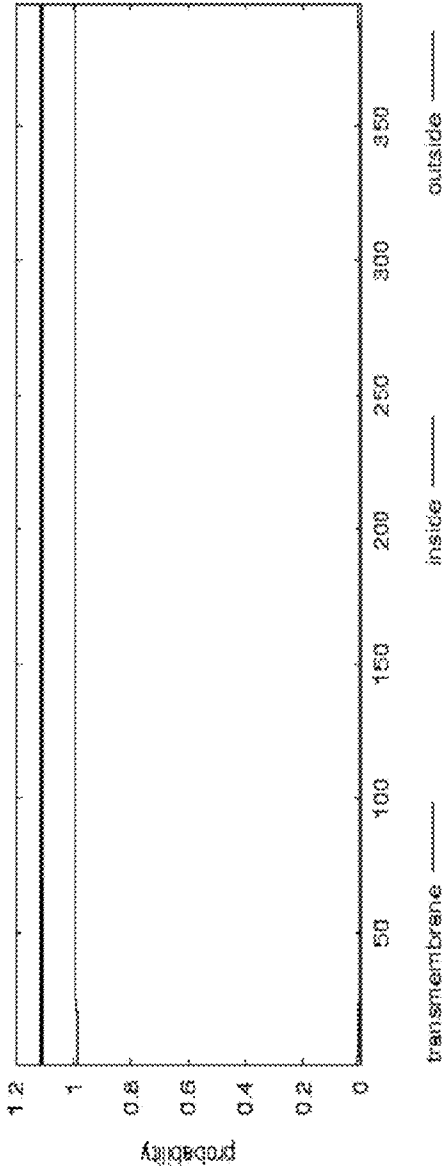
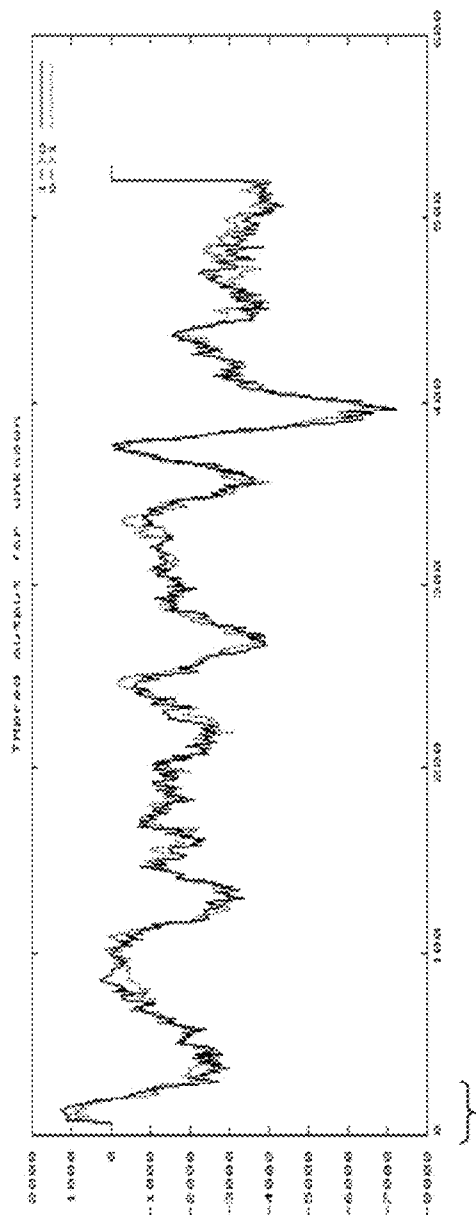


Fig 16K

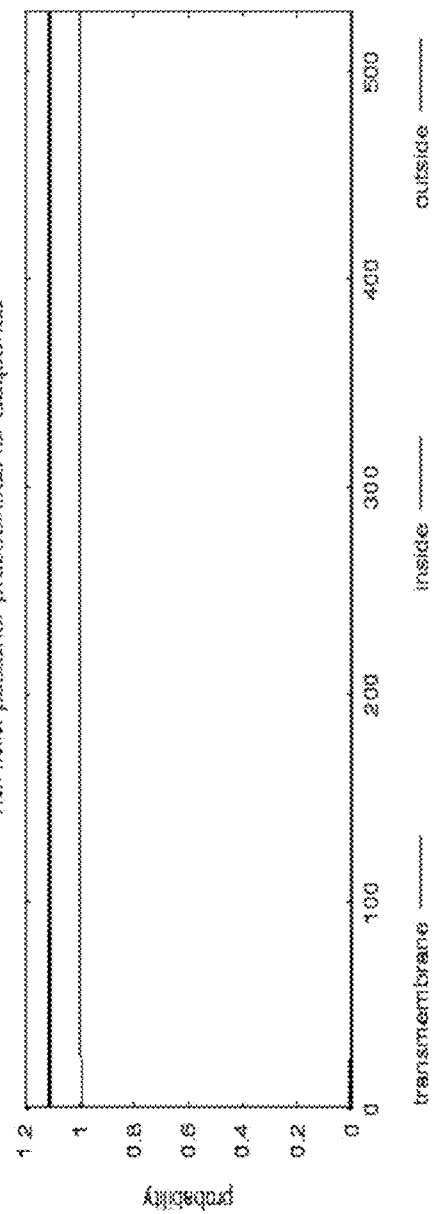
Transmembrane prediction for 158P1D7 variant 6



No transmembrane domain,
Potential signal peptide

Fig 16L

TMM-MMM posterior probabilities for Sequence



No transmembrane domain

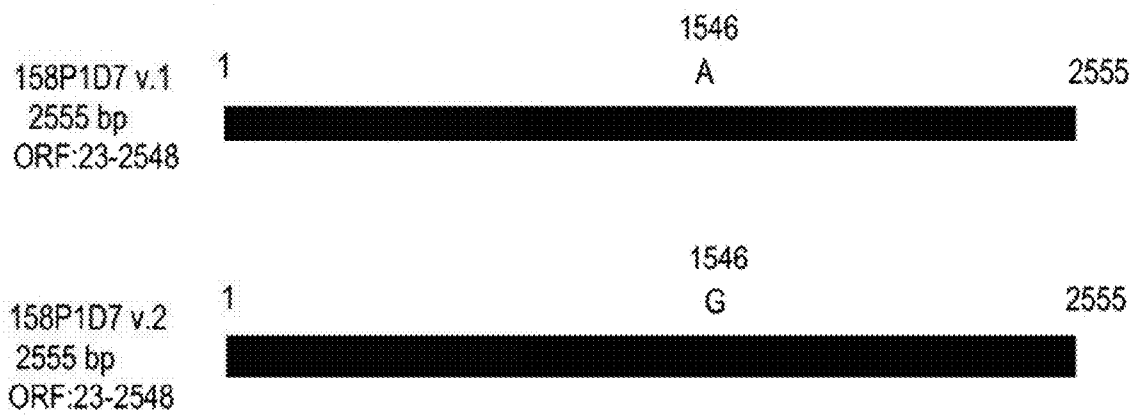
Figure 17

Figure 18

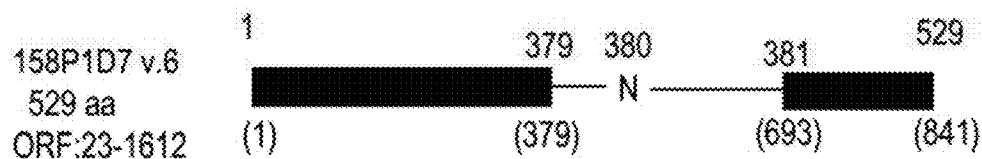
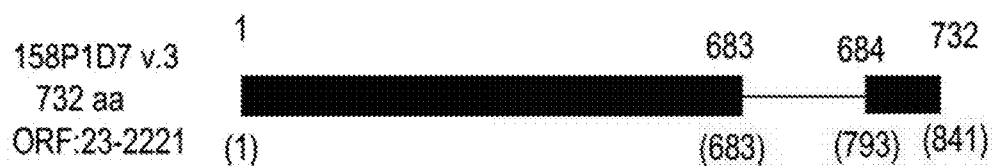


Figure 19

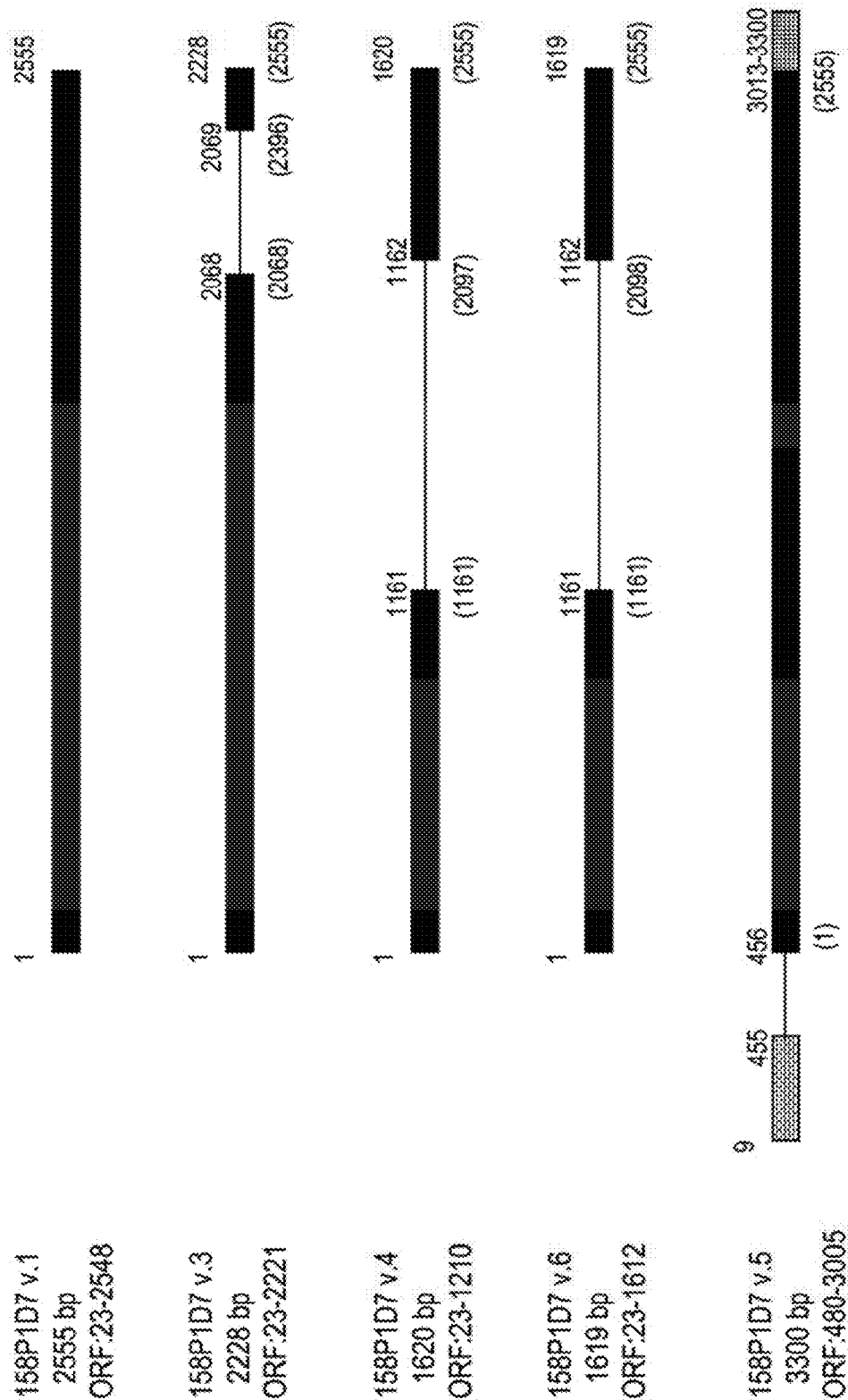
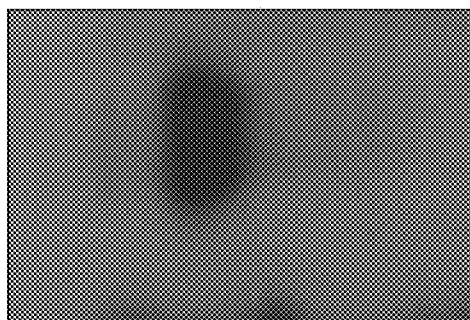


Figure 20. 158P1D7 Expression in Melanoma

1 2



1. Normal skin cell line - Detroit-551
2. Melanoma cancer cell line – A375

**Figure 2L. 158P1D7 Expression in Cervical Cancer
Patient Specimens**

Panel#	Patient ID#	Diagnosis	Grade	Stage	Cervix CA
1	Normal Cervix	(Ambion)			
2	HeLa	Cell Line			
3	USA-00281-D01	Intraepithelial neoplasia	2-3	T3AN0MX	
4	VNM-00266	AdenoCA	1	IIA	
5	VNM-00376	AdenoCA	1	IIA	
6	IND-00396	Mucinous AdenoCA	2	IIB	
7	A0098	Adenosquamous	2B	T2LNXM0	

No expression
Positive expression

Figure 22: Detection of AGS15 protein in recombinant cells
with monoclonal antibodies

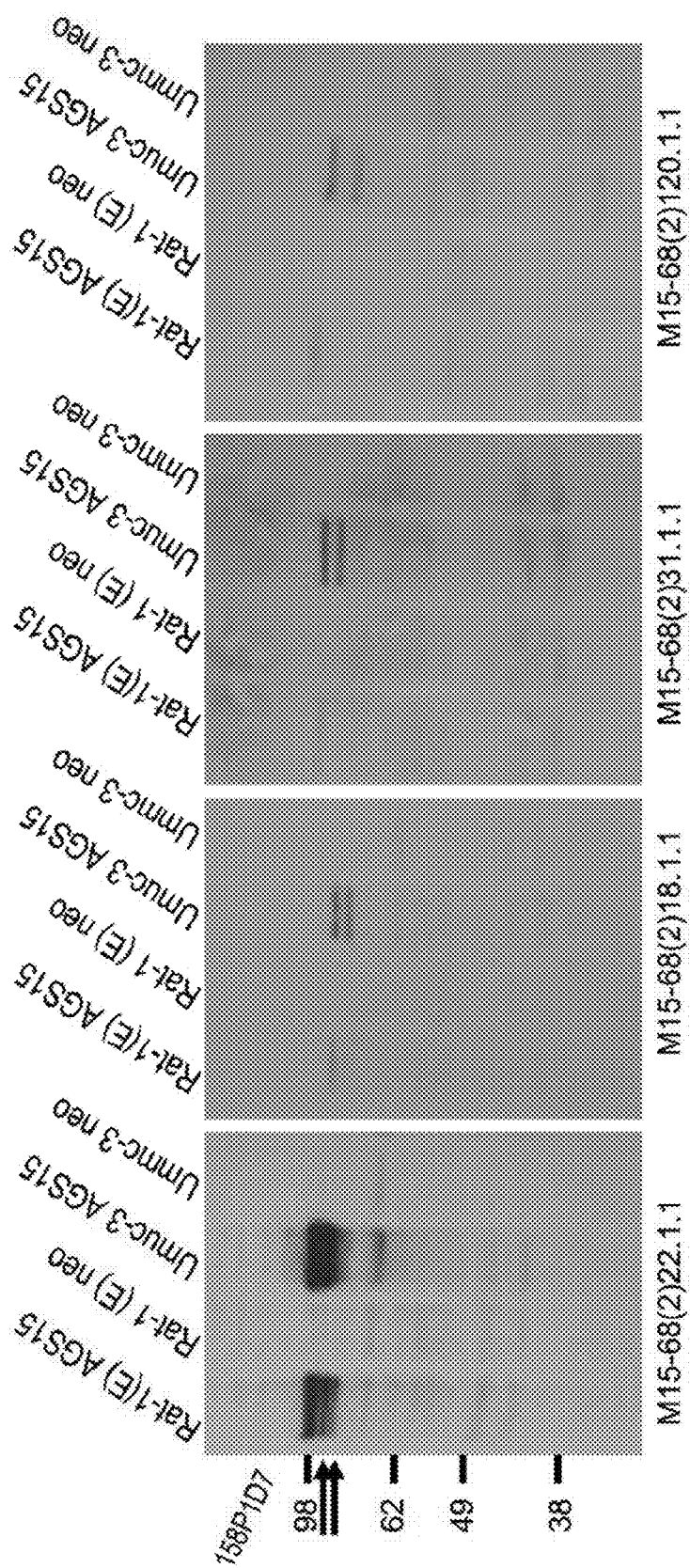


Figure 23: Surface staining of AGS15-expressing 293T and UMUC cells
with anti-AGS15 monoclonal antibodies

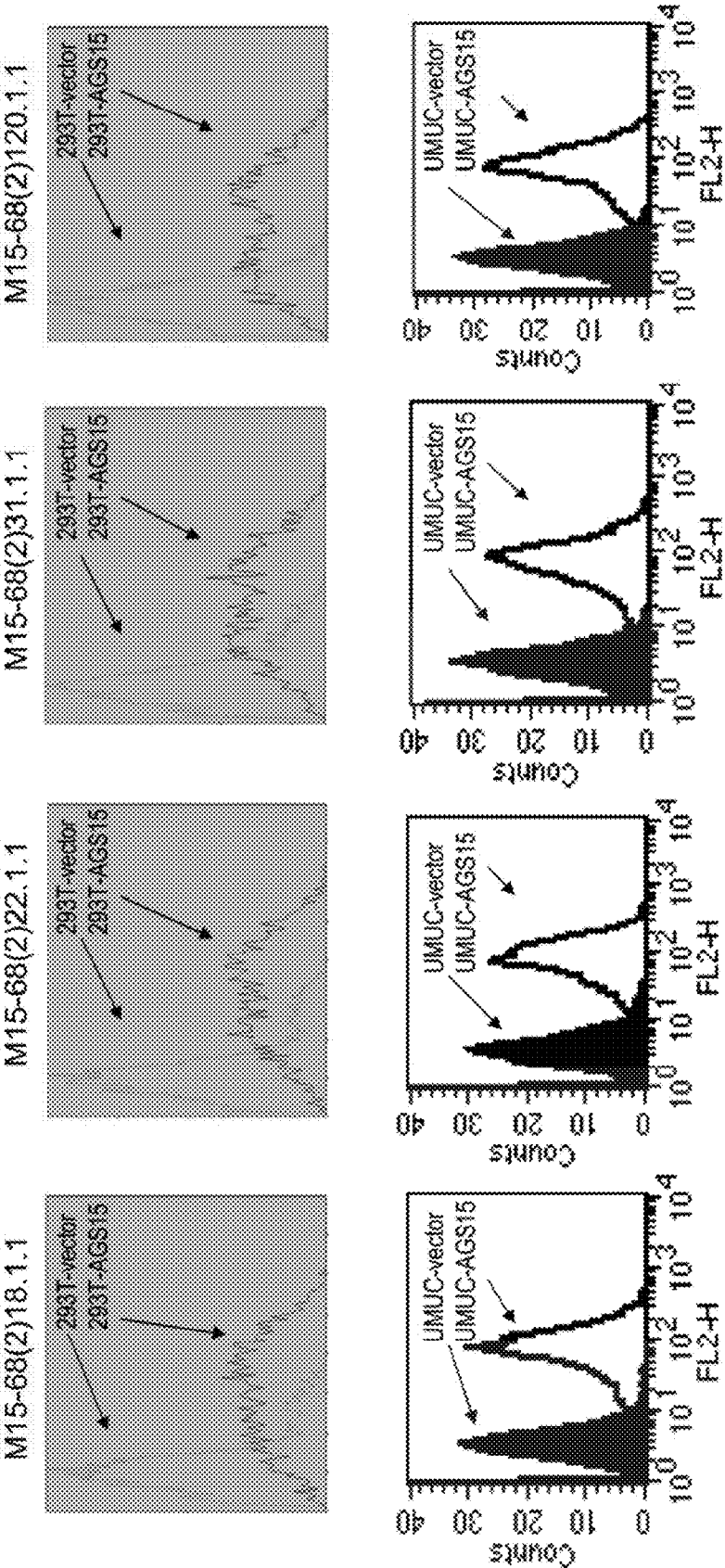


Figure 24: Surface staining of endogenous AGS15-expressing LAPC9 prostate cancer and UGB1 bladder cancer xenograft cells with MAb M15-68(2)22.1.1

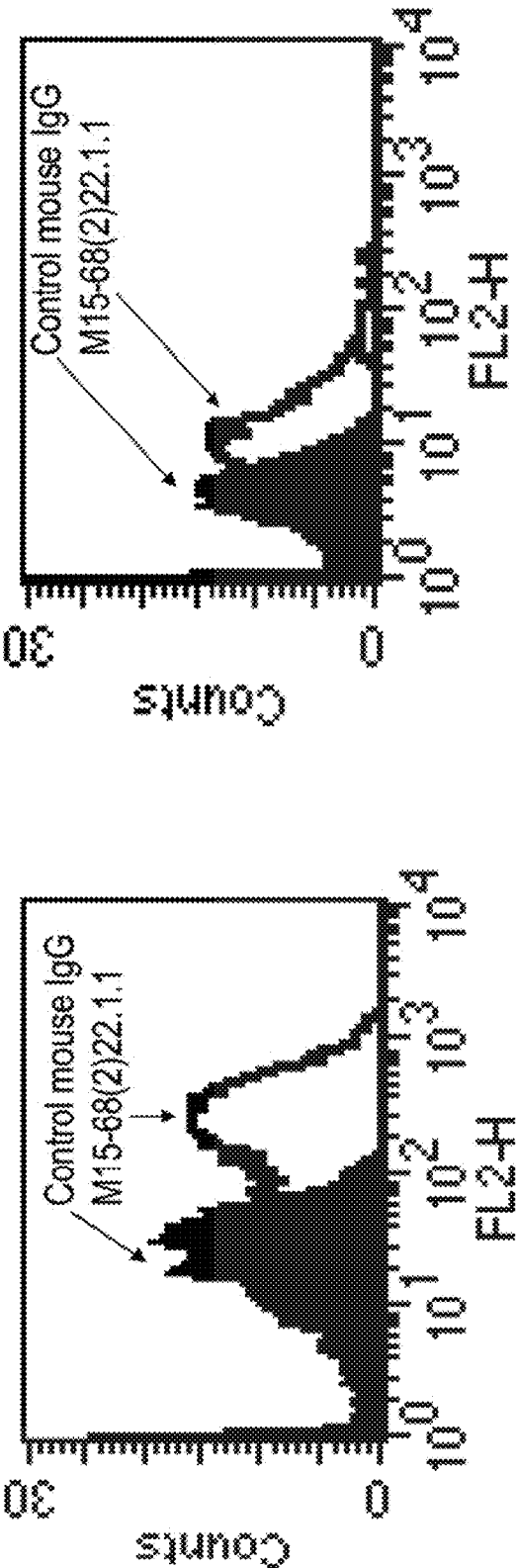


Figure 25-1: Monoclonal antibody-mediated internalization of endogenous surface 158P1D7 in NCI-H146 small cell lung cancer cells

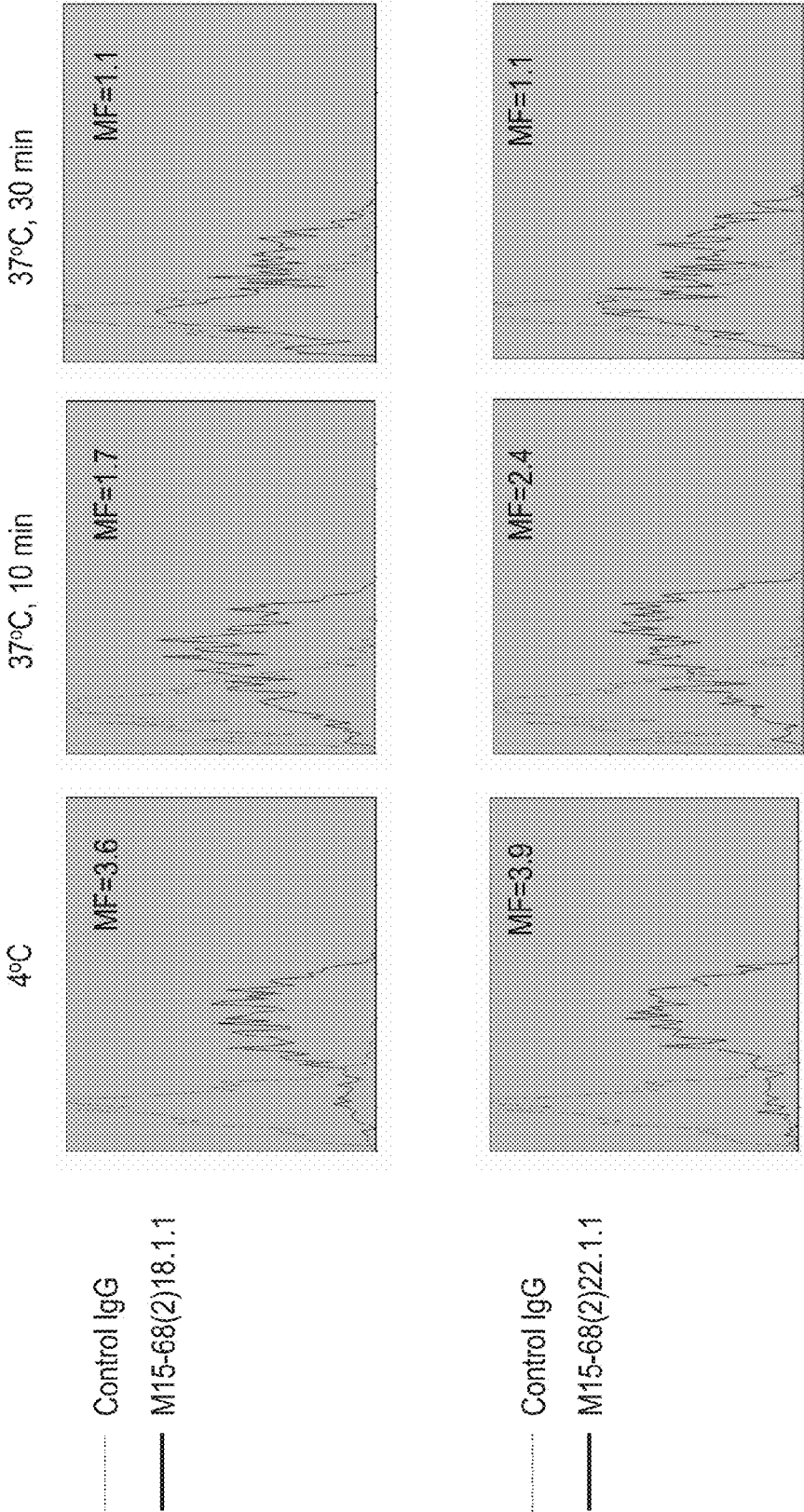


Figure 25-2

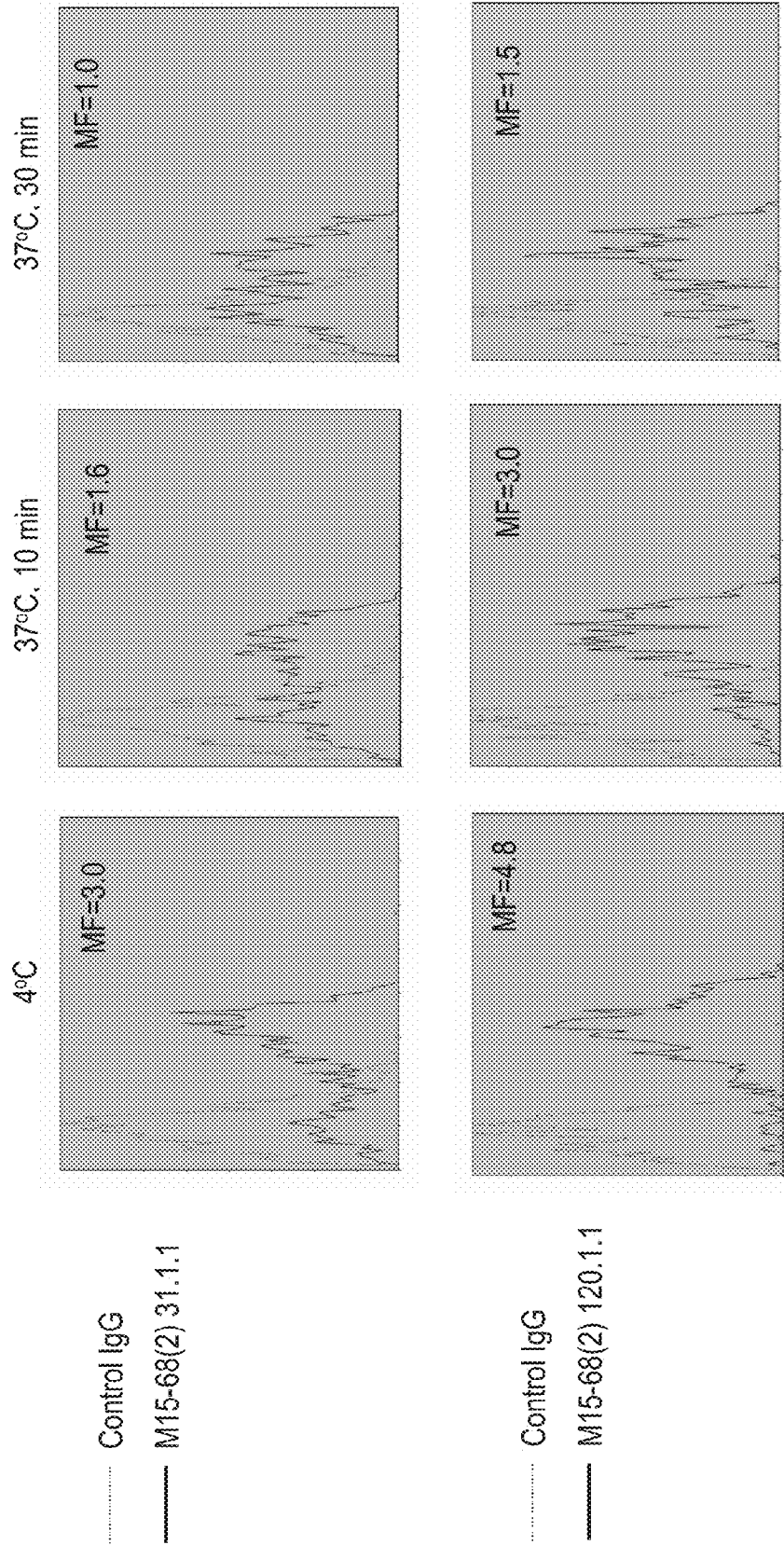


Figure 26: Binding of the 158P1D7 extracellular domain to human umbilical vein endothelial cells (HUVEC)

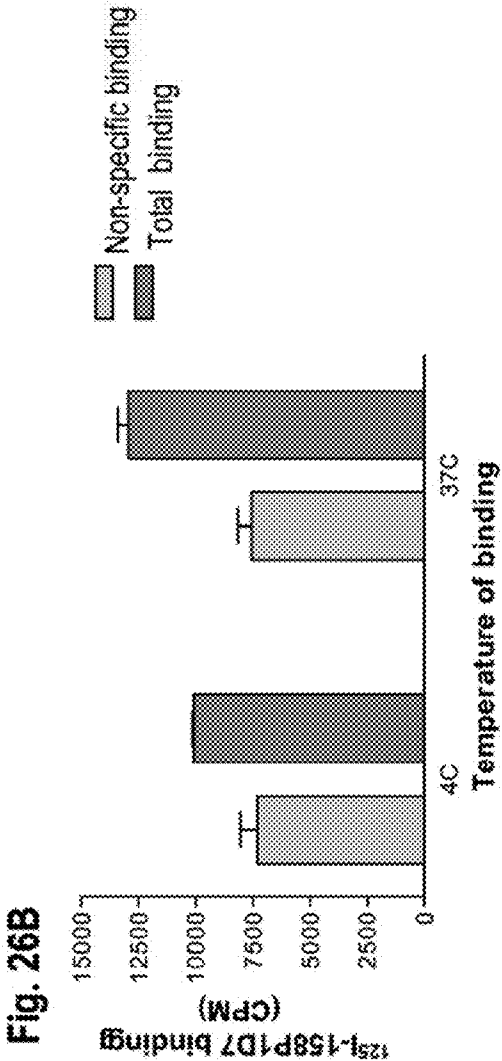
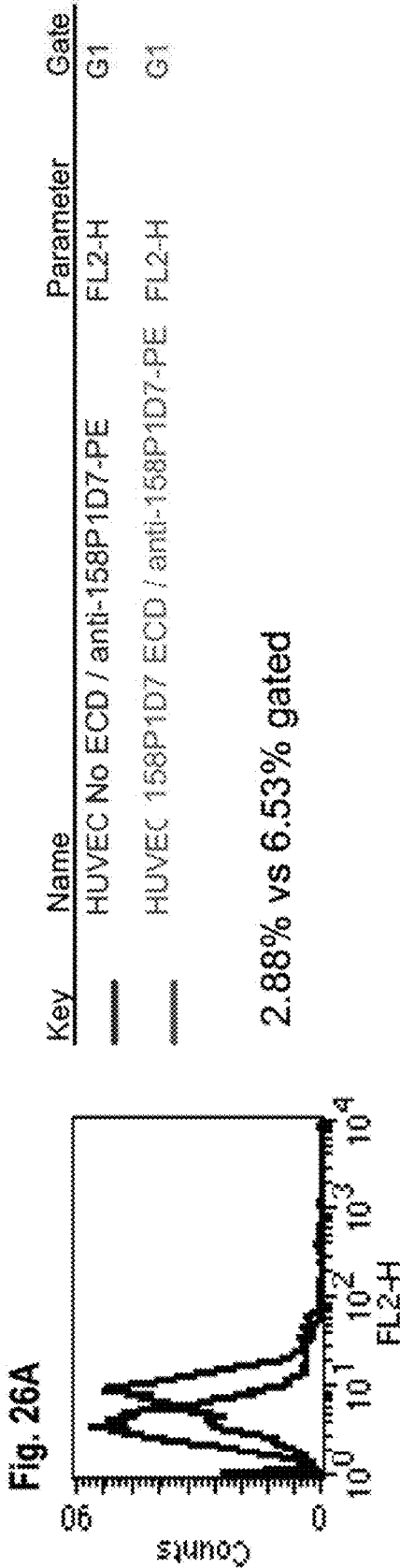


Figure 27 - 158P1D7 Enhances the Growth of Bladder Cancer UM-UC-3 Cells in Mice

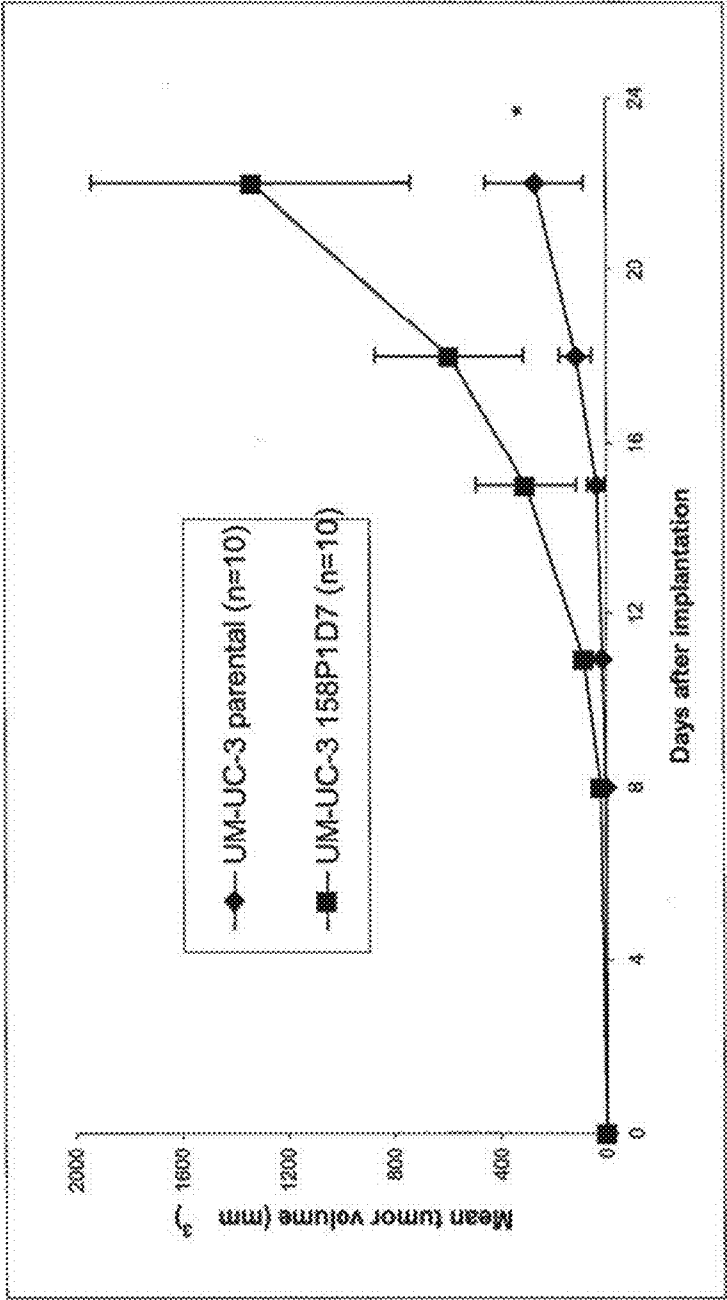
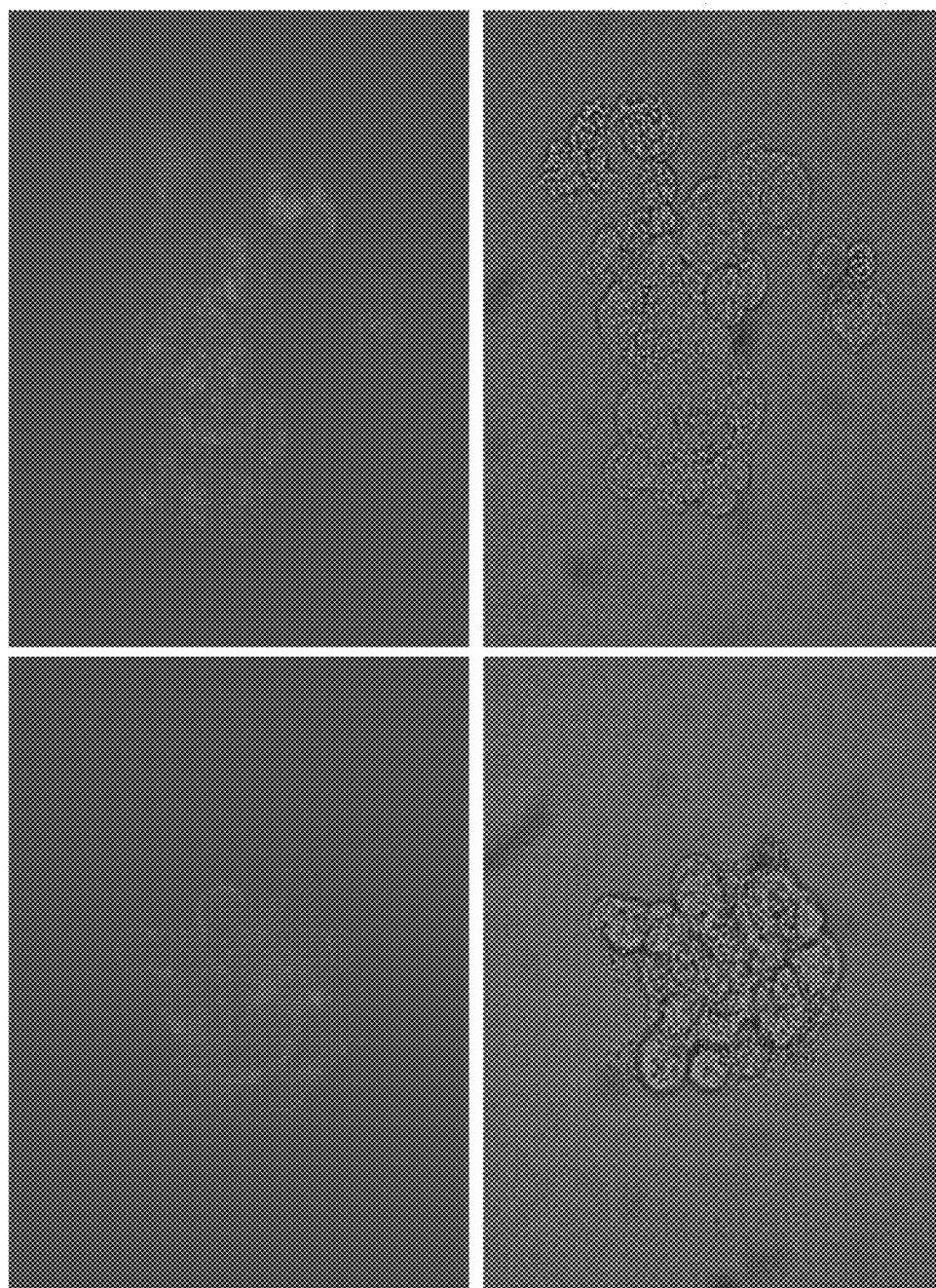


Figure 28 Internalization of MAbs MI5-68(2), 31.1, 1 in NCI-H146 cells

4C

4C → 37C for 30 min



Fluorescence

Bright Field

Figure 29: Effect of 158P1D7 RNAi on cell survival

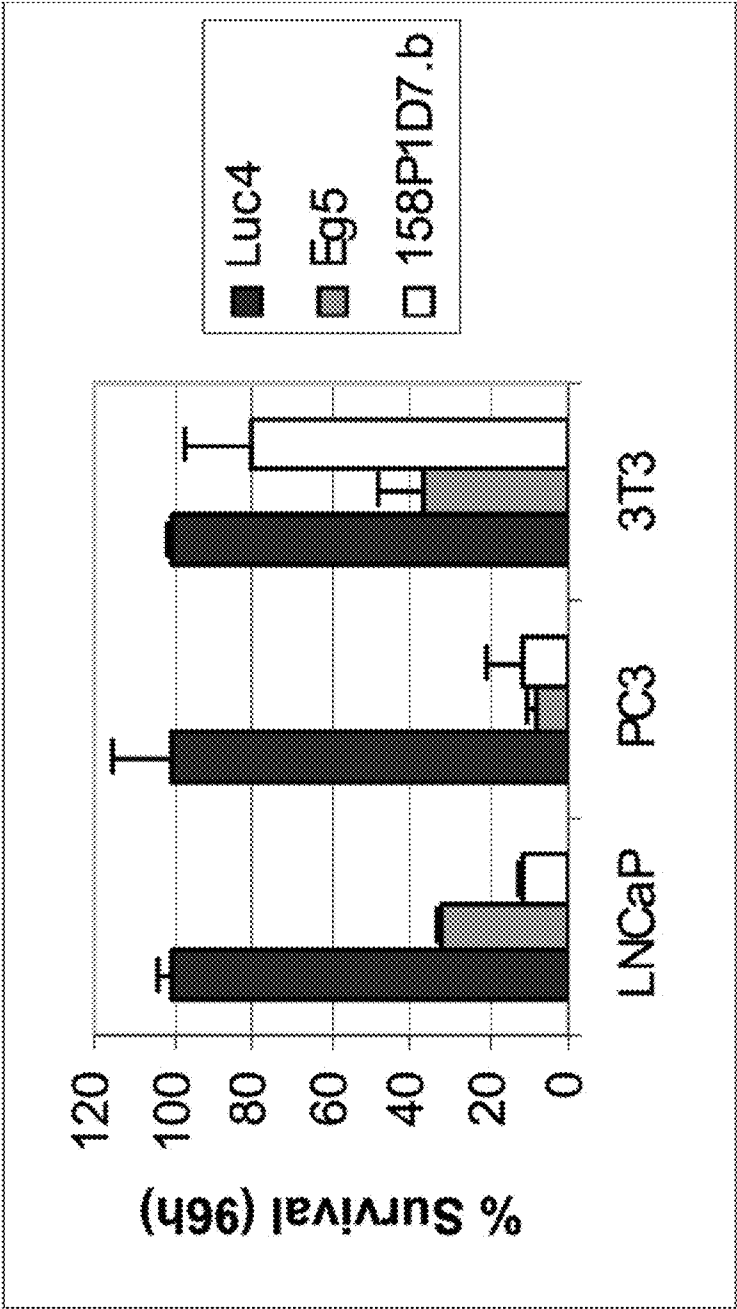


Figure 30 - 158P1D7 MAbs Retard the Growth of Human Bladder Cancer Xenografts in Mice

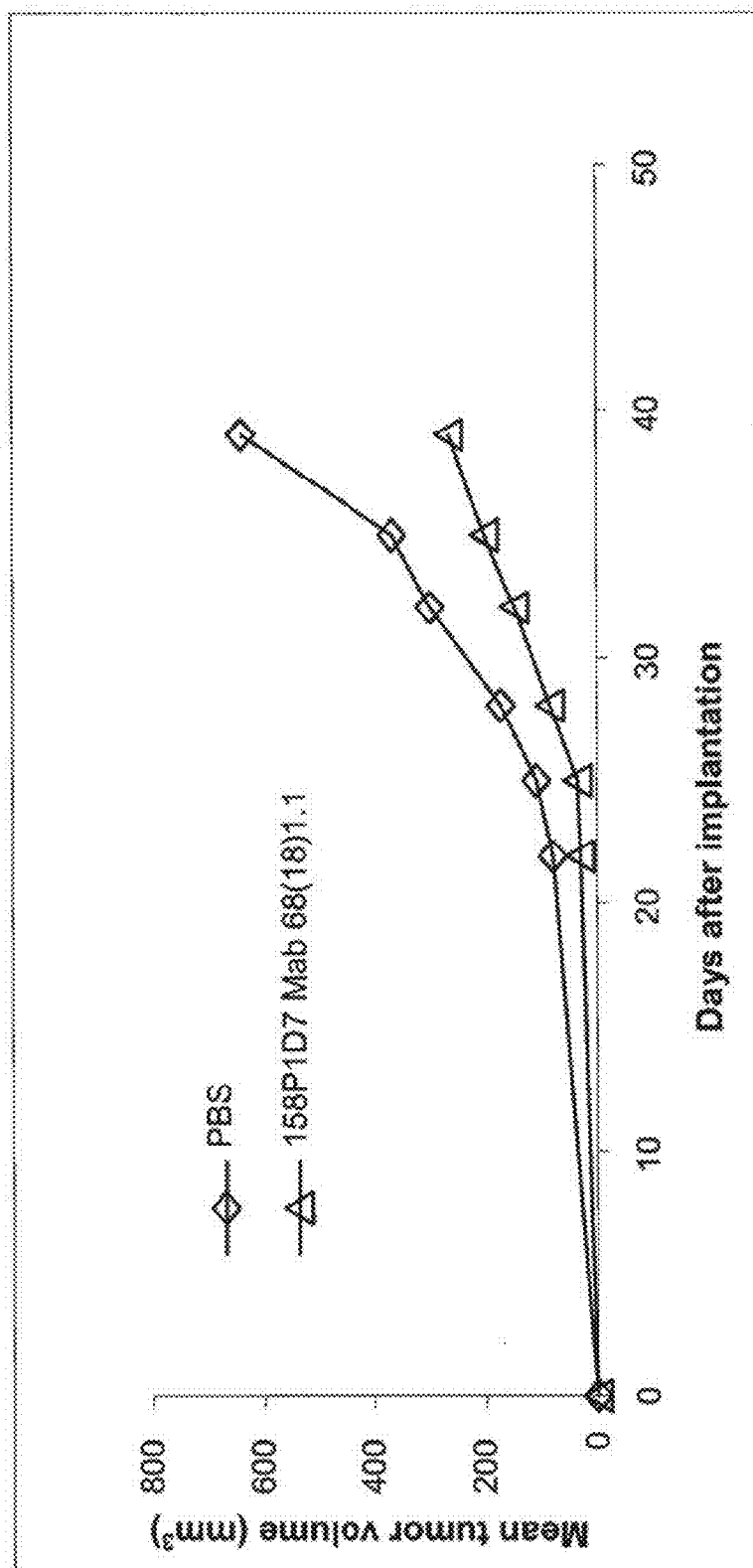


Figure 31 - 158P1D7 MAbs Retard Growth of Human Prostate Cancer Xenografts in Mice

Patient-derived LAPC9 xenograft

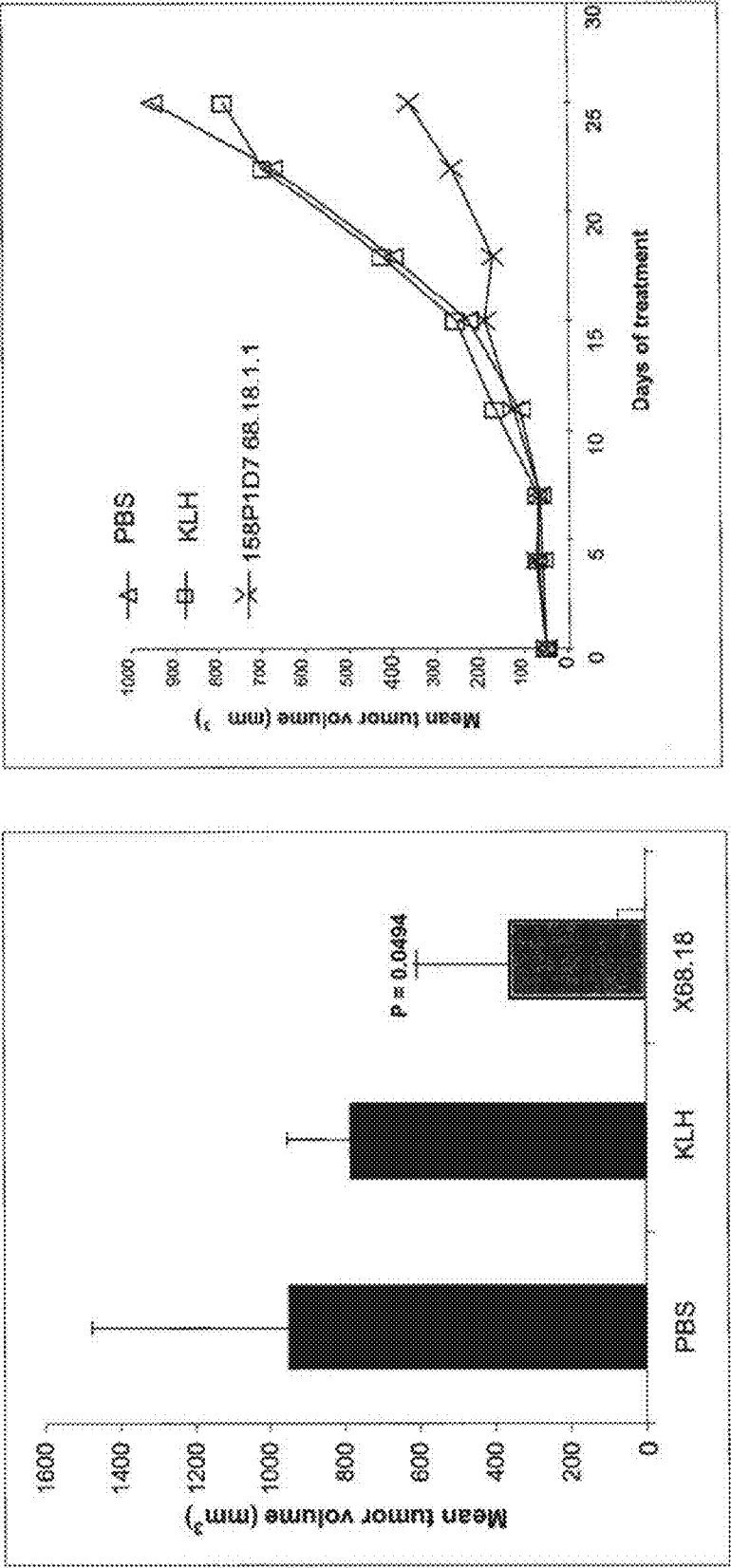


Figure 32: Effect of 158P1D7 on Proliferation of Rat1 cells

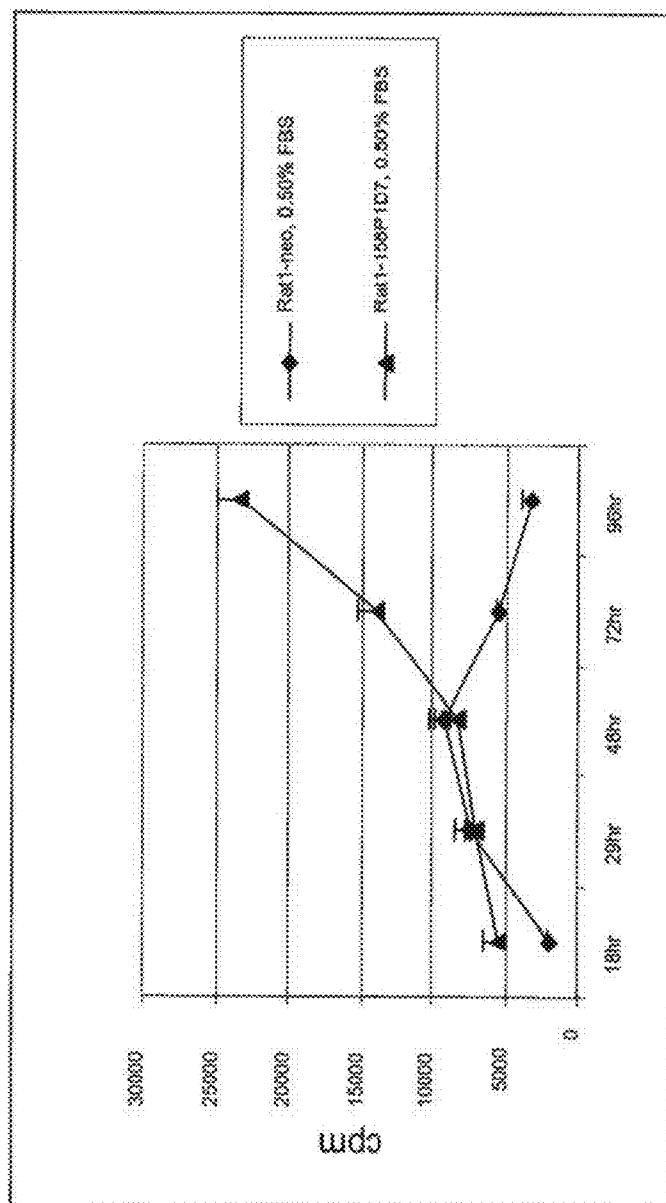


Figure 33: 158P1D7 Enhances Entry into the S Phase

Cells	Treatment	Percent Cells		
		G1	S	G2
3T3	0.5% FBS	92.7	2.6	2.2
	10% FBS	72.8	11.4	14.7
3T3-neo	0.5% FBS	95.1	1.4	2.3
	10% FBS	59.6	14.1	18.3
3T3-158P1D7	0.5% FBS	90.1	3.3	4.4
	10% FBS	68.4	21.2	1.7

Figure 34A. The cDNA and amino acid sequence of M15/X68(2)18 VH clone #1.

1 Q T A G V R S W F G G A L T E P V H H M
1 caaactgcaggagtcaggagttggcctggtggcgccctcacagagcctgtccatcacatg
21 H R L R I L I D R L W C K L G S P A S R
61 caccgtctcaggattctcattgaccggetatggtgtaaactgggttcgccagccctccagg
41 K G S G V A G N D L G R W R H R L Y F S
121 aaagggctctggggtgggtgggaatgatttggggcgatggaagcacagattatacttcagc
61 S P I Q T E H Q E G Q F K S Q T F L K N
181 totccaatccagactgagcatcaggaaaggacaattcaagagccaaactttcttaaaaaat
81 N S L Q T D D T A R Y Y C A R D E G R G
241 aacagttctgcaactgatgacacagccaggtattactgtgccagagatgaagggagggga
101 L C L I A G A K G P R S P S P
301 ctctgtttgattgctggggccaagggaacacgggtcaccggtctctctca

Figure 34B. The cDNA and amino acid sequence of M15/X68(2)18 VL clone #2.

1 D I Q L T Q S P A S L A V S L G Q R A T
1 gacatttcagctgacccagttctcctgcttctttagctgtatctctctggggcagagggccacc
21 I S Y R A S K S V S T S G Y S Y M H W N
61 atctcatcacagggccagcaaaaagtgtcagtaacatctggctatagttatatgcactggaac
41 Q Q K P G Q P P R L L I Y L V S N L E S
121 caacagaaaaccaggacagccacccagactcctcatctatcttgtatccaacotagaatct
61 G V P A R F S G S G S G T D F T L N I H
181 ggggtccctgccaggttcagtgccagtggtctctgggacagacttcaccctcaacatccat
81 P V E E E D A A T Y Y C Q H I R E L T R
241 cctgtggaggaggaggtgtgtgcaacctattactgtcagcacattagggaggttacacgt
101 S E G G P S W R S N
301 tcggaggggggaccaagctggagatctaac

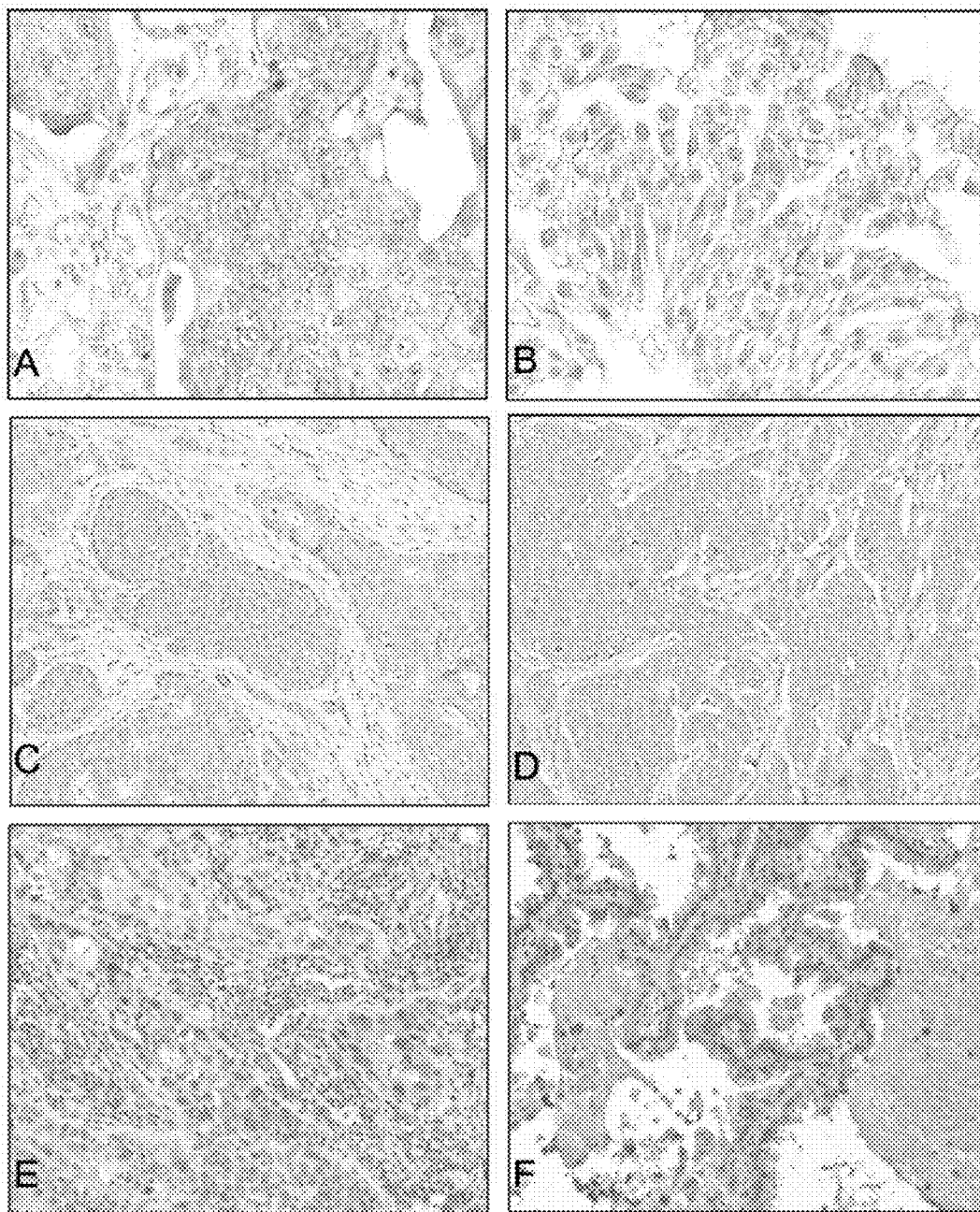
Figure 35A: The amino acid sequence of M15/X68(2)18 VH clone #1.

1 QTAGVRSWPG GALTEPVHHM HRLRILIDRL WCKLGSPASR KGSGVAGNDL
51 GRWKHRLYFS SPIQTEHQEG QFKSQTFELKN NSLQTDDTAR YYCARDEGRG
101 LCLIAGAKGP RSPSP

Figure 35B: The amino acid sequence of M15/X68(2)18 VL clone #2.

1 DIQLTQSPAS LAVSLGQRAT ISYRASKSVS TSCYSYMHWN QQKFGQPPRL
51 LIYLVSNLES GVPARFEGSG SGTDFTLNIH FVEEEDAATY YCQHIRELTR
101 SEGGPSWRSN

**Figure 36: Detection of 158PID7 protein by immunohistochemistry
in various cancer patient specimens**



**NUCLEIC ACID AND CORRESPONDING
PROTEIN NAMED 158P1D7 USEFUL IN THE
TREATMENT AND DETECTION OF
BLADDER AND OTHER CANCERS**

**CROSS-REFERENCE TO RELATED
APPLICATIONS**

[0001] This application is a continuation of U.S. application Ser. No. 12/050,895, filed Mar. 18, 2008, now pending, which is a divisional application of U.S. application Ser. No. 10/776,773, filed Feb. 10, 2004, now U.S. Pat. No. 7,358,353, which claims the benefit of priority of U.S. Provisional Application No. 60/446,633, filed Feb. 10, 2003, and is a continuation-in-part of U.S. patent application Ser. No. 10/280,340, filed Oct. 25, 2002, now abandoned, and a continuation-in-part of U.S. patent application Ser. No. 10/277,292, filed Oct. 21, 2002, now abandoned, both of which are continuations of U.S. patent application Ser. No. 09/935,430, filed Aug. 22, 2001, now U.S. Pat. No. 6,863,892, which claims the benefit of priority of U.S. Provisional Application No. 60/227,098, filed Aug. 22, 2000, and U.S. Provisional Application No. 60/282,793, filed Apr. 10, 2001. All applications are incorporated by reference in their entirety.

**SUBMISSION OF SEQUENCE LISTING ON
ASCII TEXT FILE**

[0002] The content of the following submission on ASCII text file is incorporated herein by reference in its entirety: a computer readable form (CRF) of the Sequence Listing (file name: 511582005006SeqList.txt, date recorded: Oct. 22, 2012, size: 287,914 bytes).

FIELD OF THE INVENTION

[0003] The invention described herein relates to novel nucleic acid sequences and their encoded proteins, referred to as 158P1D7 and variants thereof, and to diagnostic and therapeutic methods and compositions useful in the management of various cancers that express 158P1D7 and variants thereof.

BACKGROUND ART

[0004] Cancer is the second leading cause of human death next to coronary disease. Worldwide, millions of people die from cancer every year. In the United States alone, as reported by the American Cancer Society, cancer causes the death of well over a half-million people annually, with over 1.2 million new cases diagnosed per year. While deaths from heart disease have been declining significantly, those resulting from cancer generally are on the rise. In the early part of the next century, cancer is predicted to become the leading cause of death.

[0005] Of all new cases of cancer in the United States, bladder cancer represents approximately 5 percent in men (fifth most common neoplasm) and 3 percent in women (eighth most common neoplasm). The incidence is increasing slowly, concurrent with an increasing older population. In 1998, there was an estimated 54,500 cases, including 39,500 in men and 15,000 in women. The age-adjusted incidence in the United States is 32 per 100,000 for men and 8 per 100,000 in women. The historic male/female ratio of 3:1 may be decreasing related to smoking patterns in women. There were an estimated 11,000 deaths from bladder cancer in 1998 (7,800 in men and 3,900 in women). Bladder cancer inci-

dence and mortality strongly increase with age and will be an increasing problem as the population becomes more elderly.

[0006] Bladder cancers comprise a heterogeneous group of diseases. The main determinants of disease control and survival are histology and extent of disease. The main codes for these factors include pathology classification, the International Classification of Diseases-Oncology (ICDO), and staging classification of extent of disease, the TNM classification (Table XXI). For a general discussion of bladder and other urogenital cancers, see, e.g., Volgelzang, et al, Eds. Comprehensive Textbook of Genitourinary Oncology, (Williams & Wilkins, Baltimore 1996), in particular pages 295-556.

[0007] Three primary types of tumors have been reported in the bladder. The most common type of bladder cancer is Transitional cell carcinoma (TCC); this accounts for about 90% of all bladder cancers. The second form of bladder cancer is squamous cell carcinoma, which accounts for about 8% of all bladder cancers where schistosomiasis is not endemic, and approximately 75% of bladder carcinomas where schistosomiasis is endemic. Squamous cell carcinomas tend to invade deeper layers of the bladder. The third type of bladder cancer is adenocarcinoma, which account for 1%-2% of bladder cancers; these are primarily invasive forms of cancer.

[0008] Bladder cancer is commonly detected and diagnosed using cystoscopy and urine cytology. However these methods demonstrate poor sensitivity. Relatively more reliable methods of detection currently used in the clinic include the bladder tumor antigen (BTA) stat test, NMP22 protein assay, telomerase expression and hyaluronic acid and hyaluronidase (HA-HAase) urine test. The advantage of using such markers in the diagnosis of bladder cancer is their relative high sensitivity in earlier tumor stages compared to standard cytology.

[0009] For example, the BTA stat test has 60-80% sensitivity and 50-70% specificity for bladder cancer, while the HA-HAase urine test shows 90-92% sensitivity and 80-84% specificity for bladder cancer (J Urol 2001 165:1067). In general, sensitivity for stage Ta tumors was 81% for nuclear matrix protein (NMP22), 70% for telomerase, 32% for bladder tumor antigen (BTA) and 26% for cytology (J Urol 2001 166:470; J Urol 1999, 161:810). Although the telomeric repeat assay which measures telomerase activity is relatively sensitive, instability of telomerase in urine presently renders this detection method unreliable.

[0010] Most bladder cancers recur in the bladder. Generally, bladder cancer is managed with a combination of transurethral resection of the bladder (TUR) and intravesical chemotherapy or immunotherapy. The multifocal and recurrent nature of bladder cancer points out the limitations of TUR. Most muscle-invasive cancers are not cured by TUR alone. Radical cystectomy and urinary diversion is the most effective means to eliminate the cancer but carry an undeniable impact on urinary and sexual function.

[0011] Intravesical bacilli Calmette-Guerin (BCG) is a common and efficacious immunotherapeutic agent used in the treatment of bladder cancer. BCG is also used as a prophylactic agent to prevent recurrence of bladder cancer. However, 30% of patients fail to respond to BCG therapy and go on to develop invasive and metastatic disease (Catalona et al. J Urol 1987, 137:220-224). BCG-related side effects have been frequently observed such as drug-induced cystitis, risk of bacterial infection, and hematuria, amongst others. Other alternative immunotherapies have been used for the treatment

of bladder cancer, such as KLH (Flamm et al. *Urology* 1994; 33:138-143) interferons (Bazarbashi et al. *J Surg Oncol.* 2000; 74:181-4), and MAGE-3 peptide loaded dendritic cells (Nishiyama et al. *Clin Cancer Res* 2001; 7:23-31). All these approaches are still experimental (Zlotta et al. *Eur Urol* 2000; 37 Suppl 3:10-15). There continues to be a significant need for diagnostic and treatment modalities that are beneficial for bladder cancer patients. Furthermore, from a worldwide standpoint, several cancers stand out as the leading killers. In particular, carcinomas of the lung, prostate, breast, colon, pancreas, and ovary are primary causes of cancer death. These and virtually all other carcinomas share a common lethal feature. With very few exceptions, metastatic disease from a carcinoma is fatal. Moreover, even for those cancer patients who initially survive their primary cancers, their lives are dramatically altered. Many cancer patients experience strong anxieties driven by the awareness of the potential for recurrence or treatment failure. Many cancer patients experience physical debilitations following treatment. Furthermore, many cancer patients experience a recurrence.

[0012] Prostate cancer is the fourth most prevalent cancer in men worldwide. In North America and Northern Europe, it is by far the most common cancer in males and is the second leading cause of cancer death in men. In the United States alone, well over 30,000 men die annually of this disease, second only to lung cancer. Despite the magnitude of these figures, there is still no effective treatment for metastatic prostate cancer. Surgical prostatectomy, radiation therapy, hormone ablation therapy, surgical castration and chemotherapy continue to be the main treatment modalities. Unfortunately, these treatments are ineffective for many and are often associated with undesirable consequences.

[0013] On the diagnostic front, the lack of a prostate tumor marker that can accurately detect early-stage, localized tumors remains a significant limitation in the diagnosis and management of this disease. Although the serum prostate specific antigen (PSA) assay has been a very useful tool, however its specificity and general utility is widely regarded as lacking in several important respects. While previously identified markers such as PSA, PSM, PCTA and PSCA have facilitated efforts to diagnose and treat prostate cancer, there is need for the identification of additional markers and therapeutic targets for prostate and related cancers in order to further improve diagnosis and therapy.

[0014] Renal cell carcinoma (RCC) accounts for approximately 3 percent of adult malignancies. Once adenomas reach a diameter of 2 to 3 cm, malignant potential exists. In the adult, the two principal malignant renal tumors are renal cell adenocarcinoma and transitional cell carcinoma of the renal pelvis or ureter. The incidence of renal cell adenocarcinoma is estimated at more than 29,000 cases in the United States, and more than 11,600 patients died of this disease in 1998. Transitional cell carcinoma is less frequent, with an incidence of approximately 500 cases per year in the United States.

[0015] Surgery has been the primary therapy for renal cell adenocarcinoma for many decades. Until recently, metastatic disease has been refractory to any systemic therapy. With recent developments in systemic therapies, particularly immunotherapies, metastatic renal cell carcinoma may be approached aggressively in appropriate patients with a possibility of durable responses. Nevertheless, there is a remaining need for effective therapies for these patients.

[0016] An estimated 130,200 cases of colorectal cancer occurred in 2000 in the United States, including 93,800 cases

of colon cancer and 36,400 of rectal cancer. Colorectal cancers are the third most common cancers in men and women. Incidence rates declined significantly during 1992-1996 (-2.1% per year). Research suggests that these declines have been due to increased screening and polyp removal, preventing progression of polyps to invasive cancers. There were an estimated 56,300 deaths (47,700 from colon cancer, 8,600 from rectal cancer) in 2000, accounting for about 11% of all U.S. cancer deaths.

[0017] At present, surgery is the most common form of therapy for colorectal cancer, and for cancers that have not spread, it is frequently curative. Chemotherapy, or chemotherapy plus radiation is given before or after surgery to most patients whose cancer has deeply perforated the bowel wall or has spread to the lymph nodes. A permanent colostomy (creation of an abdominal opening for elimination of body wastes) is occasionally needed for colon cancer and is infrequently required for rectal cancer. There continues to be a need for effective diagnostic and treatment modalities for colorectal cancer.

[0018] There were an estimated 164,100 new cases of lung and bronchial cancer in 2000, accounting for 14% of all U.S. cancer diagnoses. The incidence rate of lung and bronchial cancer is declining significantly in men, from a high of 86.5 per 100,000 in 1984 to 70.0 in 1996. In the 1990s, the rate of increase among women began to slow. In 1996, the incidence rate in women was 42.3 per 100,000.

[0019] Lung and bronchial cancer caused an estimated 156,900 deaths in 2000, accounting for 28% of all cancer deaths. During 1992-1996, mortality from lung cancer declined significantly among men (-1.7% per year) while rates for women were still significantly increasing (0.9% per year). Since 1987, more women have died each year of lung cancer than breast cancer, which, for over 40 years, was the major cause of cancer death in women. Decreasing lung cancer incidence and mortality rates most likely resulted from decreased smoking rates over the previous 30 years; however, decreasing smoking patterns among women lag behind those of men. Of concern, although the declines in adult tobacco use have slowed, tobacco use in youth is increasing again.

[0020] Treatment options for lung and bronchial cancer are determined by the type and stage of the cancer and include surgery, radiation therapy, and chemotherapy. For many localized cancers, surgery is usually the treatment of choice. Because the disease has usually spread by the time it is discovered, radiation therapy and chemotherapy are often needed in combination with surgery. Chemotherapy alone or combined with radiation is the treatment of choice for small cell lung cancer; on this regimen, a large percentage of patients experience remission, which in some cases is long lasting. There is however, an ongoing need for effective treatment and diagnostic approaches for lung and bronchial cancers.

[0021] An estimated 182,800 new invasive cases of breast cancer were expected to have occurred among women in the United States during 2000. Additionally, about 1,400 new cases of breast cancer were expected to be diagnosed in men in 2000. After increasing about 4% per year in the 1980s, breast cancer incidence rates in women have leveled off in the 1990s to about 110.6 cases per 100,000.

[0022] In the U.S. alone, there were an estimated 41,200 deaths (40,800 women, 400 men) in 2000 due to breast cancer. Breast cancer ranks second among cancer deaths in women. According to the most recent data, mortality rates

declined significantly during 1992-1996 with the largest decreases in younger women, both white and black. These decreases were probably the result of earlier detection and improved treatment.

[0023] Taking into account the medical circumstances and the patient's preferences, treatment of breast cancer may involve lumpectomy (local removal of the tumor) and removal of the lymph nodes under the arm; mastectomy (surgical removal of the breast) and removal of the lymph nodes under the arm; radiation therapy; chemotherapy; or hormone therapy. Often, two or more methods are used in combination. Numerous studies have shown that, for early stage disease, long-term survival rates after lumpectomy plus radiotherapy are similar to survival rates after modified radical mastectomy. Significant advances in reconstruction techniques provide several options for breast reconstruction after mastectomy. Recently, such reconstruction has been done at the same time as the mastectomy.

[0024] Local excision of ductal carcinoma in situ (DCIS) with adequate amounts of surrounding normal breast tissue may prevent the local recurrence of the DCIS. Radiation to the breast and/or tamoxifen may reduce the chance of DCIS occurring in the remaining breast tissue. This is important because DCIS, if left untreated, may develop into invasive breast cancer. Nevertheless, there are serious side effects or sequelae to these treatments. There is, therefore, a need for efficacious breast cancer treatments.

[0025] There were an estimated 23,100 new cases of ovarian cancer in the United States in 2000. It accounts for 4% of all cancers among women and ranks second among gynecologic cancers. During 1992-1996, ovarian cancer incidence rates were significantly declining. Consequent to ovarian cancer, there were an estimated 14,000 deaths in 2000. Ovarian cancer causes more deaths than any other cancer of the female reproductive system.

[0026] Surgery, radiation therapy, and chemotherapy are treatment options for ovarian cancer. Surgery usually includes the removal of one or both ovaries, the fallopian tubes (salpingo-oophorectomy), and the uterus (hysterectomy). In some very early tumors, only the involved ovary will be removed, especially in young women who wish to have children. In advanced disease, an attempt is made to remove all intra-abdominal disease to enhance the effect of chemotherapy. There continues to be an important need for effective treatment options for ovarian cancer.

[0027] There were an estimated 28,300 new cases of pancreatic cancer in the United States in 2000. Over the past 20 years, rates of pancreatic cancer have declined in men. Rates among women have remained approximately constant but may be beginning to decline. Pancreatic cancer caused an estimated 28,200 deaths in 2000 in the United States. Over the past 20 years, there has been a slight but significant decrease in mortality rates among men (about -0.9% per year) while rates have increased slightly among women.

[0028] Surgery, radiation therapy, and chemotherapy are treatment options for pancreatic cancer. These treatment options can extend survival and/or relieve symptoms in many patients but are not likely to produce a cure for most. There is a significant need for additional therapeutic and diagnostic options for pancreatic cancer.

SUMMARY OF THE INVENTION

[0029] The present invention relates to a novel nucleic acid sequence and its encoded polypeptide, designated 158P1D7.

As used herein, "158P1D7" may refer to the novel polynucleotides or polypeptides or variants thereof or both of the disclosed invention.

[0030] Nucleic acids encoding 158P1D7 are over-expressed in the cancer(s) listed in Table I. Northern blot expression analysis of 158P1D7 expression in normal tissues shows a restricted expression pattern in adult tissues. The nucleotide (FIG. 2) and amino acid (FIG. 2, and FIG. 3) sequences of 158P1D7 are provided. The tissue-related profile of 158P1D7 in normal adult tissues, combined with the over-expression observed in bladder tumors, shows that 158P1D7 is aberrantly over-expressed in at least some cancers. Thus, 158P1D7 nucleic acids and polypeptides serve as a useful diagnostic agent (or indicator) and/or therapeutic target for cancers of the tissues, such as those listed in Table I.

[0031] The invention provides polynucleotides corresponding or complementary to all or part of the 158P1D7 nucleic acids, mRNAs, and/or coding sequences, preferably in isolated form, including polynucleotides encoding 158P1D7-related proteins and fragments of 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, or more than 25 contiguous amino acids; at least about 30, 35, 40, 45, 50, 55, 60, 65, 70, 80, 85, 90, 95, 100 or more than 100 contiguous amino acids of a 158P1D7-related protein, as well as the peptides/proteins themselves; DNA, RNA, DNA/RNA hybrids, and related molecules (such as PNAs), polynucleotides or oligonucleotides complementary or having at least a 90% homology to 158P1D7 nucleic acid sequences or mRNA sequences or parts thereof, and polynucleotides or oligonucleotides that hybridize to the 158P1D7 genes, mRNAs, or to 158P1D7-encoding polynucleotides. Also provided are means for isolating cDNAs and the gene(s) encoding 158P1D7. Recombinant DNA molecules containing 158P1D7 polynucleotides, cells transformed or transduced with such molecules, and host-vector systems for the expression of 158P1D7 gene products are also provided. The invention further provides antibodies that bind to 158P1D7 proteins and polypeptide fragments thereof, including polyclonal and monoclonal antibodies, murine and other mammalian antibodies, chimeric antibodies, humanized and fully human antibodies, and antibodies labeled with a detectable marker. The invention also comprises T cell clones that recognize an epitope of 158P1D7 in the context of a particular HLA molecule.

[0032] The invention further provides methods for detecting the presence, amount, and status of 158P1D7 polynucleotides and proteins in various biological samples, as well as methods for identifying cells that express 158P1D7 polynucleotides and polypeptides. A typical embodiment of this invention provides methods for monitoring 158P1D7 polynucleotides and polypeptides in a tissue or hematology sample having or suspected of having some form of growth dysregulation such as cancer.

[0033] Note that to determine the starting position of any peptide set forth in Tables V-XVIII and XXII to XLIX (collectively HLA Peptide Tables) respective to its parental protein, e.g., variant 1, variant 2, etc., reference is made to three factors: the particular variant, the length of the peptide in an HLA Peptide Table, and the Search Peptides in Table VII. Generally, a unique Search Peptide is used to obtain HLA peptides of a particular for a particular variant. The position of each Search Peptide relative to its respective parent molecule is listed in Table 55. Accordingly, if a Search Peptide begins at position "X", one must add the value "X-1" to each posi-

tion in Tables V-XVIII and XXII to XLIX to obtain the actual position of the HLA peptides in their parental molecule. For example, if a particular Search Peptide begins at position 150 of its parental molecule, one must add 150-1, i.e., 149 to each HLA peptide amino acid position to calculate the position of that amino acid in the parent molecule.

[0034] The invention further provides various immunogenic or therapeutic compositions and strategies for treating cancers that express 158P1D7 such as bladder cancers, including therapies aimed at inhibiting the transcription, translation, processing or function of 158P1D7 as well as cancer vaccines.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] FIG. 1. 158P1D7 SSH nucleic acid sequence. The 158P1D7 SSH sequence contains 231 bp.

[0036] FIG. 2. A) The cDNA and amino acid sequence of 158P1D7 variant 1 (also called "158P1D7 v.1" or "158P1D7 variant 1") is shown in FIG. 2A. The start methionine is underlined. The open reading frame extends from nucleic acid 23-2548 including the stop codon.

[0037] B) The cDNA and amino acid sequence of 158P1D7 variant 2 (also called "158P1D7 v.2") is shown in FIG. 2B. The codon for the start methionine is underlined. The open reading frame extends from nucleic acid 23-2548 including the stop codon.

[0038] C) The cDNA and amino acid sequence of 158P1D7 variant 3 (also called "158P1D7 v.3") is shown in FIG. 2C. The codon for the start methionine is underlined. The open reading frame extends from nucleic acid 23-2221 including the stop codon.

[0039] D) The cDNA and amino acid sequence of 158P1D7 variant 4 (also called "158P1D7 v.4") is shown in FIG. 2D. The codon for the start methionine is underlined. The open reading frame extends from nucleic acid 23-1210 including the stop codon.

[0040] E) The cDNA and amino acid sequence of 158P1D7 variant 5 (also called "158P1D7 v.5") is shown in FIG. 2E. The codon for the start methionine is underlined. The open reading frame extends from nucleic acid 480-3005 including the stop codon.

[0041] F) The cDNA and amino acid sequence of 158P1D7 variant 6 (also called "158P1D7 v.6") is shown in FIG. 2F. The codon for the start methionine is underlined. The open reading frame extends from nucleic acid 23-1612 including the stop codon.

[0042] FIG. 3. A) The amino acid sequence of 158P1D7 v.1 is shown in FIG. 3A; it has 841 amino acids. B) The amino acid sequence of 158P1D7 v.3 is shown in FIG. 3B; it has 732 amino acids. C) The amino acid sequence of 158P1D7 v.4 is shown in FIG. 3C; it has 395 amino acids. D) The amino acid sequence of 158P1D7 v.6 is shown in FIG. 3D; it has 529 amino acids. As used herein, a reference to 158P1D7 includes all variants thereof, including those shown in FIGS. 2, 3, 10, 11, and 12 unless the context clearly indicates otherwise.

[0043] FIG. 4. Alignment BLAST homology of 158P1D7 v.1 amino acid to hypothetical protein FLJ22774.

[0044] FIG. 5. FIG. 5A: Amino acid sequence alignment of 158P1D7 with human protein.

[0045] FIG. 5B: Amino acid sequence alignment of 158P1D7 with human protein similar to IGFALS.

[0046] FIG. 6. Expression of 158P1D7 by RT-PCR. First strand cDNA was prepared from vital pool 1 (VP1: liver, lung and kidney), vital pool 2 (VP2, pancreas, colon and stomach),

prostate xenograft pool (LAPC-4AD, LAPC-4AI, LAPC-9AD, LAPC-9AI), prostate cancer pool, bladder cancer pool, colon cancer pool, lung cancer pool, ovary cancer pool, breast cancer pool, and metastasis pool. Normalization was performed by PCR using primers to actin and GAPDH. Semi-quantitative PCR, using primers to 158P1D7, was performed at 30 cycles of amplification. Strong expression of 158P1D7 is observed in bladder cancer pool and breast cancer pool. Lower levels of expression are observed in VP1, VP2, xenograft pool, prostate cancer pool, colon cancer pool, lung cancer pool, ovary cancer pool, and metastasis pool.

[0047] FIG. 7. Expression of 158P1D7 in normal human tissues. Two multiple tissue northern blots, with 2 µg of mRNA/lane, were probed with the 158P1D7 fragment. Size standards in kilobases (kb) are indicated on the side. The results show expression of 158P1D7 in prostate, liver, placenta, heart and, to lower levels, in small intestine and colon.

[0048] FIG. 8. Expression of 158P1D7 in bladder cancer patient specimens. FIG. 8A. RNA was extracted from the bladder cancer cell lines (CL), normal bladder (N), bladder tumors (T) and matched normal adjacent tissue (NAT) isolated from bladder cancer patients. Northern blots with 10 µg of total RNA/lane were probed with the 158P1D7 fragment. Size standards in kilobases (kb) are indicated on the side. The results show expression of 158P1D7 in 1 of 3 bladder cancer cell lines. In patient specimens, 158P1D7 expression is detected in 4 of 6 tumors tested. FIG. 8B. In another study, 158P1D7 expression is detected in all patient tumors tested (8B). The expression observed in normal adjacent tissues (isolated from diseased tissues) but not in normal tissue, isolated from healthy donors, may indicate that these tissues are not fully normal and that 158P1D7 may be expressed in early stage tumors.

[0049] FIG. 9. Expression of 158P1D7 in lung cancer patient specimens. RNA was extracted from lung cancer cell lines (CL), lung tumors (T), and their normal adjacent tissues (NAT) isolated from lung cancer patients. Northern blot with 10 µg of total RNA/lane was probed with the 158P1D7 fragment. Size standards in kilobases (kb) are indicated on the side. The results show expression of 158P1D7 in 1 of 3 lung cancer cell lines and in all 3 lung tumors tested, but not in normal lung tissues.

[0050] FIG. 10. Expression of 158P1D7 in breast cancer patient specimens. RNA was extracted from breast cancer cell lines (CL), normal breast (N), and breast tumors (T) isolated from breast cancer patients. Northern blot with 10 µg of total RNA/lane was probed with the 158P1D7 fragment. Size standards in kilobases (kb) are indicated on the side. The results show expression of 158P1D7 in 2 of 3 breast cancer cell lines and in 2 breast tumors, but not in normal breast tissue.

[0051] FIG. 11. FIGS. 11(a)-(d): Hydrophilicity amino acid profile of 158P1D7 v.1, v.3, v.4, and v.6 determined by computer algorithm sequence analysis using the method of Hopp and Woods (Hopp T. P., Woods K. R., 1981. *Proc. Natl. Acad. Sci. U.S.A.* 78:3824-3828) accessed on the ProtScale website located on the World Wide Web through the ExPasy molecular biology server.

[0052] FIG. 12. FIGS. 12(a)-(d): Hydropathicity amino acid profile of 158P1D7 v.1, v.3,

[0053] v.4, and v.6 determined by computer algorithm sequence analysis using the method of Kyte and Doolittle (Kyte J., Doolittle R. F., 1982. *J. Mol. Biol.* 157:105-132) accessed on the ProtScale website located on the World Wide Web at the ExPasy molecular biology server.

[0054] FIG. 13. FIGS. 13(a)-(d): Percent accessible residues amino acid profile of 158P1D7 v.1, v.3, v.4, and v.6 determined by computer algorithm sequence analysis using the method of Janin (Janin J., 1979 Nature 277:491-492) accessed on the ProtScale website located on the World Wide Web at the ExPasy molecular biology server.

[0055] FIG. 14. FIGS. 14(a)-(d): Average flexibility amino acid profile of 158P1D7 v.1,

v.3, v.4, and v.6 determined by computer algorithm sequence analysis using the method of Bhaskaran and Ponnuswamy (Bhaskaran R., and Ponnuswamy P. K., 1988. Int. J. Pept. Protein Res. 32:242-255) accessed on the ProtScale website located on the World Wide Web at the ExPasy molecular biology server.

[0057] FIG. 15. FIGS. 15(a)-(d): Beta-turn amino acid profile of 158P1D7 v.1, v.3, v.4, and v.6 determined by computer algorithm sequence analysis using the method of Deleage and Roux (Deleage, G., Roux B. 1987 Protein Engineering 1:289-294) accessed on the ProtScale website located on the World Wide Web at the ExPasy molecular biology server.

[0058] FIG. 16. FIGS. 16(A)-(D): Secondary structure and transmembrane domains prediction for 158P1D7 protein variants. The secondary structures of 158P1D7 protein variants 1 (SEQ ID NO: 104), v.3 (SEQ ID NO: 105), v.4 (SEQ ID NO: 106), and v.6 (SEQ ID NO: 107), respectively, were predicted using the HNN—Hierarchical Neural Network method (NPS@: Network Protein Sequence Analysis TIBS 2000 March Vol. 25, No 3 [291]:147-150 Combet C., Blanchet C., Geourjon C. and Deléage G.), accessed from the ExPasy molecular biology server located on the World Wide Web at (.expasy.ch/tools/). This method predicts the presence and location of alpha helices, extended strands, and random coils from the primary protein sequence. The percent of the protein variant in a given secondary structure is also listed. FIGS. 16E, 16G, 16I, and 16K: Schematic representation of the probability of existence of transmembrane regions of 158P1D7 protein variants 1, 3, 4, and 6, respectively, based on the TMPred algorithm of Hofmann and Stoffel which utilizes TMBASE (K. Hofmann, W. Stoffel. TMBASE—A database of membrane spanning protein segments Biol. Chem. Hoppe-Seyler 374:166, 1993). FIGS. 16F, 16H, 16J, and 16L: Schematic representation of the probability of the existence of transmembrane regions of 158P1D7 protein variants 1, 3, 4, and 6, respectively, based on the TMHMM algorithm of Sonnhammer, von Heijne, and Krogh (Erik L. L. Sonnhammer, Gunnar von Heijne, and Anders Krogh: A hidden Markov model for predicting transmembrane helices in protein sequences. In Proc. of Sixth Int. Conf. on Intelligent Systems for Molecular Biology, p 175-182 Ed J. Glasgow, T. Littlejohn, F. Major, R. Lathrop, D. Sankoff, and C. Sensen Menlo Park, Calif.: AAAI Press, 1998). The TMPred and TMHMM algorithms are accessed from the ExPasy molecular biology server located on the World Wide Web at (.expasy.ch/tools/). Protein variants 1 and 3 are predicted to contain 1 transmembrane region and protein variants 3 and 4 are not predicted to have transmembrane regions. All variants contain a hydrophobic stretch at their amino terminus that may encode a signal peptide.

[0059] FIG. 17. Schematic alignment of SNP variants of 158P1D7. Schematic alignment of SNP variants of 158P1D7. Variant 158P1D7 v.2 is a variant with single nucleotide differences at 1546. Though this SNP variant is shown on transcript variant 158P1D7 v.1, it could also occur in any other transcript variants that contains the base pairs. Numbers cor-

respond to those of 158P1D7 v.1. Black box shows sequence similar to 158P1D7 v.1. SNP is indicated above the box.

[0060] FIG. 18. Schematic alignment of protein variants of 158P1D7. Schematic alignment of protein variants of 158P1D7. Protein variants correspond to nucleotide variants. Nucleotide variant 158P1D7 v.2 and v.5 code for the same protein as v.1. Nucleotide variants 158P1D7 v.3 and v.4 are transcript variants of v.1, as shown in FIG. 12. Variant v.6 is a single nucleotide different from v.4 but codes for a protein that differs in the C-terminal portion from the protein coded by v.4. Black boxes represent sequence similar to v.1. Hatched box represents amino acid sequence not present in v.1. Numbers underneath the box correspond to 158P1D7 v.1.

[0061] FIG. 19. Exon compositions of transcript variants of 158P1D7. Variant 158P1D7 v.3, v.4, v.5 and v.6 are transcript variants of 158P1D7 v.1. Variant 158P1D7 v.3 spliced 2069-2395 out of variant 158P1D7 v.1 and variant v.4 spliced out 1162-2096 out of v.1. Variant v.5 added another exon and 2 bp to the 5' end and extended 288 bp to the 3' end of variant v.1. Variant v.6 spliced at the same site as v.4 but spliced out an extra 'g' at the boundary. Numbers in "()" underneath the boxes correspond to those of 158P1D7 v.1. Lengths of introns and exons are not proportional.

[0062] FIG. 20. 158P1D7 Expression in Melanoma Cancer. RNA was extracted from normal skin cell line Detroit-551, and from the melanoma cancer cell line A375. Northern blots with 10 ug of total RNA were probed with the 158P1D7 DNA probe. Size standards in kilobases are on the side. Results show expression of 158P1D7 in the melanoma cancer cell line but not in the normal cell line.

[0063] FIG. 21. 158P1D7 Expression in cervical cancer patient specimens. First strand cDNA was prepared from normal cervix, cervical cancer cell line Hela, and a panel of cervical cancer patient specimens. Normalization was performed by PCR using primers to actin and GAPDH. Semi-quantitative PCR, using primers to 158P1D7, was performed at 26 and 30 cycles of amplification. Results show expression of 158P1D7 in 5 out of 14 tumor specimens tested but not in normal cervix nor in the cell line.

[0064] FIG. 22. Detection of 158P1D7 protein in recombinant cells with monoclonal antibodies. Cell lysates from the indicated cell lines were separated by SDS-PAGE and then transferred to nitrocellulose for Western blotting. The blots were probed with 5 ug/ml of the indicated anti-158P1D7 monoclonal antibodies (MAbs) in PBS+0.2% Tween 20+1% non-fat milk, washed, and then incubated with goat anti-mouse IgG-HRP secondary Ab. Immunoreactive bands were then visualized by enhanced chemoluminescence and exposure to autoradiographic film. Arrows indicate the ~95 KD and 90 kD 158P1D7 protein doublet band which suggest 158P1D7 is post-translationally modified to generate 2 different molecular weight species. These results demonstrate expression of 158P1D7 protein in recombinant cells and specific detection of the protein with monoclonal antibodies.

[0065] FIG. 23. Surface staining of 158P1D7-expressing 293T and UMUC cells with anti-158P1D7 monoclonal antibodies. Transiently transfected 293T cells expressing 158P1D7 and stable 158P1D7-expressing UMUC bladder cancer cells were analyzed for surface expression of 158P1D7 with monoclonal antibodies (MAbs) by flow cytometry. Transfected 293T control vector and 158P1D7 vector cells and stable UMUC-neo and UMUC-158P1D7 cells were stained with 10 ug/ml and 1 ug/ml, respectively, of the indicated MAbs. Surface bound MAbs were detected by

incubation with goat anti-mouse IgG-PE secondary Ab and then subjected to FACS analysis. 158P1D7-expressing 293T and UMUC cells exhibited an increase in relative fluorescence compared to control cells demonstrating surface expression and detection of 158P1D7 protein by each of the MABs.

[0066] FIG. 24. Surface staining of endogenous 158P1D7-expressing LAPC9 prostate cancer and UGB1 bladder cancer xenograft cells with MAB M15-68(2)22.1.1. LAPC9 and UGB1 xenograft cells were subjected to surface staining with either control mouse IgG antibody or MAB M15-68(2).1.1 at 1 μ g/ml. Surface bound MABs were detected by incubation with goat anti-mouse IgG-PE secondary Ab and then subjected to FACS analysis. Both LAPC9 and UGB1 cells exhibited an increase in relative fluorescence with the anti-158P1D7 MAB demonstrating surface expression and detection of 158P1D7 protein.

[0067] FIG. 25. Monoclonal antibody-mediated internalization of endogenous surface 158P1D7 in NCI-H146 small cell lung cancer cells. NCI-H146 cells were stained with 5 μ g/ml of the indicated MABs at 4° C. for 1.5 hours, washed, and then either left at 4° C. or moved to 37° C. for 10 and 30 minutes. Residual surface bound MAB was then detected with anti-mouse IgG-PE secondary antibody. The decrease in the mean fluorescence intensity (MF) of cells moved to 37° C. compared to cells left at 4° C. demonstrates internalization of surface bound 158P1D7/MAB complexes.

[0068] FIG. 26. Binding of the 158P1D7 extracellular domain to human umbilical vein endothelial cells. The recombinant extracellular domain (ECD) of 158P1D7 (amino acids 16-608) was iodinated to high specific activity using the iodogen (1,3,4,5-tetrachloro-3a,6a-diphenylglycoluril) method. Human umbilical vein endothelial cells (HUVEC) at 90% confluency in 6 well plates was incubated with 1 nM of 125I-158P1D7 ECD in the presence (non-specific binding) or absence (Total binding) of 50 fold excess unlabeled ECD for 2 hours at either 4° C. or 37° C. Cells were washed, solubilized in 0.5M NaOH, and subjected to gamma counting. The data shows specific binding of 158P1D7 ECD to HUVEC cells suggesting the presence of an 158P1D7 receptor on HUVEC cells. FIG. 26A. Shows that the 158P1D7 ECD bound directly to the surface of HUVEC cells as detected by the 158P1D7 specific MAB. FIG. 26B. Shows specific binding of 158P1D7 ECD to HUVEC cells suggesting the presence of an 158P1D7 receptor on HUVEC cells.

[0069] FIG. 27. 158P1D7 enhances the growth of bladder cancer in mice. Male ICR-SCID mice, 5-6 weeks old (Charles River Laboratory, Wilmington, Mass.) were used and maintained in a strictly controlled environment in accordance with the NIH Guide for the Care and Use of Laboratory Animals. 158P1D7 transfected UM-UC-3 cells and parental cells were injected into the subcutaneous space of SCID mice. Each mouse received 4 $\times$ 10⁶ cells suspended in 50% (v/v) of Matrigel. Tumor size was monitored through caliper measurements twice a week. The longest dimension (L) and the dimension perpendicular to it (W) were taken to calculate tumor volume according to the formula $W^2 \times L / 2$. The Mann-Whitney U test was used to evaluate differences of tumor growth. All tests were two sided with $\alpha=0.05$.

[0070] FIG. 28. Internalization of M15-68(2).31.1.1 in NCI-H146 cells. Endogenous-158P1D7 expressing NCI-H146 cells were incubated with 5 μ g/ml of MAB M15-68(2).31.1.1 at 4° C. for 1 hour, washed, and then incubated with goat anti-mouse IgG-PE secondary antibody and washed.

Cells were then either left at 4° C. or moved to 37° C. for 30 minutes. Cells were then subjected to fluorescent and bright-field microscopy. Cells that remained at 4° C. exhibited a halo of fluorescence on the cells demonstrative of surface staining. Cells moved to 37° C. exhibited a loss of the halo of surface fluorescence and the generation of punctuate internal fluorescence indicative of internalization of the 158P1D7/MAB complexes.

[0071] FIG. 29. Effect of 158P1D7 RNAi on cell survival. As control, 3T3 cells, a cell line with no detectable expression of 158P1D7 mRNA, was also treated with the panel of siRNAs (including oligo 158P1D7.b) and no phenotype was observed. This result reflects the fact that the specific protein knockdown in the LNCaP and PC3 cells is not a function of general toxicity, since the 3T3 cells did not respond to the 158P1D7.b oligo. The differential response of the three cell lines to the Eg5 control is a reflection of differences in levels of cell transfection and responsiveness of the cell lines to oligo treatment.

[0072] FIG. 30. 158P1D7 MABs Retard Growth of Human Prostate Cancer Xenografts in Mice. Male ICR-SCID mice, 5-6 weeks old (Charles River Laboratory, Wilmington, Mass.) were used and were maintained in a strictly-controlled environment in accordance with the NIH Guide for the Care and Use of Laboratory Animals. LAPC-9AD, an androgen-dependent human prostate cancer, was used to establish xenograft models. Stock tumors were regularly maintained in SCID mice. At the day of implantation, stock tumors were harvested and trimmed of necrotic tissues and minced to 1 mm³ pieces. Each mouse received 4 pieces of tissues at the subcutaneous site of right flank. Murine monoclonal antibodies to 158P1D7 and PSCA were tested at a dose of 1000 μ g/mouse and 500 μ g/mouse respectively. PBS and anti-KLH monoclonal antibody were used as controls. The study cohort consisted of 4 groups with 6 mice in each group. MABs were dosed intra-peritoneally twice a week for a total of 8 doses. Treatment was started when tumor volume reached 45 mm³. Tumor size was monitored through caliper measurements twice a week. The longest dimension (L) and the dimension perpendicular to it (W) were taken to calculate tumor volume according to the formula: $W^2 \times L / 2$. The Student's t test and the Mann-Whitney U test, where applicable, were used to evaluate differences of tumor growth. All tests were two-sided with $\alpha=0.05$.

[0073] FIG. 31. Anti-PSCA and 158P1D7 MABs Retard the Growth of Human Bladder Cancer Xenografts in Mice. Male ICR-SCID mice, 5-6 weeks old (Charles River Laboratory, Wilmington, Mass.) were used and were maintained in a strictly-controlled environment in accordance with the NIH Guide for the Care and Use of Laboratory Animals.

[0074] UG-B1, a patient bladder cancer, was used to establish xenograft models. Stock tumors regularly maintained in SCID mice were sterilely dissected, minced, and digested using Pronase (Calbiochem, San Diego, Calif.). Cell suspensions generated were incubated overnight at 37° C. to obtain a homogeneous single-cell suspension. Each mouse received 2.5 $\times$ 10⁶ cells at the subcutaneous site of right flank. Murine monoclonal antibodies to 158P1D7 and PSCA were tested at a dose of 500 μ g/mouse in the study. PBS was used as control. MABs were dosed intra-peritoneally twice a week for a total of 12 doses, starting on the same day of tumor cell injection. Tumor size was monitored through caliper measurements twice a week. The longest dimension (L) and the dimension perpendicular to it (W) were taken to calculate tumor volume

according to the formula: $W2 \times L/2$. The results show that Anti-158P1D7 mAbs are capable of inhibiting the growth of human bladder carcinoma in mice.

[0075] FIG. 32. Effect of 158P1D7 on Proliferation of Rat1 cells. Cells were grown overnight in 0.5% FBS and then compared to cells treated with 10% FBS. The cells were evaluated for proliferation at 18-96 hr post-treatment by a 3H-thymidine incorporation assay and for cell cycle analysis by a BrdU incorporation/propidium iodide staining assay. The results show that the Rat-1 cells expressing the 158P1D7 antigen grew effectively in low serum concentrations (0.1%) compared to the Rat-1-Neo cells.

[0076] FIG. 33. 158P1D7 Enhances Entry Into the S Phase. Cells were labeled with 10 μ M BrdU, washed, trypsinized and fixed in 0.4% paraformaldehyde and 70% ethanol. Anti-BrdU-FITC (Pharmingen) was added to the cells, the cells were washed and then incubated with 10 μ g/ml propidium iodide for 20 min prior to washing and analysis for fluorescence at 488 nm. The results show that there was increased labeling of cells in S-phase (DNA synthesis phase of the cell cycle) in 3T3 cells that expressed the 158P1D7 antigen relative to control cells.

[0077] FIG. 34. FIG. 34A. The cDNA (SEQ ID NO: 108) and amino acid sequence (SEQ ID NO: 109) of M15/X68(2) 18 VH clone #1. FIG. 34B. The cDNA (SEQ ID NO: 110) and amino acid sequence (SEQ ID NO: 111) of M15/X68(2) 18 VL clone #2.

[0078] FIG. 35. FIG. 35A. The amino acid sequence (SEQ ID NO: 112) of M15/X68(2) 18 VH clone #1. FIG. 35B. The amino acid sequence (SEQ ID NO: 113) of M15/X68(2) 18 VL clone #2.

[0079] FIG. 36. Detection of 158P1D7 protein by immunohistochemistry in various cancer patient specimens. Tissue was obtained from patients with bladder transitional cell carcinoma, breast ductal carcinoma and lung carcinoma. The results showed expression of 158P1D7 in the tumor cells of the cancer patients' tissue panel (A) bladder transitional cell carcinoma, invasive Grade III (B) bladder transitional cell carcinoma, papillary Grade II. (C) breast infiltrating ductal carcinoma, moderately differentiated, (D) breast infiltrating ductal carcinoma, moderate to poorly differentiated, (E) lung squamous cell carcinoma, (F) lung adenocarcinoma, well differentiated. The expression of 158P1D7 in bladder transitional cell carcinoma tissues was detected mostly around the cell membrane indicating that 158P1D7 is membrane associated.

DETAILED DESCRIPTION OF THE INVENTION

I.) Definitions

[0080] Unless otherwise defined, all terms of art, notations and other scientific terms or terminology used herein are intended to have the meanings commonly understood by those of skill in the art to which this invention pertains. In some cases, terms with commonly understood meanings are defined herein for clarity and/or for ready reference, and the inclusion of such definitions herein should not necessarily be construed to represent a substantial difference over what is generally understood in the art. Many of the techniques and procedures described or referenced herein are well understood and commonly employed using conventional methodology by those skilled in the art, such as, for example, the widely utilized molecular cloning methodologies described in Sambrook et al., *Molecular Cloning: A Laboratory Manual*

2nd. edition (1989) Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y. As appropriate, procedures involving the use of commercially available kits and reagents are generally carried out in accordance with manufacturer defined protocols and/or parameters unless otherwise noted.

[0081] The terms "invasive bladder cancer" means bladder cancers that have extended into the bladder muscle wall, and are meant to include stage stage T2-T4 and disease under the TNM (tumor, node, metastasis) system. In general, these patients have substantially less favorable outcomes compared to patients having non-invasive cancer. Following cystectomy, 50% or more of the patients with invasive cancer will develop metastasis (Whittmore. *Semin Urol* 1983; 1:4-10).

[0082] "Altering the native glycosylation pattern" is intended for purposes herein to mean deleting one or more carbohydrate moieties found in native sequence 158P1D7 (either by removing the underlying glycosylation site or by deleting the glycosylation by chemical and/or enzymatic means), and/or adding one or more glycosylation sites that are not present in the native sequence 158P1D7. In addition, the phrase includes qualitative changes in the glycosylation of the native proteins, involving a change in the nature and proportions of the various carbohydrate moieties present.

[0083] The term "analog" refers to a molecule which is structurally similar or shares similar or corresponding attributes with another molecule (e.g. a 158P1D7-related protein). For example an analog of the 158P1D7 protein can be specifically bound by an antibody or T cell that specifically binds to 158P1D7 protein.

[0084] The term "antibody" is used in the broadest sense. Therefore an "antibody" can be naturally occurring or man-made such as monoclonal antibodies produced by conventional hybridoma technology. Anti-158P1D7 antibodies bind 158P1D7 proteins, or a fragment thereof, and comprise monoclonal and polyclonal antibodies as well as fragments containing the antigen-binding domain and/or one or more complementarity determining regions of these antibodies.

[0085] An "antibody fragment" is defined as at least a portion of the variable region of the immunoglobulin molecule that binds to its target, i.e., the antigen-binding region. In one embodiment it specifically covers single anti-158P1D7 antibodies and clones thereof (including agonist, antagonist and neutralizing antibodies) and anti-158P1D7 antibody compositions with polyepitopic specificity.

[0086] The term "codon optimized sequences" refers to nucleotide sequences that have been optimized for a particular host species by replacing any one or more than one codon having a usage frequency of less than about 20%, more preferably less than about 30% or 40%. A sequence may be "completely optimized" to contain no codon having a usage frequency of less than about 20%, more preferably less than about 30% or 40%. Nucleotide sequences that have been optimized for expression in a given host species by elimination of spurious polyadenylation sequences, elimination of exon/intron splicing signals, elimination of transposon-like repeats and/or optimization of GC content in addition to codon optimization are referred to herein as an "expression enhanced sequences."

[0087] The term "cytotoxic agent" refers to a substance that inhibits or prevents one or more than one function of cells and/or causes destruction of cells. The term is intended to include radioactive isotopes chemotherapeutic agents, and toxins such as small molecule toxins or enzymatically active toxins of bacterial, fungal, plant or animal origin, including

fragments and/or variants thereof. Examples of cytotoxic agents include, but are not limited to maytansinoids, yttrium, bismuth, ricin, ricin A-chain, doxorubicin, daunorubicin, taxol, ethidium bromide, mitomycin, etoposide, teniposide, vincristine, vinblastine, colchicine, dihydroxy anthracin dione, actinomycin, diphtheria toxin, *Pseudomonas* exotoxin (PE) A, PE40, abrin, abrin A chain, modeccin A chain, alpha-sarcin, gelonin, mitogellin, restrictocin, phenomycin, enomycin, curicin, crotin, calicheamicin, sapaonaria officinalis inhibitor, and glucocorticoid and other chemotherapeutic agents, as well as radioisotopes such as At^{211} , I^{131} , I^{125} , Y^{90} , Re^{186} , Re^{188} , Sm^{153} , Bi^{212} , P^{32} and radioactive isotopes of Lu. Antibodies may also be conjugated to an anti-cancer pro-drug activating enzyme capable of converting the pro-drug to its active form.

[0088] The term “homolog” refers to a molecule which exhibits homology to another molecule, by for example, having sequences of chemical residues that are the same or similar at corresponding positions.

[0089] “Human Leukocyte Antigen” or “HLA” is a human class I or class II Major Histocompatibility Complex (MHC) protein (see, e.g., Stites, et al., IMMUNOLOGY, 8TH ED., Lange Publishing, Los Altos, Calif. (1994).

[0090] The terms “hybridize”, “hybridizing”, “hybridizes” and the like, used in the context of polynucleotides, are meant to refer to conventional hybridization conditions, preferably such as hybridization in 50% formamide/6×SSC/0.1% SDS/100 µg/ml ssDNA, in which temperatures for hybridization are above 37 degrees C. and temperatures for washing in 0.1×SSC/0.1% SDS are above 55 degrees C.

[0091] The phrases “isolated” or “biologically pure” refer to material which is substantially or essentially free from components which normally accompany the material as it is found in its native state. Thus, isolated peptides in accordance with the invention preferably do not contain materials normally associated, or present, with the peptides in their in situ environment. For example, a polynucleotide is said to be “isolated” when it is substantially separated from contaminant polynucleotides that correspond or are complementary to nucleic acids other than those of 158P1D7 or that encode polypeptides other than 158P1D7 gene product or fragments thereof. A skilled artisan can readily employ nucleic acid isolation procedures to obtain an isolated 158P1D7 polynucleotide. A protein is said to be “isolated,” for example, when physical, mechanical and/or chemical methods are employed to remove the 158P1D7 protein from cellular constituents that are normally associated, or present, with the protein. A skilled artisan can readily employ standard purification methods to obtain an isolated 158P1D7 protein. Alternatively, an isolated protein can be prepared by synthetic or chemical means.

[0092] The term “mammal” refers to any organism classified as a mammal, including mice, rats, rabbits, dogs, cats, cows, horses and humans. In one embodiment of the invention, the mammal is a mouse. In another embodiment of the invention, the mammal is a human.

[0093] The terms “metastatic bladder cancer” and “metastatic disease” mean bladder cancers that have spread to regional lymph nodes or to distant sites, and are meant to stage T×N×M+ under the TNM system. The most common site for bladder cancer metastasis is lymph node. Other common sites for metastasis include lung, bone and liver.

[0094] The term “monoclonal antibody” refers to an antibody obtained from a population of substantially homoge-

neous antibodies, i.e., the antibodies comprising the population are identical except for possible naturally occurring mutations that are present in minor amounts.

[0095] A “motif”, as in biological motif of an 158P1D7-related protein, refers to any pattern of amino acids forming part of the primary sequence of a protein, that is associated with a particular function (e.g. protein-protein interaction, protein-DNA interaction, etc) or modification (e.g. that is phosphorylated, glycosylated or amidated), or localization (e.g. secretory sequence, nuclear localization sequence, etc.) or a sequence that is correlated with being immunogenic, either humorally or cellularly. A motif can be either contiguous or capable of being aligned to certain positions that are generally correlated with a certain function or property. In the context of HLA motifs, “motif” refers to the pattern of residues in a peptide of defined length, usually a peptide of from about 8 to about 13 amino acids for a class I HLA motif and from about 6 to about 25 amino acids for a class II HLA motif, which is recognized by a particular HLA molecule. Peptide motifs for HLA binding are typically different for each protein encoded by each human HLA allele and differ in the pattern of the primary and secondary anchor residues.

[0096] A “pharmaceutical excipient” comprises a material such as an adjuvant, a carrier, pH-adjusting and buffering agents, tonicity adjusting agents, wetting agents, preservative, and the like.

[0097] “Pharmaceutically acceptable” refers to a non-toxic, inert, and/or composition that is physiologically compatible with mammals, such as humans.

[0098] The term “polynucleotide” means a polymeric form of nucleotides of at least 3, 4, 5, 6, 7, 8, 9, or 10 bases or base pairs in length, either ribonucleotides or deoxynucleotides or a modified form of either type of nucleotide, and is meant to include single and double stranded forms of DNA and/or RNA. In the art, this term is often used interchangeably with “oligonucleotide”, although “oligonucleotide” may be used to refer to the subset of polynucleotides less than about 50 nucleotides in length. A polynucleotide can comprise a nucleotide sequence disclosed herein wherein thymidine (T) (as shown for example in can also be uracil (U); this definition pertains to the differences between the chemical structures of DNA and RNA, in particular the observation that one of the four major bases in RNA is uracil (U) instead of thymidine (T).

[0099] The term “polypeptide” means a polymer of at least about 4, 5, 6, 7, or 8 amino acids. Throughout the specification, standard three letter or single letter designations for amino acids are used. In the art, this term is often used interchangeably with “peptide” or “protein”, thus “peptide” may be used to refer to the subset of polypeptides less than about 50 amino acids in length.

[0100] An HLA “primary anchor residue” is an amino acid at a specific position along a peptide sequence which is understood to provide a contact point between the immunogenic peptide and the HLA molecule. One to three, usually two, primary anchor residues within a peptide of defined length generally defines a “motif” for an immunogenic peptide. These residues are understood to fit in close contact with peptide binding groove of an HLA molecule, with their side chains buried in specific pockets of the binding groove. In one embodiment, for example, the primary anchor residues for an HLA class I molecule are located at position 2 (from the amino terminal position) and at the carboxyl terminal position of a 8, 9, 10, 11, or 12 residue peptide epitope in accor-

dance with the invention. In another embodiment, for example, the primary anchor residues of a peptide that will bind an HLA class II molecule are spaced relative to each other, rather than to the termini of a peptide, where the peptide is generally of at least 9 amino acids in length. The primary anchor positions for each motif and supermotif are set forth in Table IV. For example, analog peptides can be created by altering the presence or absence of particular residues in the primary and/or secondary anchor positions shown in Table IV. Such analogs are used to modulate the binding affinity and/or population coverage of a peptide comprising a particular HLA motif or supermotif.

[0101] A “recombinant” DNA or RNA molecule is a DNA or RNA molecule that has been subjected to molecular manipulation *in vitro*.

[0102] “Stringency” of hybridization reactions is readily determinable by one of ordinary skill in the art, and generally is an empirical calculation dependent upon probe length, washing temperature, and salt concentration. In general, longer probes require higher temperatures for proper annealing, while shorter probes need lower temperatures. Hybridization generally depends on the ability of denatured nucleic acid sequences to reanneal when complementary strands are present in an environment below their melting temperature. The higher the degree of desired homology between the probe and hybridizable sequence, the higher the relative temperature that can be used. As a result, it follows that higher relative temperatures would tend to make the reaction conditions more stringent, while lower temperatures less so. For additional details and explanation of stringency of hybridization reactions, see Ausubel et al., *Current Protocols in Molecular Biology*, Wiley Interscience Publishers, (1995).

[0103] “Stringent conditions” or “high stringency conditions”, as defined herein, are identified by, but not limited to, those that: (1) employ low ionic strength and high temperature for washing, for example 0.015 M sodium chloride/0.0015 M sodium citrate/0.1% sodium dodecyl sulfate at 50° C.; (2) employ during hybridization a denaturing agent, such as formamide, for example, 50% (v/v) formamide with 0.1% bovine serum albumin/0.1% Ficoll/0.1% polyvinylpyrrolidone/50 mM sodium phosphate buffer at pH 6.5 with 750 mM sodium chloride, 75 mM sodium citrate at 42° C.; or (3) employ 50% formamide, 5×SSC (0.75 M NaCl, 0.075 M sodium citrate), 50 mM sodium phosphate (pH 6.8), 0.1% sodium pyrophosphate, 5×Denhardt’s solution, sonicated salmon sperm DNA (50 µg/ml), 0.1% SDS, and 10% dextran sulfate at 42° C., with washes at 42° C. in 0.2×SSC (sodium chloride/sodium citrate) and 50% formamide at 55° C., followed by a high-stringency wash consisting of 0.1×SSC containing EDTA at 55° C. “Moderately stringent conditions” are described by, but not limited to, those in Sambrook et al., *Molecular Cloning: A Laboratory Manual*, New York: Cold Spring Harbor Press, 1989, and include the use of washing solution and hybridization conditions (e.g., temperature, ionic strength and % SDS) less stringent than those described above. An example of moderately stringent conditions is overnight incubation at 37° C. in a solution comprising: 20% formamide, 5×SSC (150 mM NaCl, 15 mM trisodium citrate), 50 mM sodium phosphate (pH 7.6), 5×Denhardt’s solution, 10% dextran sulfate, and 20 mg/mL denatured sheared salmon sperm DNA, followed by washing the filters in 1×SSC at about 37-50° C. The skilled artisan will recognize

how to adjust the temperature, ionic strength, etc. as necessary to accommodate factors such as probe length and the like.

[0104] An HLA “supermotif” is a peptide binding specificity shared by HLA molecules encoded by two or more HLA alleles.

[0105] A “transgenic animal” (e.g., a mouse or rat) is an animal having cells that contain a transgene, which transgene was introduced into the animal or an ancestor of the animal at a prenatal, e.g., an embryonic stage. A “transgene” is a DNA that is integrated into the genome of a cell from which a transgenic animal develops.

[0106] As used herein, an HLA or cellular immune response “vaccine” is a composition that contains or encodes one or more peptides of the invention. There are numerous embodiments of such vaccines, such as a cocktail of one or more individual peptides; one or more peptides of the invention comprised by a polyepitopic peptide; or nucleic acids that encode such individual peptides or polypeptides, e.g., a minigene that encodes a polyepitopic peptide. The “one or more peptides” can include any whole unit integer from 1-150 or more, e.g., at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140, 145, or 150 or more peptides of the invention. The peptides or polypeptides can optionally be modified, such as by lipidation, addition of targeting or other sequences. HLA class I peptides of the invention can be admixed with, or linked to, HLA class II peptides, to facilitate activation of both cytotoxic T lymphocytes and helper T lymphocytes. HLA vaccines can also comprise peptide-pulsed antigen presenting cells, e.g., dendritic cells.

[0107] The term “variant” refers to a molecule that exhibits a variation from a described type or norm, such as a protein that has one or more different amino acid residues in the corresponding position(s) of a specifically described protein (e.g. the 158P1D7 protein shown in FIG. 2 or FIG. 3). An analog is an example of a variant protein.

[0108] The 158P1D7-related proteins of the invention include those specifically identified herein, as well as allelic variants, conservative substitution variants, analogs and homologs that can be isolated/generated and characterized without undue experimentation following the methods outlined herein or readily available in the art. Fusion proteins that combine parts of different 158P1D7 proteins or fragments thereof, as well as fusion proteins of a 158P1D7 protein and a heterologous polypeptide are also included. Such 158P1D7 proteins are collectively referred to as the 158P1D7-related proteins, the proteins of the invention, or 158P1D7. The term “158P1D7-related protein” refers to a polypeptide fragment or an 158P1D7 protein sequence of 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, or more than 25 amino acids; or, at least about 30, 35, 40, 45, 50, 55, 60, 65, 70, 80, 85, 90, 95, 100 or more than 100 amino acids.

II.) 158P1D7 Polynucleotides

[0109] One aspect of the invention provides polynucleotides corresponding or complementary to all or part of an 158P1D7 gene, mRNA, and/or coding sequence, preferably in isolated form, including polynucleotides encoding an 158P1D7-related protein and fragments thereof, DNA, RNA, DNA/RNA hybrid, and related molecules, polynucleotides or oligonucleotides complementary to an 158P1D7 gene or

mRNA sequence or a part thereof, and polynucleotides or oligonucleotides that hybridize to an 158P1D7 gene, mRNA, or to an 158P1D7 encoding polynucleotide (collectively, "158P1D7 polynucleotides"). In all instances when referred to in this section, T can also be U in FIG. 2.

[0110] Embodiments of a 158P1D7 polynucleotide include: a 158P1D7 polynucleotide having the sequence shown in FIG. 2, the nucleotide sequence of 158P1D7 as shown in FIG. 2, wherein T is U; at least 10 contiguous nucleotides of a polynucleotide having the sequence as shown in FIG. 2; or, at least 10 contiguous nucleotides of a polynucleotide having the sequence as shown in FIG. 2 where T is U. For example, embodiments of 158P1D7 nucleotides comprise, without limitation:

[0111] (a) a polynucleotide comprising or consisting of the sequence as shown in FIG. 2, wherein T can also be U;

[0112] (b) a polynucleotide comprising or consisting of the sequence as shown in FIG. 2, from nucleotide residue number 23 through nucleotide residue number 2548, wherein T can also be U;

[0113] (c) a polynucleotide that encodes a 158P1D7-related protein whose sequence is encoded by the cDNAs contained in the plasmid designated p158P1D7-Turbo/3PX deposited with American Type Culture Collection as Accession No. PTA-3662 on 22 Aug. 2001 (sent via Federal Express on 20 Aug. 2001);

[0114] (d) a polynucleotide that encodes an 158P1D7-related protein that is at least 90% homologous to the entire amino acid sequence shown in FIG. 2;

[0115] (e) a polynucleotide that encodes an 158P1D7-related protein that is at least 90% identical to the entire amino acid sequence shown in FIG. 2;

[0116] (f) a polynucleotide that encodes at least one peptide set forth in Tables V-XVIII;

[0117] (g) a polynucleotide that encodes a peptide region of at least 5 amino acids of FIG. 3 in any whole number increment up to 841 that includes an amino acid position having a value greater than 0.5 in the Hydrophilicity profile of FIG. 11;

[0118] (h) a polynucleotide that encodes a peptide region of at least 5 amino acids of FIG. 3 in any whole number increment up to 841 that includes an amino acid position having a value less than 0.5 in the Hydropathicity profile of FIG. 12;

[0119] (i) a polynucleotide that encodes a peptide region of at least 5 amino acids of FIG. 3 in any whole number increment up to 841 that includes an amino acid position having a value greater than 0.5 in the Percent Accessible Residues profile of FIG. 13;

[0120] (j) a polynucleotide that encodes a peptide region of at least 5 amino acids of FIG. 3 in any whole number increment up to 841 that includes an amino acid position having a value greater than 0.5 in the Average Flexibility profile on FIG. 14;

[0121] (k) a polynucleotide that encodes a peptide region of at least 5 amino acids of FIG. 3 in any whole number increment up to 841 that includes an amino acid position having a value greater than 0.5 in the Beta-turn profile of FIG. 15;

[0122] (l) a polynucleotide that is fully complementary to a polynucleotide of any one of (a)-(k);

[0123] (m) a polynucleotide that selectively hybridizes under stringent conditions to a polynucleotide of (a)-(l);

[0124] (n) a peptide that is encoded by any of (a)-(k); and,

[0125] (o) a polynucleotide of any of (a)-(m) or peptide of (n) together with a pharmaceutical excipient and/or in a human unit dose form.

[0126] As used herein, a range is understood to specifically disclose all whole unit positions thereof.

[0127] Typical embodiments of the invention disclosed herein include 158P1D7 polynucleotides that encode specific portions of the 158P1D7 mRNA sequence (and those which are complementary to such sequences) such as those that encode the protein and fragments thereof, for example of 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 125, 150, 175, 200, 225, 250, 275, 300, 325, 350, 375, 400, 425, 450, 475, 500, 525, 550, 575, 600, 625, 650, 675, 700, 725, 750, 775, 800, 825 or 841 contiguous amino acids.

[0128] For example, representative embodiments of the invention disclosed herein include: polynucleotides and their encoded peptides themselves encoding about amino acid 1 to about amino acid 10 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polynucleotides encoding about amino acid 10 to about amino acid 20 of the 158P1D7 protein shown in FIG. 2, or FIG. 3, polynucleotides encoding about amino acid 20 to about amino acid 30 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polynucleotides encoding about amino acid 30 to about amino acid 40 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polynucleotides encoding about amino acid 40 to about amino acid 50 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polynucleotides encoding about amino acid 50 to about amino acid 60 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polynucleotides encoding about amino acid 60 to about amino acid 70 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polynucleotides encoding about amino acid 70 to about amino acid 80 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polynucleotides encoding about amino acid 80 to about amino acid 90 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polynucleotides encoding about amino acid 90 to about amino acid 100 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, in increments of about 10 amino acids, ending at the carboxyl terminal amino acid set forth in FIG. 2 or FIG. 3. Accordingly polynucleotides encoding portions of the amino acid sequence (of about 10 amino acids), of amino acids 100 through the carboxyl terminal amino acid of the 158P1D7 protein are embodiments of the invention. Wherein it is understood that each particular amino acid position discloses that position plus or minus five amino acid residues.

[0129] Polynucleotides encoding relatively long portions of the 158P1D7 protein are also within the scope of the invention. For example, polynucleotides encoding from about amino acid 1 (or 20 or 30 or 40 etc.) to about amino acid 20, (or 30, or 40 or 50 etc.) of the 158P1D7 protein shown in FIG. 2 or FIG. 3 can be generated by a variety of techniques well known in the art. These polynucleotide fragments can include any portion of the 158P1D7 sequence as shown in FIG. 2 or FIG. 3.

[0130] Additional illustrative embodiments of the invention disclosed herein include 158P1D7 polynucleotide fragments encoding one or more of the biological motifs contained within the 158P1D7 protein sequence, including one or more of the motif-bearing subsequences of the 158P1D7 protein set forth in Tables V-XVIII. In another embodiment, typical polynucleotide fragments of the invention encode one or more of the regions of 158P1D7 that exhibit homology to

a known molecule. In another embodiment of the invention, typical polynucleotide fragments can encode one or more of the 158P1D7 N-glycosylation sites, cAMP and cGMP-dependent protein kinase phosphorylation sites, casein kinase II phosphorylation sites or N-myristoylation site and amidation sites.

II.A.) Uses of 158P1D7 Polynucleotides

II.A.1.) Monitoring of Genetic Abnormalities

[0131] The polynucleotides of the preceding paragraphs have a number of different specific uses. The human 158P1D7 gene maps to the chromosomal location set forth in Example 3. For example, because the 158P1D7 gene maps to this chromosome, polynucleotides that encode different regions of the 158P1D7 protein are used to characterize cytogenetic abnormalities of this chromosomal locale, such as abnormalities that are identified as being associated with various cancers. In certain genes, a variety of chromosomal abnormalities including rearrangements have been identified as frequent cytogenetic abnormalities in a number of different cancers (see e.g. Krajcinovic et al., *Mutat. Res.* 382(3-4): 81-83 (1998); Johansson et al., *Blood* 86(10): 3905-3914 (1995) and Finger et al., *P.N.A.S.* 85(23): 9158-9162 (1988)). Thus, polynucleotides encoding specific regions of the 158P1D7 protein provide new tools that can be used to delineate, with greater precision than previously possible, cytogenetic abnormalities in the chromosomal region that encodes 158P1D7 that may contribute to the malignant phenotype. In this context, these polynucleotides satisfy a need in the art for expanding the sensitivity of chromosomal screening in order to identify more subtle and less common chromosomal abnormalities (see e.g. Evans et al., *Am. J. Obstet. Gynecol* 171(4): 1055-1057 (1994)).

[0132] Furthermore, as 158P1D7 was shown to be highly expressed in bladder and other cancers, 158P1D7 polynucleotides are used in methods assessing the status of 158P1D7 gene products in normal versus cancerous tissues. Typically, polynucleotides that encode specific regions of the 158P1D7 protein are used to assess the presence of perturbations (such as deletions, insertions, point mutations, or alterations resulting in a loss of an antigen etc.) in specific regions of the 158P1D7 gene, such as such regions containing one or more motifs. Exemplary assays include both RT-PCR assays as well as single-strand conformation polymorphism (SSCP) analysis (see, e.g., Marrogi et al., *J. Cutan. Pathol.* 26(8): 369-378 (1999), both of which utilize polynucleotides encoding specific regions of a protein to examine these regions within the protein.

II.A.2.) Antisense Embodiments

[0133] Other specifically contemplated nucleic acid related embodiments of the invention disclosed herein are genomic DNA, cDNAs, ribozymes, and antisense molecules, as well as nucleic acid molecules based on an alternative backbone, or including alternative bases, whether derived from natural sources or synthesized, and include molecules capable of inhibiting the RNA or protein expression of 158P1D7. For example, antisense molecules can be RNAs or other molecules, including peptide nucleic acids (PNAs) or non-nucleic acid molecules such as phosphorothioate derivatives, that specifically bind DNA or RNA in a base pair-dependent manner. A skilled artisan can readily obtain these classes of

nucleic acid molecules using the 158P1D7 polynucleotides and polynucleotide sequences disclosed herein.

[0134] Antisense technology entails the administration of exogenous oligonucleotides that bind to a target polynucleotide located within the cells. The term "antisense" refers to the fact that such oligonucleotides are complementary to their intracellular targets, e.g., 158P1D7. See for example, Jack Cohen, *Oligodeoxynucleotides, Antisense Inhibitors of Gene Expression*, CRC Press, 1989; and *Synthesis* 1:1-5 (1988). The 158P1D7 antisense oligonucleotides of the present invention include derivatives such as S-oligonucleotides (phosphorothioate derivatives or S-oligos, see, Jack Cohen, *supra*), which exhibit enhanced cancer cell growth inhibitory action. S-oligos (nucleoside phosphorothioates) are isoelectronic analogs of an oligonucleotide (O-oligo) in which a nonbridging oxygen atom of the phosphate group is replaced by a sulfur atom. The S-oligos of the present invention can be prepared by treatment of the corresponding O-oligos with 3H-1,2-benzodithiol-3-one-1,1-dioxide, which is a sulfur transfer reagent. See Iyer, R. P. et al., *J. Org. Chem.* 55:4693-4698 (1990); and Iyer, R. P. et al., *J. Am. Chem. Soc.* 112: 1253-1254 (1990). Additional 158P1D7 antisense oligonucleotides of the present invention include morpholino antisense oligonucleotides known in the art (see, e.g., Partridge et al., 1996, *Antisense & Nucleic Acid Drug Development* 6: 169-175).

[0135] The 158P1D7 antisense oligonucleotides of the present invention typically can be RNA or DNA that is complementary to and stably hybridizes with the first 100 5' codons or last 100 3' codons of the 158P1D7 genomic sequence or the corresponding mRNA. Absolute complementarity is not required, although high degrees of complementarity are preferred. Use of an oligonucleotide complementary to this region allows for the selective hybridization to 158P1D7 mRNA and not to mRNA specifying other regulatory subunits of protein kinase. In one embodiment, 158P1D7 antisense oligonucleotides of the present invention are 15 to 30-mer fragments of the antisense DNA molecule that have a sequence that hybridizes to 158P1D7 mRNA. Optionally, 158P1D7 antisense oligonucleotide is a 30-mer oligonucleotide that is complementary to a region in the first 10 5' codons or last 10 3' codons of 158P1D7. Alternatively, the antisense molecules are modified to employ ribozymes in the inhibition of 158P1D7 expression, see, e.g., L. A. Couture & D. T. Stinchcomb; *Trends Genet* 12: 510-515 (1996).

II.A.3.) Primers and Primer Pairs

[0136] Further specific embodiments of the nucleotides of the invention include primers and primer pairs, which allow the specific amplification of polynucleotides of the invention or of any specific parts thereof, and probes that selectively or specifically hybridize to nucleic acid molecules of the invention or to any part thereof. Primers may also be used as probes and can be labeled with a detectable marker, such as, for example, a radioisotope, fluorescent compound, bioluminescent compound, a chemiluminescent compound, metal chelator or enzyme. Such probes and primers are used to detect the presence of a 158P1D7 polynucleotide in a sample and as a means for detecting a cell expressing a 158P1D7 protein.

[0137] Examples of such probes include polypeptides comprising all or part of the human 158P1D7 cDNA sequence shown in FIG. 2. Examples of primer pairs capable of specifically amplifying 158P1D7 mRNAs are also described in the Examples. As will be understood by the skilled artisan, a

great many different primers and probes can be prepared based on the sequences provided herein and used effectively to amplify and/or detect a 158P1D7 mRNA. Preferred probes of the invention are polynucleotides of more than about 9, about 12, about 15, about 18, about 20, about 23, about 25, about 30, about 35, about 40, about 45, and about 50 consecutive nucleotides found in 158P1D7 nucleic acids disclosed herein.

[0138] The 158P1D7 polynucleotides of the invention are useful for a variety of purposes, including but not limited to their use as probes and primers for the amplification and/or detection of the 158P1D7 gene(s), mRNA(s), or fragments thereof; as reagents for the diagnosis and/or prognosis of bladder cancer and other cancers; as coding sequences capable of directing the expression of 158P1D7 polypeptides; as tools for modulating or inhibiting the expression of the 158P1D7 gene(s) and/or translation of the 158P1D7 transcript(s); and as therapeutic agents.

II.A.4.) Isolation of 158P1D7-Encoding Nucleic Acid Molecules

[0139] The 158P1D7 cDNA sequences described herein enable the isolation of other polynucleotides encoding 158P1D7 gene product(s), as well as the isolation of polynucleotides encoding 158P1D7 gene product homologs, alternatively spliced isoforms, allelic variants, and mutant forms of the 158P1D7 gene product as well as polynucleotides that encode analogs of 158P1D7-related proteins. Various molecular cloning methods that can be employed to isolate full length cDNAs encoding an 158P1D7 gene are well known (see, for example, Sambrook, J. et al., *Molecular Cloning: A Laboratory Manual*, 2d edition, Cold Spring Harbor Press, New York, 1989; *Current Protocols in Molecular Biology*, Ausubel et al., Eds., Wiley and Sons, 1995). For example, lambda phage cloning methodologies can be conveniently employed, using commercially available cloning systems (e.g., Lambda ZAP Express, Stratagene). Phage clones containing 158P1D7 gene cDNAs can be identified by probing with a labeled 158P1D7 cDNA or a fragment thereof. For example, in one embodiment, the 158P1D7 cDNA (FIG. 2) or a portion thereof can be synthesized and used as a probe to retrieve overlapping and full-length cDNAs corresponding to a 158P1D7 gene. The 158P1D7 gene itself can be isolated by screening genomic DNA libraries, bacterial artificial chromosome libraries (BACs), yeast artificial chromosome libraries (YACs), and the like, with 158P1D7 DNA probes or primers.

[0140] The present invention includes the use of any probe as described herein to identify and isolate a 158P1D7 or 158P1D7 related nucleic acid sequence from a naturally occurring source, such as humans or other mammals, as well as the isolated nucleic acid sequence per se, which would comprise all or most of the sequences found in the probe used.

II.A.5.) Recombinant Nucleic Acid Molecules and Host-Vector Systems

[0141] The invention also provides recombinant DNA or RNA molecules containing an 158P1D7 polynucleotide, a fragment, analog or homologue thereof, including but not limited to phages, plasmids, phagemids, cosmids, YACs, BACs, as well as various viral and non-viral vectors well known in the art, and cells transformed or transfected with such recombinant DNA or RNA molecules. Methods for gen-

erating such molecules are well known (see, for example, Sambrook et al, 1989, *supra*). The invention further provides a host-vector system comprising a recombinant DNA molecule containing a 158P1D7 polynucleotide, fragment, analog or homologue thereof within a suitable prokaryotic or eukaryotic host cell. Examples of suitable eukaryotic host cells include a yeast cell, a plant cell, or an animal cell, such as a mammalian cell or an insect cell (e.g., a baculovirus-infectible cell such as an Sf9 or HighFive cell). Examples of suitable mammalian cells include various bladder cancer cell lines such as SCaBER, UM-UC3, HT1376, RT4, T24, TCC-SUP, J82 and SW780, other transfectable or transducible bladder cancer cell lines, as well as a number of mammalian cells routinely used for the expression of recombinant proteins (e.g., COS, CHO, 293, 293T cells). More particularly, a polynucleotide comprising the coding sequence of 158P1D7 or a fragment, analog or homolog thereof can be used to generate 158P1D7 proteins or fragments thereof using any number of host-vector systems routinely used and widely known in the art.

[0142] A wide range of host-vector systems suitable for the expression of 158P1D7 proteins or fragments thereof are available, see for example, Sambrook et al., 1989, *supra*; *Current Protocols in Molecular Biology*, 1995, *supra*). Preferred vectors for mammalian expression include but are not limited to pcDNA 3.1 myc-His-tag (Invitrogen) and the retroviral vector pSR α tkneo (Muller et al., 1991, MCB 11:1785). Using these expression vectors, 158P1D7 can be expressed in several bladder cancer and non-bladder cell lines, including for example SCaBER, UM-UC3, HT1376, RT4, T24, TCC-SUP, J82 and SW780. The host-vector systems of the invention are useful for the production of a 158P1D7 protein or fragment thereof. Such host-vector systems can be employed to study the functional properties of 158P1D7 and 158P1D7 mutations or analogs.

[0143] Recombinant human 158P1D7 protein or an analog or homolog or fragment thereof can be produced by mammalian cells transfected with a construct encoding a 158P1D7-related nucleotide. For example, 293T cells can be transfected with an expression plasmid encoding 158P1D7 or fragment, analog or homolog thereof, the 158P1D7 or related protein is expressed in the 293T cells, and the recombinant 158P1D7 protein is isolated using standard purification methods (e.g., affinity purification using anti-158P1D7 antibodies). In another embodiment, a 158P1D7 coding sequence is subcloned into the retroviral vector pSR α MSVtkneo and used to infect various mammalian cell lines, such as NIH 3T3, TsuPr1, 293 and rat-1 in order to establish 158P1D7 expressing cell lines. Various other expression systems well known in the art can also be employed. Expression constructs encoding a leader peptide joined in frame to the 158P1D7 coding sequence can be used for the generation of a secreted form of recombinant 158P1D7 protein.

[0144] As discussed herein, redundancy in the genetic code permits variation in 158P1D7 gene sequences. In particular, it is known in the art that specific host species often have specific codon preferences, and thus one can adapt the disclosed sequence as preferred for a desired host. For example, preferred analog codon sequences typically have rare codons (i.e., codons having a usage frequency of less than about 20% in known sequences of the desired host) replaced with higher frequency codons. Codon preferences for a specific species are calculated, for example, by utilizing codon usage tables available on the INTERNET.

[0145] Additional sequence modifications are known to enhance protein expression in a cellular host. These include elimination of sequences encoding spurious polyadenylation signals, exon/intron splice site signals, transposon-like repeats, and/or other such well-characterized sequences that are deleterious to gene expression. The GC content of the sequence is adjusted to levels average for a given cellular host, as calculated by reference to known genes expressed in the host cell. Where possible, the sequence is modified to avoid predicted hairpin secondary mRNA structures. Other useful modifications include the addition of a translational initiation consensus sequence at the start of the open reading frame, as described in Kozak, *Mol. Cell Biol.*, 9:5073-5080 (1989). Skilled artisans understand that the general rule that eukaryotic ribosomes initiate translation exclusively at the 5' proximal AUG codon is abrogated only under rare conditions (see, e.g., Kozak PNAS 92(7): 2662-2666, (1995) and Kozak NAR 15(20): 8125-8148 (1987)).

III.) 158P1D7-Related Proteins

[0146] Another aspect of the present invention provides 158P1D7-related proteins. Specific embodiments of 158P1D7 proteins comprise a polypeptide having all or part of the amino acid sequence of human 158P1D7 as shown in FIG. 2 or FIG. 3. Alternatively, embodiments of 158P1D7 proteins comprise variant, homolog or analog polypeptides that have alterations in the amino acid sequence of 158P1D7 shown in FIG. 2 or FIG. 3.

[0147] In general, naturally occurring allelic variants of human 158P1D7 share a high degree of structural identity and homology (e.g., 90% or more homology). Typically, allelic variants of the 158P1D7 protein contain conservative amino acid substitutions within the 158P1D7 sequences described herein or contain a substitution of an amino acid from a corresponding position in a homologue of 158P1D7. One class of 158P1D7 allelic variants are proteins that share a high degree of homology with at least a small region of a particular 158P1D7 amino acid sequence, but further contain a radical departure from the sequence, such as a non-conservative substitution, truncation, insertion or frame shift. In comparisons of protein sequences, the terms, similarity, identity, and homology each have a distinct meaning as appreciated in the field of genetics. Moreover, orthology and paralogy can be important concepts describing the relationship of members of a given protein family in one organism to the members of the same family in other organisms.

[0148] Amino acid abbreviations are provided in Table II. Conservative amino acid substitutions can frequently be made in a protein without altering either the conformation or the function of the protein. Proteins of the invention can comprise 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 or more conservative substitutions. Such changes include substituting any of isoleucine (I), valine (V), and leucine (L) for any other of these hydrophobic amino acids; aspartic acid (D) for glutamic acid (E) and vice versa; glutamine (Q) for asparagine (N) and vice versa; and serine (S) for threonine (T) and vice versa. Other substitutions can also be considered conservative, depending on the environment of the particular amino acid and its role in the three-dimensional structure of the protein. For example, glycine (G) and alanine (A) can frequently be interchangeable, as can alanine (A) and valine (V). Methionine (M), which is relatively hydrophobic, can frequently be interchanged with leucine and isoleucine, and sometimes with valine. Lysine (K) and arginine (R) are fre-

quently interchangeable in locations in which the significant feature of the amino acid residue is its charge and the differing pK's of these two amino acid residues are not significant. Still other changes can be considered "conservative" in particular environments (see, e.g. Table III herein; pages 13-15 "Biochemistry" 2nd ED. Lubert Stryer ed (Stanford University); Henikoff et al., PNAS 1992 Vol 89 10915-10919; Lei et al., J Biol Chem 1995 May 19; 270(20):11882-6).

[0149] Embodiments of the invention disclosed herein include a wide variety of art-accepted variants or analogs of 158P1D7 proteins such as polypeptides having amino acid insertions, deletions and substitutions. 158P1D7 variants can be made using methods known in the art such as site-directed mutagenesis, alanine scanning, and PCR mutagenesis. Site-directed mutagenesis (Carter et al., Nucl. Acids Res., 13:4331 (1986); Zoller et al., Nucl. Acids Res., 10:6487 (1987)), cassette mutagenesis (Wells et al., Gene, 34:315 (1985)), restriction selection mutagenesis (Wells et al., Philos. Trans. R. Soc. London SerA, 317:415 (1986)) or other known techniques can be performed on the cloned DNA to produce the 158P1D7 variant DNA.

[0150] Scanning amino acid analysis can also be employed to identify one or more amino acids along a contiguous sequence that is involved in a specific biological activity such as a protein-protein interaction. Among the preferred scanning amino acids are relatively small, neutral amino acids. Such amino acids include alanine, glycine, serine, and cysteine. Alanine is typically a preferred scanning amino acid among this group because it eliminates the side-chain beyond the beta-carbon and is less likely to alter the main-chain conformation of the variant. Alanine is also typically preferred because it is the most common amino acid. Further, it is frequently found in both buried and exposed positions (Creighton, The Proteins, (W.H. Freeman & Co., N.Y.); Chothia, J. Mol. Biol., 150:1 (1976)). If alanine substitution does not yield adequate amounts of variant, an isosteric amino acid can be used.

[0151] As defined herein, 158P1D7 variants, analogs or homologs, have the distinguishing attribute of having at least one epitope that is "cross reactive" with a 158P1D7 protein having the amino acid sequence of FIG. 2. As used in this sentence, "cross reactive" means that an antibody or T cell that specifically binds to an 158P1D7 variant also specifically binds to the 158P1D7 protein having the amino acid sequence of FIG. 2. A polypeptide ceases to be a variant of the protein shown in FIG. 2 when it no longer contains any epitope capable of being recognized by an antibody or T cell that specifically binds to the 158P1D7 protein. Those skilled in the art understand that antibodies that recognize proteins bind to epitopes of varying size, and a grouping of the order of about four or five amino acids, contiguous or not, is regarded as a typical number of amino acids in a minimal epitope. See, e.g., Nair et al., J. Immunol 2000 165(12): 6949-6955; Hebbes et al., Mol Immunol (1989) 26(9):865-73; Schwartz et al., J Immunol (1985) 135(4):2598-608.

[0152] Another class of 158P1D7-related protein variants share 70%, 75%, 80%, 85% or 90% or more similarity with the amino acid sequence of FIG. 2 or a fragment thereof. Another specific class of 158P1D7 protein variants or analogs comprise one or more of the 158P1D7 biological motifs described herein or presently known in the art. Thus, encompassed by the present invention are analogs of 158P1D7 fragments (nucleic or amino acid) that have altered functional (e.g. immunogenic) properties relative to the starting frag-

ment. It is to be appreciated that motifs now or which become part of the art are to be applied to the nucleic or amino acid sequences of FIG. 2 or FIG. 3.

[0153] As discussed herein, embodiments of the claimed invention include polypeptides containing less than the full amino acid sequence of the 158P1D7 protein shown in FIG. 2 or FIG. 3. For example, representative embodiments of the invention comprise peptides/proteins having any 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 or more contiguous amino acids of the 158P1D7 protein shown in FIG. 2 or FIG. 3.

[0154] Moreover, representative embodiments of the invention disclosed herein include polypeptides consisting of about amino acid 1 to about amino acid 10 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polypeptides consisting of about amino acid 10 to about amino acid 20 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polypeptides consisting of about amino acid 20 to about amino acid 30 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polypeptides consisting of about amino acid 30 to about amino acid 40 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polypeptides consisting of about amino acid 40 to about amino acid 50 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polypeptides consisting of about amino acid 50 to about amino acid 60 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polypeptides consisting of about amino acid 60 to about amino acid 70 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polypeptides consisting of about amino acid 70 to about amino acid 80 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polypeptides consisting of about amino acid 80 to about amino acid 90 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, polypeptides consisting of about amino acid 90 to about amino acid 100 of the 158P1D7 protein shown in FIG. 2 or FIG. 3, etc. throughout the entirety of the 158P1D7 amino acid sequence. Moreover, polypeptides consisting of about amino acid 1 (or 20 or 30 or 40 etc.) to about amino acid 20, (or 130, or 140 or 150 etc.) of the 158P1D7 protein shown in FIG. 2 or FIG. 3 are embodiments of the invention. It is to be appreciated that the starting and stopping positions in this paragraph refer to the specified position as well as that position plus or minus 5 residues.

[0155] 158P1D7-related proteins are generated using standard peptide synthesis technology or using chemical cleavage methods well known in the art. Alternatively, recombinant methods can be used to generate nucleic acid molecules that encode a 158P1D7-related protein. In one embodiment, nucleic acid molecules provide a means to generate defined fragments of the 158P1D7 protein (or variants, homologs or analogs thereof).

III.A.) Motif-Bearing Protein Embodiments

[0156] Additional illustrative embodiments of the invention disclosed herein include 158P1D7 polypeptides comprising the amino acid residues of one or more of the biological motifs contained within the 158P1D7 polypeptide sequence set forth in FIG. 2 or FIG. 3. Various motifs are known in the art, and a protein can be evaluated for the presence of such motifs by a number of publicly available Internet sites (see, e.g., Epimatrix™ and Epimer™, Brown University, and BIMAS.).

[0157] Motif-bearing subsequences of the 158P1D7 protein are set forth and identified in Table XIX.

[0158] Table XX sets forth several frequently occurring motifs based on pfam searches (see URL address pfam.wustl.edu/). The columns of Table XX list (1) motif name abbreviation, (2) percent identity found amongst the different

member of the motif family, (3) motif name or description and (4) most common function; location information is included if the motif is relevant for location.

[0159] Polypeptides comprising one or more of the 158P1D7 motifs discussed above are useful in elucidating the specific characteristics of a malignant phenotype in view of the observation that the 158P1D7 motifs discussed above are associated with growth dysregulation and because 158P1D7 is overexpressed in certain cancers (See, e.g., Table I). Casein kinase II, cAMP and camp-dependent protein kinase, and Protein Kinase C, for example, are enzymes known to be associated with the development of the malignant phenotype (see e.g. Chen et al., *Lab Invest.*, 78(2): 165-174 (1998); Gaiddon et al., *Endocrinology* 136(10): 4331-4338 (1995); Hall et al., *Nucleic Acids Research* 24(6): 1119-1126 (1996); Peterziel et al., *Oncogene* 18(46): 6322-6329 (1999) and O'Brian, *Oncol. Rep.* 5(2): 305-309 (1998)). Moreover, both glycosylation and myristoylation are protein modifications also associated with cancer and cancer progression (see e.g. Dennis et al., *Biochem. Biophys. Acta* 1473(1):21-34 (1999); Raju et al., *Exp. Cell Res.* 235(1): 145-154 (1997)). Amidation is another protein modification also associated with cancer and cancer progression (see e.g. Trestone et al., *J. Natl. Cancer Inst. Monogr.* (13): 169-175 (1992)).

[0160] In another embodiment, proteins of the invention comprise one or more of the immunoreactive epitopes identified in accordance with art-accepted methods, such as the peptides set forth in Tables V-XVIII. CTL epitopes can be determined using specific algorithms to identify peptides within an 158P1D7 protein that are capable of optimally binding to specified HLA alleles (e.g., Table IV; Epimatrix™ and Epimer™, Brown University; and BIMAS.) Moreover, processes for identifying peptides that have sufficient binding affinity for HLA molecules and which are correlated with being immunogenic epitopes, are well known in the art, and are carried out without undue experimentation. In addition, processes for identifying peptides that are immunogenic epitopes, are well known in the art, and are carried out without undue experimentation either in vitro or in vivo.

[0161] Also known in the art are principles for creating analogs of such epitopes in order to modulate immunogenicity. For example, one begins with an epitope that bears a CTL or HTL motif (see, e.g., the HLA Class I and HLA Class II motifs/supermotifs of Table IV). The epitope is analogized by substituting out an amino acid at one of the specified positions, and replacing it with another amino acid specified for that position. For example, one can substitute out a deleterious residue in favor of any other residue, such as a preferred residue as defined in Table IV; substitute a less-preferred residue with a preferred residue as defined in Table IV; or substitute an originally-occurring preferred residue with another preferred residue as defined in Table IV. Substitutions can occur at primary anchor positions or at other positions in a peptide; see, e.g., Table IV.

[0162] A variety of references reflect the art regarding the identification and generation of epitopes in a protein of interest as well as analogs thereof. See, for example, WO 9733602 to Chesnut et al.; Sette, *Immunogenetics* 1999 50(3-4): 201-212; Sette et al., *J. Immunol.* 2001 166(2): 1389-1397; Sidney et al., *Hum. Immunol.* 1997 58(1): 12-20; Kondo et al., *Immunogenetics* 1997 45(4): 249-258; Sidney et al., *J. Immunol.* 1996 157(8): 3480-90; and Falk et al., *Nature* 351: 290-6 (1991); Hunt et al., *Science* 255:1261-3 (1992); Parker et al., *J. Immunol.* 149:3580-7 (1992); Parker et al., *J. Immunol.*

152:163-75 (1994)); Kast et al., 1994 152(8): 3904-12; Borras-Cuesta et al., Hum. Immunol. 2000 61(3): 266-278; Alexander et al., J. Immunol. 2000 164(3): 1625-1633; Alexander et al., PMID: 7895164, UI: 95202582; O'Sullivan et al., J. Immunol. 1991 147(8): 2663-2669; Alexander et al., Immunity 1994 1(9): 751-761 and Alexander et al., Immunol. Res. 1998 18(2): 79-92.

[0163] Related embodiments of the inventions include polypeptides comprising combinations of the different motifs set forth in Table XIX, and/or, one or more of the predicted CTL epitopes of Table V through Table XVIII, and/or, one or more of the T cell binding motifs known in the art. Preferred embodiments contain no insertions, deletions or substitutions either within the motifs or the intervening sequences of the polypeptides. In addition, embodiments which include a number of either N-terminal and/or C-terminal amino acid residues on either side of these motifs may be desirable (to, for example, include a greater portion of the polypeptide architecture in which the motif is located). Typically the number of N-terminal and/or C-terminal amino acid residues on either side of a motif is between about 1 to about 100 amino acid residues, preferably 5 to about 50 amino acid residues.

[0164] 158P1D7-related proteins are embodied in many forms, preferably in isolated form. A purified 158P1D7 protein molecule will be substantially free of other proteins or molecules that impair the binding of 158P1D7 to antibody, T cell or other ligand. The nature and degree of isolation and purification will depend on the intended use. Embodiments of a 158P1D7-related protein include purified 158P1D7-related proteins and functional, soluble 158P1D7-related proteins. In one embodiment, a functional, soluble 158P1D7 protein or fragment thereof retains the ability to be bound by antibody, T cell or other ligand.

[0165] The invention also provides 158P1D7 proteins comprising biologically active fragments of the 158P1D7 amino acid sequence shown in FIG. 2 or FIG. 3. Such proteins exhibit properties of the 158P1D7 protein, such as the ability to elicit the generation of antibodies that specifically bind an epitope associated with the 158P1D7 protein; to be bound by such antibodies; to elicit the activation of HTL or CTL; and/or, to be recognized by HTL or CTL.

[0166] 158P1D7-related polypeptides that contain particularly interesting structures can be predicted and/or identified using various analytical techniques well known in the art, including, for example, the methods of Chou-Fasman, Garnier-Robson, Kyte-Doolittle, Eisenberg, Karplus-Schultz or Jameson-Wolf analysis, or on the basis of immunogenicity. Fragments that contain such structures are particularly useful in generating subunit-specific anti-158P1D7 antibodies, or T cells or in identifying cellular factors that bind to 158P1D7.

[0167] CTL epitopes can be determined using specific algorithms to identify peptides within an 158P1D7 protein that are capable of optimally binding to specified HLA alleles (e.g., by using the SYFPEITHI site at World Wide Web; the listings in Table IV(A)-(E); Epimatrix™ and Epimer™ Brown University; and BIMAS). Illustrating this, peptide epitopes from 158P1D7 that are presented in the context of human MHC class I molecules HLA-A1, A2, A3, A11, A24, B7 and B35 were predicted (Tables V-XVIII). Specifically, the complete amino acid sequence of the 158P1D7 protein was entered into the HLA Peptide Motif Search algorithm found in the Bioinformatics and Molecular Analysis Section (BIMAS) web site listed above. The HLA peptide motif search algorithm was developed by Dr. Ken Parker based on

binding of specific peptide sequences in the groove of HLA Class I molecules, in particular HLA-A2 (see, e.g., Falk et al., Nature 351: 290-6 (1991); Hunt et al., Science 255:1261-3 (1992); Parker et al., J. Immunol. 149:3580-7 (1992); Parker et al., J. Immunol. 152:163-75 (1994)). This algorithm allows location and ranking of 8-mer, 9-mer, and 10-mer peptides from a complete protein sequence for predicted binding to HLA-A2 as well as numerous other HLA Class I molecules. Many HLA class I binding peptides are 8-, 9-, 10 or 11-mers. For example, for class I HLA-A2, the epitopes preferably contain a leucine (L) or methionine (M) at position 2 and a valine (V) or leucine (L) at the C-terminus (see, e.g., Parker et al., J. Immunol. 149:3580-7 (1992)). Selected results of 158P1D7 predicted binding peptides are shown in Tables V-XVIII herein. In Tables V-XVIII, the top 50 ranking candidates, 9-mers and 10-mers, for each family member are shown along with their location, the amino acid sequence of each specific peptide, and an estimated binding score. The binding score corresponds to the estimated half time of dissociation of complexes containing the peptide at 37° C. at pH 6.5. Peptides with the highest binding score are predicted to be the most tightly bound to HLA Class I on the cell surface for the greatest period of time and thus represent the best immunogenic targets for T-cell recognition.

[0168] Actual binding of peptides to an HLA allele can be evaluated by stabilization of HLA expression on the antigen-processing defective cell line T2 (see, e.g., Xue et al., Prostate 30:73-8 (1997) and Peshwa et al., Prostate 36:129-38 (1998)). Immunogenicity of specific peptides can be evaluated in vitro by stimulation of CD8+ cytotoxic T lymphocytes (CTL) in the presence of antigen presenting cells such as dendritic cells.

[0169] It is to be appreciated that every epitope predicted by the BIMAS site, Epimer™ and Epimatrix™ sites, or specified by the HLA class I or class II motifs available in the art or which become part of the art such as set forth in Table IV (or determined using World Wide Web) are to be "applied" to the 158P1D7 protein. As used in this context "applied" means that the 158P1D7 protein is evaluated, e.g., visually or by computer-based patterns finding methods, as appreciated by those of skill in the relevant art. Every subsequence of the 158P1D7 of 8, 9, 10, or 11 amino acid residues that bears an HLA Class I motif, or a subsequence of 9 or more amino acid residues that bear an HLA Class II motif are within the scope of the invention.

III.B.) Expression of 158P1D7-Related Proteins

[0170] In an embodiment described in the examples that follow, 158P1D7 can be conveniently expressed in cells (such as 293T cells) transfected with a commercially available expression vector such as a CMV-driven expression vector encoding 158P1D7 with a C-terminal 6xHis and MYC tag (pcDNA3.1/mycHis, Invitrogen or Tag5, GenHunter Corporation, Nashville Tenn.). The Tag5 vector provides an IgGK secretion signal that can be used to facilitate the production of a secreted 158P1D7 protein in transfected cells. The secreted HIS-tagged 158P1D7 in the culture media can be purified, e.g., using a nickel column using standard techniques.

III. C.) Modifications of 158P1D7-Related Proteins

[0171] Modifications of 158P1D7-related proteins such as covalent modifications are included within the scope of this invention. One type of covalent modification includes react-

ing targeted amino acid residues of a 158P1D7 polypeptide with an organic derivatizing agent that is capable of reacting with selected side chains or the N- or C-terminal residues of the 158P1D7. Another type of covalent modification of the 158P1D7 polypeptide included within the scope of this invention comprises altering the native glycosylation pattern of a protein of the invention. Another type of covalent modification of 158P1D7 comprises linking the 158P1D7 polypeptide to one of a variety of nonproteinaceous polymers, e.g., polyethylene glycol (PEG), polypropylene glycol, or polyoxyalkylenes, in the manner set forth in U.S. Pat. Nos. 4,640,835; 4,496,689; 4,301,144; 4,670,417; 4,791,192 or 4,179,337.

[0172] The 158P1D7-related proteins of the present invention can also be modified to form a chimeric molecule comprising 158P1D7 fused to another, heterologous polypeptide or amino acid sequence. Such a chimeric molecule can be synthesized chemically or recombinantly. A chimeric molecule can have a protein of the invention fused to another tumor-associated antigen or fragment thereof. Alternatively, a protein in accordance with the invention can comprise a fusion of fragments of the 158P1D7 sequence (amino or nucleic acid) such that a molecule is created that is not, through its length, directly homologous to the amino or nucleic acid sequences shown in FIG. 2 or FIG. 3. Such a chimeric molecule can comprise multiples of the same subsequence of 158P1D7. A chimeric molecule can comprise a fusion of a 158P1D7-related protein with a polyhistidine epitope tag, which provides an epitope to which immobilized nickel can selectively bind, with cytokines or with growth factors. The epitope tag is generally placed at the amino- or carboxyl-terminus of the 158P1D7. In an alternative embodiment, the chimeric molecule can comprise a fusion of a 158P1D7-related protein with an immunoglobulin or a particular region of an immunoglobulin. For a bivalent form of the chimeric molecule (also referred to as an “immunoadhesin”), such a fusion could be to the Fc region of an IgG molecule. The Ig fusions preferably include the substitution of a soluble (transmembrane domain deleted or inactivated) form of a 158P1D7 polypeptide in place of at least one variable region within an Ig molecule. In a preferred embodiment, the immunoglobulin fusion includes the hinge, CH2 and CH3, or the hinge, CH1, CH2 and CH3 regions of an IgG1 molecule. For the production of immunoglobulin fusions see, e.g., U.S. Pat. No. 5,428,130 issued Jun. 27, 1995.

III.D.) Uses of 158P1D7-Related Proteins

[0173] The proteins of the invention have a number of different uses. As 158P1D7 is highly expressed in bladder and other cancers, 158P1D7-related proteins are used in methods that assess the status of 158P1D7 gene products in normal versus cancerous tissues, thereby elucidating the malignant phenotype. Typically, polypeptides from specific regions of the 158P1D7 protein are used to assess the presence of perturbations (such as deletions, insertions, point mutations etc.) in those regions (such as regions containing one or more motifs). Exemplary assays utilize antibodies or T cells targeting 158P1D7-related proteins comprising the amino acid residues of one or more of the biological motifs contained within the 158P1D7 polypeptide sequence in order to evaluate the characteristics of this region in normal versus cancerous tissues or to elicit an immune response to the epitope. Alternatively, 158P1D7-related proteins that contain the amino acid residues of one or more of the biological motifs in

the 158P1D7 protein are used to screen for factors that interact with that region of 158P1D7.

[0174] 158P1D7 protein fragments/subsequences are particularly useful in generating and characterizing domain-specific antibodies (e.g., antibodies recognizing an extracellular or intracellular epitope of an 158P1D7 protein), for identifying agents or cellular factors that bind to 158P1D7 or a particular structural domain thereof, and in various therapeutic and diagnostic contexts, including but not limited to diagnostic assays, cancer vaccines and methods of preparing such vaccines.

[0175] Proteins encoded by the 158P1D7 genes, or by analogs, homologs or fragments thereof, have a variety of uses, including but not limited to generating antibodies and in methods for identifying ligands and other agents and cellular constituents that bind to an 158P1D7 gene product. Antibodies raised against an 158P1D7 protein or fragment thereof are useful in diagnostic and prognostic assays, and imaging methodologies in the management of human cancers characterized by expression of 158P1D7 protein, such as those listed in Table I. Such antibodies can be expressed intracellularly and used in methods of treating patients with such cancers. 158P1D7-related nucleic acids or proteins are also used in generating HTL or CTL responses.

[0176] Various immunological assays useful for the detection of 158P1D7 proteins are used, including but not limited to various types of radioimmunoassays, enzyme-linked immunosorbent assays (ELISA), enzyme-linked immunofluorescent assays (ELIFA), immunocytochemical methods, and the like. Antibodies can be labeled and used as immunological imaging reagents capable of detecting 158P1D7-expressing cells (e.g., in radioscintigraphic imaging methods). 158P1D7 proteins are also particularly useful in generating cancer vaccines, as further described herein.

IV.) 158P1D7 Antibodies

[0177] Another aspect of the invention provides antibodies that bind to 158P1D7-related proteins. Preferred antibodies specifically bind to a 158P1D7-related protein and do not bind (or bind weakly) to peptides or proteins that are not 158P1D7-related proteins. For example, antibodies bind 158P1D7 can bind 158P1D7-related proteins such as the homologs or analogs thereof.

[0178] 158P1D7 antibodies of the invention are particularly useful in bladder cancer diagnostic and prognostic assays, and imaging methodologies. Similarly, such antibodies are useful in the treatment, diagnosis, and/or prognosis of other cancers, to the extent 158P1D7 is also expressed or overexpressed in these other cancers. Moreover, intracellularly expressed antibodies (e.g., single chain antibodies) are therapeutically useful in treating cancers in which the expression of 158P1D7 is involved, such as advanced or metastatic bladder cancers.

[0179] The invention also provides various immunological assays useful for the detection and quantification of 158P1D7 and mutant 158P1D7-related proteins. Such assays can comprise one or more 158P1D7 antibodies capable of recognizing and binding a 158P1D7-related protein, as appropriate. These assays are performed within various immunological assay formats well known in the art, including but not limited to various types of radioimmunoassays, enzyme-linked immunosorbent assays (ELISA), enzyme-linked immunofluorescent assays (ELIFA), and the like.

[0180] Immunological non-antibody assays of the invention also comprise T cell immunogenicity assays (inhibitory or stimulatory) as well as major histocompatibility complex (MHC) binding assays.

[0181] In addition, immunological imaging methods capable of detecting bladder cancer and other cancers expressing 158P1D7 are also provided by the invention, including but not limited to radioscintigraphic imaging methods using labeled 158P1D7 antibodies. Such assays are clinically useful in the detection, monitoring, and prognosis of 158P1D7 expressing cancers such as bladder cancer.

[0182] 158P1D7 antibodies are also used in methods for purifying a 158P1D7-related protein and for isolating 158P1D7 homologues and related molecules. For example, a method of purifying a 158P1D7-related protein comprises incubating an 158P1D7 antibody, which has been coupled to a solid matrix, with a lysate or other solution containing a 158P1D7-related protein under conditions that permit the 158P1D7 antibody to bind to the 158P1D7-related protein; washing the solid matrix to eliminate impurities; and eluting the 158P1D7-related protein from the coupled antibody. Other uses of the 158P1D7 antibodies of the invention include generating anti-idiotypic antibodies that mimic the 158P1D7 protein.

[0183] Various methods for the preparation of antibodies are well known in the art. For example, antibodies can be prepared by immunizing a suitable mammalian host using a 158P1D7-related protein, peptide, or fragment, in isolated or immunconjugated form (Antibodies: A Laboratory Manual, CSH Press, Eds., Harlow, and Lane (1988); Harlow, Antibodies, Cold Spring Harbor Press, NY (1989)). In addition, fusion proteins of 158P1D7 can also be used, such as a 158P1D7 GST-fusion protein. In a particular embodiment, a GST fusion protein comprising all or most of the amino acid sequence of FIG. 2 or FIG. 3 is produced, then used as an immunogen to generate appropriate antibodies. In another embodiment, a 158P1D7-related protein is synthesized and used as an immunogen.

[0184] In addition, naked DNA immunization techniques known in the art are used (with or without purified 158P1D7-related protein or 158P1D7 expressing cells) to generate an immune response to the encoded immunogen (for review, see Donnelly et al., 1997, Ann. Rev. Immunol. 15: 617-648).

[0185] The amino acid sequence of 158P1D7 as shown in FIG. 2 or FIG. 3 can be analyzed to select specific regions of the 158P1D7 protein for generating antibodies. For example, hydrophobicity and hydrophilicity analyses of the 158P1D7 amino acid sequence are used to identify hydrophilic regions in the 158P1D7 structure (see, e.g., the Example entitled "Antigenicity profiles"). Regions of the 158P1D7 protein that show immunogenic structure, as well as other regions and domains, can readily be identified using various other methods known in the art, such as Chou-Fasman, Hopp and Woods, Kyte-Doolittle, Janin, Bhaskaran and Ponnuswamy, Deleage and Roux, Garnier-Robson, Eisenberg, Karplus-Schultz, or Jameson-Wolf analysis. Thus, each region identified by any of these programs or methods is within the scope of the present invention. Methods for the generation of 158P1D7 antibodies are further illustrated by way of the examples provided herein. Methods for preparing a protein or polypeptide for use as an immunogen are well known in the art. Also well known in the art are methods for preparing immunogenic conjugates of a protein with a carrier, such as BSA, KLH or other carrier protein. In some circumstances,

direct conjugation using, for example, carbodiimide reagents are used; in other instances linking reagents such as those supplied by Pierce Chemical Co., Rockford, Ill., are effective. Administration of a 158P1D7 immunogen is often conducted by injection over a suitable time period and with use of a suitable adjuvant, as is understood in the art. During the immunization schedule, titers of antibodies can be taken to determine adequacy of antibody formation.

[0186] 158P1D7 monoclonal antibodies can be produced by various means well known in the art. For example, immortalized cell lines that secrete a desired monoclonal antibody are prepared using the standard hybridoma technology of Kohler and Milstein or modifications that immortalize antibody-producing B cells, as is generally known. Immortalized cell lines that secrete the desired antibodies are screened by immunoassay in which the antigen is a 158P1D7-related protein. When the appropriate immortalized cell culture is identified, the cells can be expanded and antibodies produced either from in vitro cultures or from ascites fluid.

[0187] One embodiment of the invention is a mouse hybridoma that produces murine monoclonal antibodies designated X68(2)18 (a.k.a. M15-68(2)18.1.1) deposited with American Type Culture Collection (ATCC), P.O. Box 1549, Manassas, Va. 20108 on 6 Feb. 2004 and assigned Accession No. PTA-5801.

[0188] The antibodies or fragments of the invention can also be produced, by recombinant means. Regions that bind specifically to the desired regions of the 158P1D7 protein can also be produced in the context of chimeric or complementarity determining region (CDR) grafted antibodies of multiple species origin. Humanized or human 158P1D7 antibodies can also be produced, and are preferred for use in therapeutic contexts. Methods for humanizing murine and other non-human antibodies, by substituting one or more of the non-human antibody CDRs for corresponding human antibody sequences, are well known (see for example, Jones et al., 1986, Nature 321: 522-525; Riechmann et al., 1988, Nature 332: 323-327; Verhoeven et al., 1988, Science 239: 1534-1536). See also, Carter et al., 1993, Proc. Natl. Acad. Sci. USA 89: 4285 and Sims et al., 1993, J. Immunol. 151: 2296.

[0189] Methods for producing fully human monoclonal antibodies include phage display and transgenic methods (for review, see Vaughan et al., 1998, Nature Biotechnology 16: 535-539). Fully human 158P1D7 monoclonal antibodies can be generated using cloning technologies employing large human Ig gene combinatorial libraries (i.e., phage display) (Griffiths and Hoogenboom, Building an in vitro immune system: human antibodies from phage display libraries. In: Protein Engineering of Antibody Molecules for Prophylactic and Therapeutic Applications in Man, Clark, M. (Ed.), Nottingham Academic, pp 45-64 (1993); Burton and Barbas, Human Antibodies from combinatorial libraries. Id., pp 65-82). Fully human 158P1D7 monoclonal antibodies can also be produced using transgenic mice engineered to contain human immunoglobulin gene loci as described in PCT Patent Application WO98/24893, Kucheralapati and Jakobovits et al., published Dec. 3, 1997 (see also, Jakobovits, 1998, Exp. Opin. Invest. Drugs 7(4): 607-614; U.S. Pat. Nos. 6,162,963 issued 19 Dec. 2000; 6,150,584 issued 12 Nov. 2000; and, 6,114,598 issued 5 Sep. 2000). This method avoids the in vitro manipulation required with phage display technology and efficiently produces high affinity authentic human antibodies.

[0190] Reactivity of 158P1D7 antibodies with an 158P1D7-related protein can be established by a number of well known means, including Western blot, immunoprecipitation, ELISA, and FACS analyses using, as appropriate, 158P1D7-related proteins, 158P1D7-expressing cells or extracts thereof. A 158P1D7 antibody or fragment thereof can be labeled with a detectable marker or conjugated to a second molecule. Suitable detectable markers include, but are not limited to, a radioisotope, a fluorescent compound, a bioluminescent compound, chemiluminescent compound, a metal chelator or an enzyme. Further, bi-specific antibodies specific for two or more 158P1D7 epitopes are generated using methods generally known in the art. Homodimeric antibodies can also be generated by cross-linking techniques known in the art (e.g., Wolff et al., *Cancer Res.* 53: 2560-2565).

V.) 158P1D7 Cellular Immune Responses

[0191] The mechanism by which T cells recognize antigens has been delineated. Efficacious peptide epitope vaccine compositions of the invention induce a therapeutic or prophylactic immune responses in very broad segments of the worldwide population. For an understanding of the value and efficacy of compositions of the invention that induce cellular immune responses, a brief review of immunology-related technology is provided.

[0192] A complex of an HLA molecule and a peptidic antigen acts as the ligand recognized by HLA-restricted T cells (Buus, S. et al., *Cell* 47:1071, 1986; Babbitt, B. P. et al., *Nature* 317:359, 1985; Townsend, A. and Bodmer, H., *Annu. Rev. Immunol.* 7:601, 1989; Germain, R. N., *Annu. Rev. Immunol.* 11:403, 1993). Through the study of single amino acid substituted antigen analogs and the sequencing of endogenously bound, naturally processed peptides, critical residues that correspond to motifs required for specific binding to HLA antigen molecules have been identified and are set forth in Table IV (see also, e.g., Southwood, et al., *J. Immunol.* 160:3363, 1998; Rammensee, et al., *Immunogenetics* 41:178, 1995; Rammensee et al., SYFPEITHI, access via World Wide Web at URL syfpeithi.bmi-heidelberg.com/; Sette, A. and Sidney, J. *Curr. Opin. Immunol.* 10:478, 1998; Engelhard, V. H., *Curr. Opin. Immunol.* 6:13, 1994; Sette, A. and Grey, H. M., *Curr. Opin. Immunol.* 4:79, 1992; Sinigaglia, F. and Hammer, J. *Curr. Biol.* 6:52, 1994; Ruppert et al., *Cell* 74:929-937, 1993; Kondo et al., *J. Immunol.* 155:4307-4312, 1995; Sidney et al., *J. Immunol.* 157:3480-3490, 1996; Sidney et al., *Human Immunol.* 45:79-93, 1996; Sette, A. and Sidney, J. *Immunogenetics* 1999 November; 50(3-4):201-12, Review).

[0193] Furthermore, x-ray crystallographic analyses of HLA-peptide complexes have revealed pockets within the peptide binding cleft/groove of HLA molecules which accommodate, in an allele-specific mode, residues borne by peptide ligands; these residues in turn determine the HLA binding capacity of the peptides in which they are present. (See, e.g., Madden, D. R. *Annu. Rev. Immunol.* 13:587, 1995; Smith, et al., *Immunity* 4:203, 1996; Fremont et al., *Immunity* 8:305, 1998; Stern et al., *Structure* 2:245, 1994; Jones, E. Y. *Curr. Opin. Immunol.* 9:75, 1997; Brown, J. H. et al., *Nature* 364:33, 1993; Guo, H. C. et al., *Proc. Natl. Acad. Sci. USA* 90:8053, 1993; Guo, H. C. et al., *Nature* 360:364, 1992; Silver, M. L. et al., *Nature* 360:367, 1992; Matsumura, M. et al., *Science* 257:927, 1992; Madden et al., *Cell* 70:1035, 1992; Fremont, D. H. et al., *Science* 257:919, 1992; Saper, M. A., Bjorkman, P. J. and Wiley, D. C., *J. Mol. Biol.* 219:277, 1991.)

[0194] Accordingly, the definition of class I and class II allele-specific HLA binding motifs, or class I or class II supermotifs allows identification of regions within a protein that are correlated with binding to particular HLA antigen(s).

[0195] Thus, by a process of HLA motif identification, candidates for epitope-based vaccines have been identified; such candidates can be further evaluated by HLA-peptide binding assays to determine binding affinity and/or the time period of association of the epitope and its corresponding HLA molecule. Additional confirmatory work can be performed to select, amongst these vaccine candidates, epitopes with preferred characteristics in terms of population coverage, and/or immunogenicity.

[0196] Various strategies can be utilized to evaluate cellular immunogenicity, including:

[0197] 1) Evaluation of primary T cell cultures from normal individuals (see, e.g., Wentworth, P. A. et al., *Mol. Immunol.* 32:603, 1995; Celis, E. et al., *Proc. Natl. Acad. Sci. USA* 91:2105, 1994; Tsai, V. et al., *J. Immunol.* 158:1796, 1997; Kawashima, I. et al., *Human Immunol.* 59:1, 1998). This procedure involves the stimulation of peripheral blood lymphocytes (PBL) from normal subjects with a test peptide in the presence of antigen presenting cells in vitro over a period of several weeks. T cells specific for the peptide become activated during this time and are detected using, e.g., a lymphokine- or 51Cr-release assay involving peptide sensitized target cells.

[0198] 2) Immunization of HLA transgenic mice (see, e.g., Wentworth, P. A. et al., *J. Immunol.* 26:97, 1996; Wentworth, P. A. et al., *Int. Immunol.* 8:651, 1996; Alexander, J. et al., *J. Immunol.* 159:4753, 1997). For example, in such methods peptides in incomplete Freund's adjuvant are administered subcutaneously to HLA transgenic mice. Several weeks following immunization, splenocytes are removed and cultured in vitro in the presence of test peptide for approximately one week. Peptide-specific T cells are detected using, e.g., a 51Cr-release assay involving peptide sensitized target cells and target cells expressing endogenously generated antigen.

[0199] 3) Demonstration of recall T cell responses from immune individuals who have been either effectively vaccinated and/or from chronically ill patients (see, e.g., Rehmann, B. et al., *J. Exp. Med.* 181:1047, 1995; Doolan, D. L. et al., *Immunity* 7:97, 1997; Bertoni, R. et al., *J. Clin. Invest.* 100:503, 1997; Threlkeld, S. C. et al., *J. Immunol.* 159:1648, 1997; Diepolder, H. M. et al., *J. Virol.* 71:6011, 1997). Accordingly, recall responses are detected by culturing PBL from subjects that have been exposed to the antigen due to disease and thus have generated an immune response "naturally", or from patients who were vaccinated against the antigen. PBL from subjects are cultured in vitro for 1-2 weeks in the presence of test peptide plus antigen presenting cells (APC) to allow activation of "memory" T cells, as compared to "naive" T cells. At the end of the culture period, T cell activity is detected using assays including 51Cr release involving peptide-sensitized targets, T cell proliferation, or lymphokine release.

VI.) 158P1D7 Transgenic Animals

[0200] Nucleic acids that encode a 158P1D7-related protein can also be used to generate either transgenic animals or "knock out" animals which, in turn, are useful in the development and screening of therapeutically useful reagents. In accordance with established techniques, cDNA encoding 158P1D7 can be used to clone genomic DNA that encodes

158P1D7. The cloned genomic sequences can then be used to generate transgenic animals containing cells that express DNA that encode 158P1D7. Methods for generating transgenic animals, particularly animals such as mice or rats, have become conventional in the art and are described, for example, in U.S. Pat. Nos. 4,736,866 issued 12 Apr. 1988, and 4,870,009 issued 26 Sep. 1989. Typically, particular cells would be targeted for 158P1D7 transgene incorporation with tissue-specific enhancers.

[0201] Transgenic animals that include a copy of a transgene encoding 158P1D7 can be used to examine the effect of increased expression of DNA that encodes 158P1D7. Such animals can be used as tester animals for reagents thought to confer protection from, for example, pathological conditions associated with its overexpression. In accordance with this aspect of the invention, an animal is treated with a reagent and a reduced incidence of a pathological condition, compared to untreated animals that bear the transgene, would indicate a potential therapeutic intervention for the pathological condition.

[0202] Alternatively, non-human homologues of 158P1D7 can be used to construct a 158P1D7 “knock out” animal that has a defective or altered gene encoding 158P1D7 as a result of homologous recombination between the endogenous gene encoding 158P1D7 and altered genomic DNA encoding 158P1D7 introduced into an embryonic cell of the animal. For example, cDNA that encodes 158P1D7 can be used to clone genomic DNA encoding 158P1D7 in accordance with established techniques. A portion of the genomic DNA encoding 158P1D7 can be deleted or replaced with another gene, such as a gene encoding a selectable marker that can be used to monitor integration. Typically, several kilobases of unaltered flanking DNA (both at the 5' and 3' ends) are included in the vector (see, e.g., Thomas and Capecchi, *Cell*, 51:503 (1987) for a description of homologous recombination vectors). The vector is introduced into an embryonic stem cell line (e.g., by electroporation) and cells in which the introduced DNA has homologously recombined with the endogenous DNA are selected (see, e.g., Li et al., *Cell*, 69:915 (1992)). The selected cells are then injected into a blastocyst of an animal (e.g., a mouse or rat) to form aggregation chimeras (see, e.g., Bradley, in *Teratocarcinomas and Embryonic Stem Cells: A Practical Approach*, E. J. Robertson, ed. (IRL, Oxford, 1987), pp. 113-152). A chimeric embryo can then be implanted into a suitable pseudopregnant female foster animal, and the embryo brought to term to create a “knock out” animal. Progeny harboring the homologously recombined DNA in their germ cells can be identified by standard techniques and used to breed animals in which all cells of the animal contain the homologously recombined DNA. Knock out animals can be characterized, for example, for their ability to defend against certain pathological conditions or for their development of pathological conditions due to absence of the 158P1D7 polypeptide.

VII.) Methods for the Detection of 158P1D7

[0203] Another aspect of the present invention relates to methods for detecting 158P1D7 polynucleotides and polypeptides and 158P1D7-related proteins, as well as methods for identifying a cell that expresses 158P1D7. The expression profile of 158P1D7 makes it a diagnostic marker for metastasized disease. Accordingly, the status of 158P1D7 gene products provides information useful for predicting a variety of factors including susceptibility to advanced stage

disease, rate of progression, and/or tumor aggressiveness. As discussed in detail herein, the status of 158P1D7 gene products in patient samples can be analyzed by a variety of protocols that are well known in the art including immunohistochemical analysis, the variety of Northern blotting techniques including in situ hybridization, RT-PCR analysis (for example on laser capture micro-dissected samples), Western blot analysis and tissue array analysis.

[0204] More particularly, the invention provides assays for the detection of 158P1D7 polynucleotides in a biological sample, such as urine, serum, bone, prostatic fluid, tissues, semen, cell preparations, and the like. Detectable 158P1D7 polynucleotides include, for example, a 158P1D7 gene or fragment thereof, 158P1D7 mRNA, alternative splice variant 158P1D7 mRNAs, and recombinant DNA or RNA molecules that contain a 158P1D7 polynucleotide. A number of methods for amplifying and/or detecting the presence of 158P1D7 polynucleotides are well known in the art and can be employed in the practice of this aspect of the invention.

[0205] In one embodiment, a method for detecting an 158P1D7 mRNA in a biological sample comprises producing cDNA from the sample by reverse transcription using at least one primer; amplifying the cDNA so produced using an 158P1D7 polynucleotides as sense and antisense primers to amplify 158P1D7 cDNAs therein; and detecting the presence of the amplified 158P1D7 cDNA. Optionally, the sequence of the amplified 158P1D7 cDNA can be determined.

[0206] In another embodiment, a method of detecting a 158P1D7 gene in a biological sample comprises first isolating genomic DNA from the sample; amplifying the isolated genomic DNA using 158P1D7 polynucleotides as sense and antisense primers; and detecting the presence of the amplified 158P1D7 gene. Any number of appropriate sense and antisense probe combinations can be designed from the nucleotide sequence provided for the 158P1D7 (FIG. 2) and used for this purpose.

[0207] The invention also provides assays for detecting the presence of an 158P1D7 protein in a tissue or other biological sample such as urine, serum, semen, bone, prostate, cell preparations, and the like. Methods for detecting a 158P1D7-related protein are also well known and include, for example, immunoprecipitation, immunohistochemical analysis, Western blot analysis, molecular binding assays, ELISA, ELIFA and the like. For example, a method of detecting the presence of a 158P1D7-related protein in a biological sample comprises first contacting the sample with a 158P1D7 antibody, a 158P1D7-reactive fragment thereof, or a recombinant protein containing an antigen binding region of a 158P1D7 antibody; and then detecting the binding of 158P1D7-related protein in the sample.

[0208] Methods for identifying a cell that expresses 158P1D7 are also within the scope of the invention. In one embodiment, an assay for identifying a cell that expresses a 158P1D7 gene comprises detecting the presence of 158P1D7 mRNA in the cell. Methods for the detection of particular mRNAs in cells are well known and include, for example, hybridization assays using complementary DNA probes (such as in situ hybridization using labeled 158P1D7 riboprobes, Northern blot and related techniques) and various nucleic acid amplification assays (such as RT-PCR using complementary primers specific for 158P1D7, and other amplification type detection methods, such as, for example, branched DNA, SISBA, TMA and the like). Alternatively, an assay for identifying a cell that expresses a 158P1D7 gene

comprises detecting the presence of 158P1D7-related protein in the cell or secreted by the cell. Various methods for the detection of proteins are well known in the art and are employed for the detection of 158P1D7-related proteins and cells that express 158P1D7-related proteins.

[0209] 158P1D7 expression analysis is also useful as a tool for identifying and evaluating agents that modulate 158P1D7 gene expression. For example, 158P1D7 expression is significantly upregulated in bladder cancer, and is expressed in cancers of the tissues listed in Table I. Identification of a molecule or biological agent that inhibits 158P1D7 expression or over-expression in cancer cells is of therapeutic value. For example, such an agent can be identified by using a screen that quantifies 158P1D7 expression by RT-PCR, nucleic acid hybridization or antibody binding.

VIII.) Methods for Monitoring the Status of 158P1D7-Related Genes and Their Products

[0210] Oncogenesis is known to be a multistep process where cellular growth becomes progressively dysregulated and cells progress from a normal physiological state to precancerous and then cancerous states (see, e.g., Alers et al., *Lab Invest.* 77(5): 437-438 (1997) and Isaacs et al., *Cancer Surv.* 23: 19-32 (1995)). In this context, examining a biological sample for evidence of dysregulated cell growth (such as aberrant 158P1D7 expression in cancers) allows for early detection of such aberrant physiology, before a pathologic state such as cancer has progressed to a stage that therapeutic options are more limited and/or the prognosis is worse. In such examinations, the status of 158P1D7 in a biological sample of interest can be compared, for example, to the status of 158P1D7 in a corresponding normal sample (e.g. a sample from that individual or alternatively another individual that is not affected by a pathology). An alteration in the status of 158P1D7 in the biological sample (as compared to the normal sample) provides evidence of dysregulated cellular growth. In addition to using a biological sample that is not affected by a pathology as a normal sample, one can also use a predetermined normative value such as a predetermined normal level of mRNA expression (see, e.g., Greyer et al., *J. Comp. Neurol.* 1996 Dec. 9; 376(2):306-14 and U.S. Pat. No. 5,837,501) to compare 158P1D7 status in a sample.

[0211] The term "status" in this context is used according to its art accepted meaning and refers to the condition or state of a gene and its products. Typically, skilled artisans use a number of parameters to evaluate the condition or state of a gene and its products. These include, but are not limited to the location of expressed gene products (including the location of 158P1D7 expressing cells) as well as the level, and biological activity of expressed gene products (such as 158P1D7 mRNA, polynucleotides and polypeptides). Typically, an alteration in the status of 158P1D7 comprises a change in the location of 158P1D7 and/or 158P1D7 expressing cells and/or an increase in 158P1D7 mRNA and/or protein expression.

[0212] 158P1D7 status in a sample can be analyzed by a number of means well known in the art, including without limitation, immunohistochemical analysis, in situ hybridization, RT-PCR analysis on laser capture micro-dissected samples, Western blot analysis, and tissue array analysis. Typical protocols for evaluating the status of the 158P1D7 gene and gene products are found, for example in Ausubel et al. eds., 1995, *Current Protocols In Molecular Biology*, Units 2 (Northern Blotting), 4 (Southern Blotting), 15 (Immunoblotting) and 18 (PCR Analysis). Thus, the status of 158P1D7

in a biological sample is evaluated by various methods utilized by skilled artisans including, but not limited to genomic Southern analysis (to examine, for example perturbations in the 158P1D7 gene), Northern analysis and/or PCR analysis of 158P1D7 mRNA (to examine, for example alterations in the polynucleotide sequences or expression levels of 158P1D7 mRNAs), and, Western and/or immunohistochemical analysis (to examine, for example alterations in polypeptide sequences, alterations in polypeptide localization within a sample, alterations in expression levels of 158P1D7 proteins and/or associations of 158P1D7 proteins with polypeptide binding partners). Detectable 158P1D7 polynucleotides include, for example, a 158P1D7 gene or fragment thereof, 158P1D7 mRNA, alternative splice variants, 158P1D7 mRNAs, and recombinant DNA or RNA molecules containing a 158P1D7 polynucleotide.

[0213] The expression profile of 158P1D7 makes it a diagnostic marker for local and/or metastasized disease, and provides information on the growth or oncogenic potential of a biological sample. In particular, the status of 158P1D7 provides information useful for predicting susceptibility to particular disease stages, progression, and/or tumor aggressiveness. The invention provides methods and assays for determining 158P1D7 status and diagnosing cancers that express 158P1D7, such as cancers of the tissues listed in Table I. For example, because 158P1D7 mRNA is so highly expressed in bladder and other cancers relative to normal bladder tissue, assays that evaluate the levels of 158P1D7 mRNA transcripts or proteins in a biological sample can be used to diagnose a disease associated with 158P1D7 dysregulation, and can provide prognostic information useful in defining appropriate therapeutic options.

[0214] The expression status of 158P1D7 provides information including the presence, stage and location of dysplastic, precancerous and cancerous cells, predicting susceptibility to various stages of disease, and/or for gauging tumor aggressiveness. Moreover, the expression profile makes it useful as an imaging reagent for metastasized disease. Consequently, an aspect of the invention is directed to the various molecular prognostic and diagnostic methods for examining the status of 158P1D7 in biological samples such as those from individuals suffering from, or suspected of suffering from a pathology characterized by dysregulated cellular growth, such as cancer.

[0215] As described above, the status of 158P1D7 in a biological sample can be examined by a number of well-known procedures in the art. For example, the status of 158P1D7 in a biological sample taken from a specific location in the body can be examined by evaluating the sample for the presence or absence of 158P1D7 expressing cells (e.g. those that express 158P1D7 mRNAs or proteins). This examination can provide evidence of dysregulated cellular growth, for example, when 158P1D7-expressing cells are found in a biological sample that does not normally contain such cells (such as a lymph node), because such alterations in the status of 158P1D7 in a biological sample are often associated with dysregulated cellular growth. Specifically, one indicator of dysregulated cellular growth is the metastases of cancer cells from an organ of origin (such as the bladder) to a different area of the body (such as a lymph node). By example, evidence of dysregulated cellular growth is important because occult lymph node metastases can be detected in a substantial proportion of patients with prostate cancer, and such metastases are associated with known predictors of disease

progression (see, e.g., Murphy et al., *Prostate* 42(4): 315-317 (2000); Su et al., *Semin. Surg. Oncol.* 18(1): 17-28 (2000) and Freeman et al., *J Urol* 1995 August 154(2 Pt 1):474-8).

[0216] In one aspect, the invention provides methods for monitoring 158P1D7 gene products by determining the status of 158P1D7 gene products expressed by cells from an individual suspected of having a disease associated with dysregulated cell growth (such as hyperplasia or cancer) and then comparing the status so determined to the status of 158P1D7 gene products in a corresponding normal sample. The presence of aberrant 158P1D7 gene products in the test sample relative to the normal sample provides an indication of the presence of dysregulated cell growth within the cells of the individual.

[0217] In another aspect, the invention provides assays useful in determining the presence of cancer in an individual, comprising detecting a significant increase in 158P1D7 mRNA or protein expression in a test cell or tissue sample relative to expression levels in the corresponding normal cell or tissue. The presence of 158P1D7 mRNA can, for example, be evaluated in tissue samples including but not limited to those listed in Table I. The presence of significant 158P1D7 expression in any of these tissues is useful to indicate the emergence, presence and/or severity of a cancer, since the corresponding normal tissues do not express 158P1D7 mRNA or express it at lower levels.

[0218] In a related embodiment, 158P1D7 status is determined at the protein level rather than at the nucleic acid level. For example, such a method comprises determining the level of 158P1D7 protein expressed by cells in a test tissue sample and comparing the level so determined to the level of 158P1D7 expressed in a corresponding normal sample. In one embodiment, the presence of 158P1D7 protein is evaluated, for example, using immunohistochemical methods. 158P1D7 antibodies or binding partners capable of detecting 158P1D7 protein expression are used in a variety of assay formats well known in the art for this purpose.

[0219] In a further embodiment, one can evaluate the status of 158P1D7 nucleotide and amino acid sequences in a biological sample in order to identify perturbations in the structure of these molecules. These perturbations can include insertions, deletions, substitutions and the like. Such evaluations are useful because perturbations in the nucleotide and amino acid sequences are observed in a large number of proteins associated with a growth dysregulated phenotype (see, e.g., Marrogi et al., 1999, *J. Cutan. Pathol.* 26(8):369-378). For example, a mutation in the sequence of 158P1D7 may be indicative of the presence or promotion of a tumor. Such assays therefore have diagnostic and predictive value where a mutation in 158P1D7 indicates a potential loss of function or increase in tumor growth.

[0220] A wide variety of assays for observing perturbations in nucleotide and amino acid sequences are well known in the art. For example, the size and structure of nucleic acid or amino acid sequences of 158P1D7 gene products are observed by the Northern, Southern, Western, PCR and DNA sequencing protocols discussed herein. In addition, other methods for observing perturbations in nucleotide and amino acid sequences such as single strand conformation polymorphism analysis are well known in the art (see, e.g., U.S. Pat. Nos. 5,382,510 issued 7 Sep. 1999, and 5,952,170 issued 17 Jan. 1995).

[0221] Additionally, one can examine the methylation status of the 158P1D7 gene in a biological sample. Aberrant

demethylation and/or hypermethylation of CpG islands in gene 5' regulatory regions frequently occurs in immortalized and transformed cells, and can result in altered expression of various genes. For example, promoter hypermethylation of the DBCCR1, PAX6 and APC genes have been detected in bladder cancers leading to aberrant expression of the genes (Esteller et al., *Cancer Res* 2001; 61:3225-3229). A variety of assays for examining methylation status of a gene are well known in the art. For example, one can utilize, in Southern hybridization approaches, methylation-sensitive restriction enzymes which cannot cleave sequences that contain methylated CpG sites to assess the methylation status of CpG islands. In addition, MSP (methylation specific PCR) can rapidly profile the methylation status of all the CpG sites present in a CpG island of a given gene. This procedure involves initial modification of DNA by sodium bisulfite (which will convert all unmethylated cytosines to uracil) followed by amplification using primers specific for methylated versus unmethylated DNA. Protocols involving methylation interference can also be found for example in *Current Protocols In Molecular Biology*, Unit 12, Frederick M. Ausubel et al. eds., 1995.

[0222] Gene amplification is an additional method for assessing the status of 158P1D7. Gene amplification is measured in a sample directly, for example, by conventional Southern blotting or Northern blotting to quantitate the transcription of mRNA (Thomas, 1980, *Proc. Natl. Acad. Sci. USA*, 77:5201-5205), dot blotting (DNA analysis), or in situ hybridization, using an appropriately labeled probe, based on the sequences provided herein. Alternatively, antibodies are employed that recognize specific duplexes, including DNA duplexes, RNA duplexes, and DNA-RNA hybrid duplexes or DNA-protein duplexes. The antibodies in turn are labeled and the assay carried out where the duplex is bound to a surface, so that upon the formation of duplex on the surface, the presence of antibody bound to the duplex can be detected.

[0223] Biopsied tissue or peripheral blood can be conveniently assayed for the presence of cancer cells using for example, Northern, dot blot or RT-PCR analysis to detect 158P1D7 expression. The presence of RT-PCR amplifiable 158P1D7 mRNA provides an indication of the presence of cancer. RT-PCR assays are well known in the art. RT-PCR detection assays for tumor cells in peripheral blood are currently being evaluated for use in the diagnosis and management of a number of human solid tumors.

[0224] A further aspect of the invention is an assessment of the susceptibility that an individual has for developing cancer. In one embodiment, a method for predicting susceptibility to cancer comprises detecting 158P1D7 mRNA or 158P1D7 protein in a tissue sample, its presence indicating susceptibility to cancer, wherein the degree of 158P1D7 mRNA expression correlates to the degree of susceptibility. In a specific embodiment, the presence of 158P1D7 in bladder or other tissue is examined, with the presence of 158P1D7 in the sample providing an indication of bladder cancer susceptibility (or the emergence or existence of a bladder tumor). Similarly, one can evaluate the integrity 158P1D7 nucleotide and amino acid sequences in a biological sample, in order to identify perturbations in the structure of these molecules such as insertions, deletions, substitutions and the like. The presence of one or more perturbations in 158P1D7 gene products in the sample is an indication of cancer susceptibility (or the emergence or existence of a tumor).

[0225] The invention also comprises methods for gauging tumor aggressiveness. In one embodiment, a method for gauging aggressiveness of a tumor comprises determining the level of 158P1D7 mRNA or 158P1D7 protein expressed by tumor cells, comparing the level so determined to the level of 158P1D7 mRNA or 158P1D7 protein expressed in a corresponding normal tissue taken from the same individual or a normal tissue reference sample, wherein the degree of 158P1D7 mRNA or 158P1D7 protein expression in the tumor sample relative to the normal sample indicates the degree of aggressiveness. In a specific embodiment, aggressiveness of a tumor is evaluated by determining the extent to which 158P1D7 is expressed in the tumor cells, with higher expression levels indicating more aggressive tumors. Another embodiment is the evaluation of the integrity of 158P1D7 nucleotide and amino acid sequences in a biological sample, in order to identify perturbations in the structure of these molecules such as insertions, deletions, substitutions and the like. The presence of one or more perturbations indicates more aggressive tumors.

[0226] Another embodiment of the invention is directed to methods for observing the progression of a malignancy in an individual over time. In one embodiment, methods for observing the progression of a malignancy in an individual over time comprise determining the level of 158P1D7 mRNA or 158P1D7 protein expressed by cells in a sample of the tumor, comparing the level so determined to the level of 158P1D7 mRNA or 158P1D7 protein expressed in an equivalent tissue sample taken from the same individual at a different time, wherein the degree of 158P1D7 mRNA or 158P1D7 protein expression in the tumor sample over time provides information on the progression of the cancer. In a specific embodiment, the progression of a cancer is evaluated by determining 158P1D7 expression in the tumor cells over time, where increased expression over time indicates a progression of the cancer. Also, one can evaluate the integrity 158P1D7 nucleotide and amino acid sequences in a biological sample in order to identify perturbations in the structure of these molecules such as insertions, deletions, substitutions and the like, where the presence of one or more perturbations indicates a progression of the cancer.

[0227] The above diagnostic approaches can be combined with any one of a wide variety of prognostic and diagnostic protocols known in the art. For example, another embodiment of the invention is directed to methods for observing a coincidence between the expression of 158P1D7 gene and 158P1D7 gene products (or perturbations in 158P1D7 gene and 158P1D7 gene products) and a factor that is associated with malignancy, as a means for diagnosing and prognosticating the status of a tissue sample. A wide variety of factors associated with malignancy can be utilized, such as the expression of genes associated with malignancy (e.g. PSCA, H-ras and p53 expression etc.) as well as gross cytological observations (see, e.g., Bocking et al., 1984, *Anal. Quant. Cytol.* 6(2):74-88; Epstein, 1995, *Hum. Pathol.* 26(2):223-9; Thorson et al., 1998, *Mod. Pathol.* 11(6):543-51; Baisden et al., 1999, *Am. J. Surg. Pathol.* 23(8):918-24). Methods for observing a coincidence between the expression of 158P1D7 gene and 158P1D7 gene products (or perturbations in 158P1D7 gene and 158P1D7 gene products) and another factor that is associated with malignancy are useful, for example, because the presence of a set of specific factors that coincide with disease provides information crucial for diagnosing and prognosticating the status of a tissue sample.

[0228] In one embodiment, methods for observing a coincidence between the expression of 158P1D7 gene and 158P1D7 gene products (or perturbations in 158P1D7 gene and 158P1D7 gene products) and another factor associated with malignancy entails detecting the overexpression of 158P1D7 mRNA or protein in a tissue sample, detecting the overexpression of BLCA-4A mRNA or protein in a tissue sample (or PSCA expression), and observing a coincidence of 158P1D7 mRNA or protein and BLCA-4 mRNA or protein overexpression (or PSCA expression) (Amara et al., 2001, *Cancer Res* 61:4660-4665; Konety et al., *Clin Cancer Res*, 2000, 6(7):2618-2625). In a specific embodiment, the expression of 158P1D7 and BLCA-4 mRNA in bladder tissue is examined, where the coincidence of 158P1D7 and BLCA-4 mRNA overexpression in the sample indicates the existence of bladder cancer, bladder cancer susceptibility or the emergence or status of a bladder tumor.

[0229] Methods for detecting and quantifying the expression of 158P1D7 mRNA or protein are described herein, and standard nucleic acid and protein detection and quantification technologies are well known in the art. Standard methods for the detection and quantification of 158P1D7 mRNA include in situ hybridization using labeled 158P1D7 riboprobes, Northern blot and related techniques using 158P1D7 polynucleotide probes, RT-PCR analysis using primers specific for 158P1D7, and other amplification type detection methods, such as, for example, branched DNA, SISBA, TMA and the like. In a specific embodiment, semi-quantitative RT-PCR is used to detect and quantify 158P1D7 mRNA expression. Any number of primers capable of amplifying 158P1D7 can be used for this purpose, including but not limited to the various primer sets specifically described herein. In a specific embodiment, polyclonal or monoclonal antibodies specifically reactive with the wild-type 158P1D7 protein can be used in an immunohistochemical assay of biopsied tissue.

IX.) Identification of Molecules that Interact with 158P1D7

[0230] The 158P1D7 protein and nucleic acid sequences disclosed herein allow a skilled artisan to identify proteins, small molecules and other agents that interact with 158P1D7, as well as pathways activated by 158P1D7 via any one of a variety of art accepted protocols. For example, one can utilize one of the so-called interaction trap systems (also referred to as the "two-hybrid assay"). In such systems, molecules interact and reconstitute a transcription factor which directs expression of a reporter gene, whereupon the expression of the reporter gene is assayed. Other systems identify protein-protein interactions in vivo through reconstitution of a eukaryotic transcriptional activator, see, e.g., U.S. Pat. Nos. 5,955,280 issued 21 Sep. 1999, 5,925,523 issued 20 Jul. 1999, 5,846,722 issued 8 Dec. 1998 and 6,004,746 issued 21 Dec. 1999. Algorithms are also available in the art for genome-based predictions of protein function (see, e.g., Marcotte, et al., *Nature* 402: 4 Nov. 1999, 83-86).

[0231] Alternatively one can screen peptide libraries to identify molecules that interact with 158P1D7 protein sequences. In such methods, peptides that bind to 158P1D7 are identified by screening libraries that encode a random or controlled collection of amino acids. Peptides encoded by the libraries are expressed as fusion proteins of bacteriophage coat proteins, the bacteriophage particles are then screened against the 158P1D7 protein.

[0232] Accordingly, peptides having a wide variety of uses, such as therapeutic, prognostic or diagnostic reagents, are thus identified without any prior information on the structure of the expected ligand or receptor molecule. Typical peptide libraries and screening methods that can be used to identify molecules that interact with 158P1D7 protein sequences are disclosed for example in U.S. Pat. Nos. 5,723,286 issued 3 Mar. 1998 and 5,733,731 issued 31 Mar. 1998.

[0233] Alternatively, cell lines that express 158P1D7 are used to identify protein-protein interactions mediated by 158P1D7. Such interactions can be examined using immunoprecipitation techniques (see, e.g., Hamilton B J, et al. *Biochem. Biophys. Res. Commun.* 1999, 261:646-51). 158P1D7 protein can be immunoprecipitated from 158P1D7-expressing cell lines using anti-158P1D7 antibodies. Alternatively, antibodies against His-tag can be used in a cell line engineered to express fusions of 158P1D7 and a His-tag (vectors mentioned above). The immunoprecipitated complex can be examined for protein association by procedures such as Western blotting, 35S-methionine labeling of proteins, protein microsequencing, silver staining and two-dimensional gel electrophoresis.

[0234] Small molecules and ligands that interact with 158P1D7 can be identified through related embodiments of such screening assays. For example, small molecules can be identified that interfere with protein function, including molecules that interfere with 158P1D7's ability to mediate phosphorylation and de-phosphorylation, interaction with DNA or RNA molecules as an indication of regulation of cell cycles, second messenger signaling or tumorigenesis. Similarly, small molecules that modulate 158P1D7 related ion channel, protein pump, or cell communication functions 158P1D7 are identified and used to treat patients that have a cancer that expresses 158P1D7 (see, e.g., Hille, B., *Ionic Channels of Excitable Membranes* 2nd Ed., Sinauer Assoc., Sunderland, Mass., 1992). Moreover, ligands that regulate 158P1D7 function can be identified based on their ability to bind 158P1D7 and activate a reporter construct. Typical methods are discussed for example in U.S. Pat. No. 5,928,868 issued 27 Jul. 1999, and include methods for forming hybrid ligands in which at least one ligand is a small molecule. In an illustrative embodiment, cells engineered to express a fusion protein of 158P1D7 and a DNA-binding protein are used to co-express a fusion protein of a hybrid ligand/small molecule and a cDNA library transcriptional activator protein. The cells further contain a reporter gene, the expression of which is conditioned on the proximity of the first and second fusion proteins to each other, an event that occurs only if the hybrid ligand binds to target sites on both hybrid proteins. Those cells that express the reporter gene are selected and the unknown small molecule or the unknown ligand is identified. This method provides a means of identifying modulators which activate or inhibit 158P1D7.

[0235] An embodiment of this invention comprises a method of screening for a molecule that interacts with an 158P1D7 amino acid sequence shown in FIG. 2 or FIG. 3, comprising the steps of contacting a population of molecules with the 158P1D7 amino acid sequence, allowing the population of molecules and the 158P1D7 amino acid sequence to interact under conditions that facilitate an interaction, determining the presence of a molecule that interacts with the 158P1D7 amino acid sequence, and then separating molecules that do not interact with the 158P1D7 amino acid sequence from molecules that do. In a specific embodiment,

the method further comprises purifying, characterizing and identifying a molecule that interacts with the 158P1D7 amino acid sequence. The identified molecule can be used to modulate a function performed by 158P1D7. In a preferred embodiment, the 158P1D7 amino acid sequence is contacted with a library of peptides.

X.) Therapeutic Methods and Compositions

[0236] The identification of 158P1D7 as a protein that is normally expressed in a restricted set of tissues, but which is also expressed in bladder and other cancers, opens a number of therapeutic approaches to the treatment of such cancers. As contemplated herein, 158P1D7 functions as a transcription factor involved in activating tumor-promoting genes or repressing genes that block tumorigenesis.

[0237] Accordingly, therapeutic approaches that inhibit the activity of the 158P1D7 protein are useful for patients suffering from a cancer that expresses 158P1D7. These therapeutic approaches generally fall into two classes. One class comprises various methods for inhibiting the binding or association of the 158P1D7 protein with its binding partner or with other proteins. Another class comprises a variety of methods for inhibiting the transcription of the 158P1D7 gene or translation of 158P1D7 mRNA.

[0238] X.A.) Anti-Cancer Vaccines

[0239] The invention provides cancer vaccines comprising a 158P1D7-related protein or 158P1D7-related nucleic acid. In view of the expression of 158P1D7, cancer vaccines prevent and/or treat 158P1D7-expressing cancers with minimal or no effects on non-target tissues. The use of a tumor antigen in a vaccine that generates humoral and/or cell-mediated immune responses as anti-cancer therapy is well known in the art (see, e.g., Hodge et al., 1995, *Int. J. Cancer* 63:231-237; Fong et al., 1997, *J. Immunol.* 159:3113-3117).

[0240] Such methods can be readily practiced by employing a 158P1D7-related protein, or a 158P1D7-encoding nucleic acid molecule and recombinant vectors capable of expressing and presenting the 158P1D7 immunogen (which typically comprises a number of antibody or T cell epitopes). Skilled artisans understand that a wide variety of vaccine systems for delivery of immunoreactive epitopes are known in the art (see, e.g., Heryln et al., *Ann Med* 1999 February 31(1):66-78; Maruyama et al., *Cancer Immunol Immunother* 2000 June 49(3):123-32). Briefly, such methods of generating an immune response (e.g. humoral and/or cell-mediated) in a mammal, comprise the steps of: exposing the mammal's immune system to an immunoreactive epitope (e.g. an epitope present in the 158P1D7 protein shown in FIG. 2 or analog or homolog thereof) so that the mammal generates an immune response that is specific for that epitope (e.g. generates antibodies that specifically recognize that epitope). In a preferred method, the 158P1D7 immunogen contains a biological motif, see e.g., Tables V-XVIII, or a peptide of a size range from 158P1D7 indicated in FIG. 11, FIG. 12, FIG. 13, FIG. 14, and FIG. 15.

[0241] The entire 158P1D7 protein, immunogenic regions or epitopes thereof can be combined and delivered by various means. Such vaccine compositions can include, for example, lipopeptides (e.g., Vitiello, A. et al., *J. Clin. Invest.* 95:341, 1995), peptide compositions encapsulated in poly(DL-lactide-co-glycolide) ("PLG") microspheres (see, e.g., Eldridge, et al., *Molec. Immunol.* 28:287-294, 1991; Alonso et al., *Vaccine* 12:299-306, 1994; Jones et al., *Vaccine* 13:675-681, 1995), peptide compositions contained in immune stimulat-

ing complexes (ISCOMS) (see, e.g., Takahashi et al., *Nature* 344:873-875, 1990; Hu et al., *Clin Exp Immunol.* 113:235-243, 1998), multiple antigen peptide systems (MAPs) (see e.g., Tam, J. P., *Proc. Natl. Acad. Sci. U.S.A.* 85:5409-5413, 1988; Tam, J. P., *J. Immunol. Methods* 196:17-32, 1996), peptides formulated as multivalent peptides; peptides for use in ballistic delivery systems, typically crystallized peptides, viral delivery vectors (Perkus, M. E. et al., In: *Concepts in vaccine development*, Kaufmann, S. H. E., ed., p. 379, 1996; Chakrabarti, S. et al., *Nature* 320:535, 1986; Hu, S. L. et al., *Nature* 320:537, 1986; Kieny, M.-P. et al., *AIDS Bio/Technology* 4:790, 1986; Top, F. H. et al., *J. Infect. Dis.* 124:148, 1971; Chanda, P. K. et al., *Virology* 175:535, 1990), particles of viral or synthetic origin (e.g., Kofler, N. et al., *J. Immunol. Methods* 192:25, 1996; Eldridge, J. H. et al., *Sem. Hematol.* 30:16, 1993; Falo, L. D., Jr. et al., *Nature Med.* 7:649, 1995), adjuvants (Warren, H. S., Vogel, F. R., and Chedid, L. A. *Annu. Rev. Immunol.* 4:369, 1986; Gupta, R. K. et al., *Vaccine* 11:293, 1993), liposomes (Reddy, R. et al., *J. Immunol.* 148:1585, 1992; Rock, K. L., *Immunol. Today* 17:131, 1996), or, naked or particle absorbed cDNA (Ulmer, J. B. et al., *Science* 259:1745, 1993; Robinson, H. L., Hunt, L. A., and Webster, R. G., *Vaccine* 11:957, 1993; Shiver, J. W. et al., In: *Concepts in vaccine development*, Kaufmann, S. H. E., ed., p. 423, 1996; Cease, K. B., and Berzofsky, J. A., *Annu. Rev. Immunol.* 12:923, 1994 and Eldridge, J. H. et al., *Sem. Hematol.* 30:16, 1993). Toxin-targeted delivery technologies, also known as receptor mediated targeting, such as those of Avant Immunotherapeutics, Inc. (Needham, Mass.) may also be used.

[0242] In patients with 158P1D7-associated cancer, the vaccine compositions of the invention can also be used in conjunction with other treatments used for cancer, e.g., surgery, chemotherapy, drug therapies, radiation therapies, etc. including use in combination with immune adjuvants such as IL-2, IL-12, GM-CSF, and the like.

[0243] Cellular Vaccines:

[0244] CTL epitopes can be determined using specific algorithms to identify peptides within 158P1D7 protein that bind corresponding HLA alleles (see e.g., Table IV; Epimer™ and Epimatrix™, Brown University, BIMAS, and SYFPEI-THI). In a preferred embodiment, the 158P1D7 immunogen contains one or more amino acid sequences identified using techniques well known in the art, such as the sequences shown in Tables V-XVIII or a peptide of 8, 9, 10 or 11 amino acids specified by an HLA Class I motif/supermotif (e.g., Table IV (A), Table IV (D), or Table IV (E)) and/or a peptide of at least 9 amino acids that comprises an HLA Class II motif/supermotif (e.g., Table IV (B) or Table IV (C)). As is appreciated in the art, the HLA Class I binding groove is essentially closed ended so that peptides of only a particular size range can fit into the groove and be bound, generally HLA Class I epitopes are 8, 9, 10, or 11 amino acids long. In contrast, the HLA Class II binding groove is essentially open ended; therefore a peptide of about 9 or more amino acids can be bound by an HLA Class II molecule. Due to the binding groove differences between HLA Class I and II, HLA Class I motifs are length specific, i.e., position two of a Class I motif is the second amino acid in an amino to carboxyl direction of the peptide. The amino acid positions in a Class II motif are relative only to each other, not the overall peptide, i.e., additional amino acids can be attached to the amino and/or carboxyl termini of a motif-bearing sequence. HLA Class II

epitopes are often 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, or 25 amino acids long, or longer than 25 amino acids.

[0245] Antibody-Based Vaccines

[0246] A wide variety of methods for generating an immune response in a mammal are known in the art (for example as the first step in the generation of hybridomas). Methods of generating an immune response in a mammal comprise exposing the mammal's immune system to an immunogenic epitope on a protein (e.g. the 158P1D7 protein) so that an immune response is generated. A typical embodiment consists of a method for generating an immune response to 158P1D7 in a host, by contacting the host with a sufficient amount of at least one 158P1D7 B cell or cytotoxic T-cell epitope or analog thereof; and at least one periodic interval thereafter re-contacting the host with the 158P1D7 B cell or cytotoxic T-cell epitope or analog thereof. A specific embodiment consists of a method of generating an immune response against a 158P1D7-related protein or a man-made multi-epitopic peptide comprising: administering 158P1D7 immunogen (e.g. the 158P1D7 protein or a peptide fragment thereof, an 158P1D7 fusion protein or analog etc.) in a vaccine preparation to a human or another mammal. Typically, such vaccine preparations further contain a suitable adjuvant (see, e.g., U.S. Pat. No. 6,146,635) or a universal helper epitope such as a PADRE™ peptide (Epimmune Inc., San Diego, Calif.; see, e.g., Alexander et al., *J. Immunol.* 2000 164(3): 164(3): 1625-1633; Alexander et al., *Immunity* 1994 1(9): 751-761 and Alexander et al., *Immunol. Res.* 1998 18(2): 79-92). An alternative method comprises generating an immune response in an individual against a 158P1D7 immunogen by: administering in vivo to muscle or skin of the individual's body a DNA molecule that comprises a DNA sequence that encodes an 158P1D7 immunogen, the DNA sequence operatively linked to regulatory sequences which control the expression of the DNA sequence; wherein the DNA molecule is taken up by cells, the DNA sequence is expressed in the cells and an immune response is generated against the immunogen (see, e.g., U.S. Pat. No. 5,962,428). Optionally a genetic vaccine facilitator such as anionic lipids; saponins; lectins; estrogenic compounds; hydroxylated lower alkyls; dimethyl sulfoxide; and urea is also administered.

[0247] Nucleic Acid Vaccines:

[0248] Vaccine compositions of the invention include nucleic acid-mediated modalities. DNA or RNA that encode protein(s) of the invention can be administered to a patient. Genetic immunization methods can be employed to generate prophylactic or therapeutic humoral and cellular immune responses directed against cancer cells expressing 158P1D7. Constructs comprising DNA encoding a 158P1D7-related protein/immunogen and appropriate regulatory sequences can be injected directly into muscle or skin of an individual, such that the cells of the muscle or skin take-up the construct and express the encoded 158P1D7 protein/immunogen. Alternatively, a vaccine comprises a 158P1D7-related protein. Expression of the 158P1D7-related protein immunogen results in the generation of prophylactic or therapeutic humoral and cellular immunity against cells that bear 158P1D7 protein. Various prophylactic and therapeutic genetic immunization techniques known in the art can be used (for review, see information and references published at Internet address URL: genweb.com). Nucleic acid-based delivery is described, for instance, in Wolff et. al., *Science* 247:1465 (1990) as well as U.S. Pat. Nos. 5,580,859; 5,589,466; 5,804,

566; 5,739,118; 5,736,524; 5,679,647; WO 98/04720. Examples of DNA-based delivery technologies include “naked DNA”, facilitated (bupivacaine, polymers, peptide-mediated) delivery, cationic lipid complexes, and particle-mediated (“gene gun”) or pressure-mediated delivery (see, e.g., U.S. Pat. No. 5,922,687).

[0249] For therapeutic or prophylactic immunization purposes, proteins of the invention can be expressed via viral or bacterial vectors. Various viral gene delivery systems that can be used in the practice of the invention include, but are not limited to, vaccinia, fowlpox, canarypox, adenovirus, influenza, poliovirus, adeno-associated virus, lentivirus, and sindbis virus (see, e.g., Restifo, 1996, *Curr. Opin. Immunol.* 8:658-663; Tsang et al. *J. Natl. Cancer Inst.* 87:982-990 (1995)). Non-viral delivery systems can also be employed by introducing naked DNA encoding a 158P1D7-related protein into the patient (e.g., intramuscularly or intradermally) to induce an anti-tumor response.

[0250] Vaccinia virus is used, for example, as a vector to express nucleotide sequences that encode the peptides of the invention. Upon introduction into a host, the recombinant vaccinia virus expresses the protein immunogenic peptide, and thereby elicits a host immune response. Vaccinia vectors and methods useful in immunization protocols are described in, e.g., U.S. Pat. No. 4,722,848. Another vector is BCG (*Bacille Calmette Guérin*). BCG vectors are described in Stover et al., *Nature* 351:456-460 (1991). A wide variety of other vectors useful for therapeutic administration or immunization of the peptides of the invention, e.g. adeno and adeno-associated virus vectors, retroviral vectors, *Salmonella typhi* vectors, detoxified anthrax toxin vectors, and the like, will be apparent to those skilled in the art from the description herein.

[0251] Thus, gene delivery systems are used to deliver a 158P1D7-related nucleic acid molecule. In one embodiment, the full-length human 158P1D7 cDNA is employed. In another embodiment, 158P1D7 nucleic acid molecules encoding specific cytotoxic T lymphocyte (CTL) and/or antibody epitopes are employed.

[0252] *Ex Vivo* Vaccines

[0253] Various *ex vivo* strategies can also be employed to generate an immune response. One approach involves the use of antigen presenting cells (APCs) such as dendritic cells (DC) to present 158P1D7 antigen to a patient's immune system. Dendritic cells express MHC class I and II molecules, B7 co-stimulator, and IL-12, and are thus highly specialized antigen presenting cells. In bladder cancer, autologous dendritic cells pulsed with peptides of the MAGE-3 antigen are being used in a Phase I clinical trial to stimulate bladder cancer patients' immune systems (Nishiyama et al., 2001, *Clin Cancer Res.* 7(1):23-31). Thus, dendritic cells can be used to present 158P1D7 peptides to T cells in the context of MHC class I or II molecules. In one embodiment, autologous dendritic cells are pulsed with 158P1D7 peptides capable of binding to MHC class I and/or class II molecules. In another embodiment, dendritic cells are pulsed with the complete 158P1D7 protein. Yet another embodiment involves engineering the overexpression of the 158P1D7 gene in dendritic cells using various implementing vectors known in the art, such as adenovirus (Arthur et al., 1997, *Cancer Gene Ther.* 4:17-25), retrovirus (Henderson et al., 1996, *Cancer Res.* 56:3763-3770), lentivirus, adeno-associated virus, DNA transfection (Ribas et al., 1997, *Cancer Res.* 57:2865-2869), or tumor-derived RNA transfection (Ashley et al., 1997, *J.*

Exp. Med. 186:1177-1182). Cells that express 158P1D7 can also be engineered to express immune modulators, such as GM-CSF, and used as immunizing agents.

[0254] X.B.) 158P1D7 as a Target for Antibody-Based Therapy

[0255] 158P1D7 is an attractive target for antibody-based therapeutic strategies. A number of antibody strategies are known in the art for targeting both extracellular and intracellular molecules (see, e.g., complement and ADCC mediated killing as well as the use of intrabodies). Because 158P1D7 is expressed by cancer cells of various lineages relative to corresponding normal cells, systemic administration of 158P1D7-immunoreactive compositions are prepared that exhibit excellent sensitivity without toxic, non-specific and/or non-target effects caused by binding of the immunoreactive composition to non-target organs and tissues. Antibodies specifically reactive with domains of 158P1D7 are useful to treat 158P1D7-expressing cancers systemically, either as conjugates with a toxin or therapeutic agent, or as naked antibodies capable of inhibiting cell proliferation or function.

[0256] 158P1D7 antibodies can be introduced into a patient such that the antibody binds to 158P1D7 and modulates a function, such as an interaction with a binding partner, and consequently mediates destruction of the tumor cells and/or inhibits the growth of the tumor cells. Mechanisms by which such antibodies exert a therapeutic effect can include complement-mediated cytotoxicity, antibody-dependent cellular cytotoxicity, modulation of the physiological function of 158P1D7, inhibition of ligand binding or signal transduction pathways, modulation of tumor cell differentiation, alteration of tumor angiogenesis factor profiles, and/or apoptosis.

[0257] Those skilled in the art understand that antibodies can be used to specifically target and bind immunogenic molecules such as an immunogenic region of the 158P1D7 sequence shown in FIG. 2 or FIG. 3. In addition, skilled artisans understand that it is routine to conjugate antibodies to cytotoxic agents (see, e.g., Slevens et al. *Blood* 93:11 3678-3684 (Jun. 1, 1999)). When cytotoxic and/or therapeutic agents are delivered directly to cells, such as by conjugating them to antibodies specific for a molecule expressed by that cell (e.g. 158P1D7), the cytotoxic agent will exert its known biological effect (i.e. cytotoxicity) on those cells.

[0258] A wide variety of compositions and methods for using antibody-cytotoxic agent conjugates to kill cells are known in the art. In the context of cancers, typical methods entail administering to an animal having a tumor a biologically effective amount of a conjugate comprising a selected cytotoxic and/or therapeutic agent linked to a targeting agent (e.g. an anti-158P1D7 antibody) that binds to a marker (e.g. 158P1D7) expressed, accessible to binding or localized on the cell surfaces. A typical embodiment is a method of delivering a cytotoxic and/or therapeutic agent to a cell expressing 158P1D7, comprising conjugating the cytotoxic agent to an antibody that immunospecifically binds to a 158P1D7 epitope, and, exposing the cell to the antibody-agent conjugate. Another illustrative embodiment is a method of treating an individual suspected of suffering from metastasized cancer, comprising a step of administering parenterally to said individual a pharmaceutical composition comprising a therapeutically effective amount of an antibody conjugated to a cytotoxic and/or therapeutic agent.

[0259] Cancer immunotherapy using anti-158P1D7 antibodies can be done in accordance with various approaches that have been successfully employed in the treatment of

other types of cancer, including but not limited to colon cancer (Arlen et al., 1998, Crit. Rev. Immunol. 18:133-138), multiple myeloma (Ozaki et al., 1997, Blood 90:3179-3186, Tsunenari et al., 1997, Blood 90:2437-2444), gastric cancer (Kasprzyk et al., 1992, Cancer Res. 52:2771-2776), B-cell lymphoma (Funakoshi et al., 1996, J. Immunother. Emphasis Tumor Immunol. 19:93-101), leukemia (Zhong et al., 1996, Leuk. Res. 20:581-589), colorectal cancer (Moun et al., 1994, Cancer Res. 54:6160-6166; Velders et al., 1995, Cancer Res. 55:4398-4403), and breast cancer (Shepard et al., 1991, J. Clin. Immunol. 11:117-127). Some therapeutic approaches involve conjugation of naked antibody to a toxin, such as the conjugation of Y91 or 1131 to anti-CD20 antibodies (e.g., Zevalin™, IDEC Pharmaceuticals Corp. or Bexxar™, Coulter Pharmaceuticals), while others involve co-administration of antibodies and other therapeutic agents, such as Herceptin™ (trastuzumab) with paclitaxel (Genentech, Inc.). To treat bladder cancer, for example, 158P1D7 antibodies can be administered in conjunction with radiation, chemotherapy or hormone ablation.

[0260] Although 158P1D7 antibody therapy is useful for all stages of cancer, antibody therapy can be particularly appropriate in advanced or metastatic cancers. Treatment with the antibody therapy of the invention is indicated for patients who have received one or more rounds of chemotherapy. Alternatively, antibody therapy of the invention is combined with a chemotherapeutic or radiation regimen for patients who have not received chemotherapeutic treatment. Additionally, antibody therapy can enable the use of reduced dosages of concomitant chemotherapy, particularly for patients who do not tolerate the toxicity of the chemotherapeutic agent very well.

[0261] Cancer patients can be evaluated for the presence and level of 158P1D7 expression, preferably using immunohistochemical assessments of tumor tissue, quantitative 158P1D7 imaging, or other techniques that reliably indicate the presence and degree of 158P1D7 expression. Immunohistochemical analysis of tumor biopsies or surgical specimens is preferred for this purpose. Methods for immunohistochemical analysis of tumor tissues are well known in the art.

[0262] Anti-158P1D7 monoclonal antibodies that treat bladder and other cancers include those that initiate a potent immune response against the tumor or those that are directly cytotoxic. In this regard, anti-158P1D7 monoclonal antibodies (mAbs) can elicit tumor cell lysis by either complement-mediated or antibody-dependent cell cytotoxicity (ADCC) mechanisms, both of which require an intact Fc portion of the immunoglobulin molecule for interaction with effector cell Fc receptor sites on complement proteins. In addition, anti-158P1D7 mAbs that exert a direct biological effect on tumor growth are useful to treat cancers that express 158P1D7. Mechanisms by which directly cytotoxic mAbs act include: inhibition of cell growth, modulation of cellular differentiation, modulation of tumor angiogenesis factor profiles, and the induction of apoptosis. The mechanism(s) by which a particular anti-158P1D7 mAb exerts an anti-tumor effect is evaluated using any number of in vitro assays that evaluate cell death such as ADCC, ADMMC, complement-mediated cell lysis, and so forth, as is generally known in the art.

[0263] In some patients, the use of murine or other non-human monoclonal antibodies, or human/mouse chimeric mAbs can induce moderate to strong immune responses against the non-human antibody. This can result in clearance of the antibody from circulation and reduced efficacy. In the

most severe cases, such an immune response can lead to the extensive formation of immune complexes which, potentially, can cause renal failure. Accordingly, preferred monoclonal antibodies used in the therapeutic methods of the invention are those that are either fully human or humanized and that bind specifically to the target 158P1D7 antigen with high affinity but exhibit low or no antigenicity in the patient.

[0264] Therapeutic methods of the invention contemplate the administration of single anti-158P1D7 mAbs as well as combinations, or cocktails, of different mAbs. Such mAb cocktails can have certain advantages inasmuch as they contain mAbs that target different epitopes, exploit different effector mechanisms or combine directly cytotoxic mAbs with mAbs that rely on immune effector functionality. Such mAbs in combination can exhibit synergistic therapeutic effects. In addition, anti-158P1D7 mAbs can be administered concomitantly with other therapeutic modalities, including but not limited to various chemotherapeutic agents, androgen-blockers, immune modulators (e.g., IL-2, GM-CSF), surgery or radiation. The anti-158P1D7 mAbs are administered in their “naked” or unconjugated form, or can have a therapeutic agent(s) conjugated to them.

[0265] Anti-158P1D7 antibody formulations are administered via any route capable of delivering the antibodies to a tumor cell. Routes of administration include, but are not limited to, intravenous, intraperitoneal, intramuscular, intratumor, intradermal, and the like. Treatment generally involves repeated administration of the anti-158P1D7 antibody preparation, via an acceptable route of administration such as intravenous injection (IV), typically at a dose in the range of about 0.1 to about 10 mg/kg body weight. In general, doses in the range of 10-500 mg mAb per week are effective and well tolerated.

[0266] Based on clinical experience with the Herceptin mAb in the treatment of metastatic breast cancer, an initial loading dose of approximately 4 mg/kg patient body weight IV, followed by weekly doses of about 2 mg/kg IV of the anti-158P1D7 mAb preparation represents an acceptable dosing regimen. Preferably, the initial loading dose is administered as a 90 minute or longer infusion. The periodic maintenance dose is administered as a 30 minute or longer infusion, provided the initial dose was well tolerated. As appreciated by those of skill in the art, various factors can influence the ideal dose regimen in a particular case. Such factors include, for example, the binding affinity and half life of the Ab or mAbs used, the degree of 158P1D7 expression in the patient, the extent of circulating shed 158P1D7 antigen, the desired steady-state antibody concentration level, frequency of treatment, and the influence of chemotherapeutic or other agents used in combination with the treatment method of the invention, as well as the health status of a particular patient.

[0267] Optionally, patients should be evaluated for the levels of 158P1D7 in a given sample (e.g. the levels of circulating 158P1D7 antigen and/or 158P1D7 expressing cells) in order to assist in the determination of the most effective dosing regimen, etc. Such evaluations are also used for monitoring purposes throughout therapy, and are useful to gauge therapeutic success in combination with the evaluation of other parameters (for example, urine cytology and/or ImmunoCyt levels in bladder cancer therapy, or by analogy, serum PSA levels in prostate cancer therapy).

[0268] Anti-idiotypic anti-158P1D7 antibodies can also be used in anti-cancer therapy as a vaccine for inducing an immune response to cells expressing a 158P1D7-related pro-

tein. In particular, the generation of anti-idiotypic antibodies is well known in the art; this methodology can readily be adapted to generate anti-idiotypic anti-158P1D7 antibodies that mimic an epitope on a 158P1D7-related protein (see, for example, Wagner et al., 1997, Hybridoma 16: 33-40; Foon et al., 1995, J. Clin. Invest. 96:334-342; Herlyn et al., 1996, Cancer Immunol. Immunother. 43:65-76). Such an anti-idiotypic antibody can be used in cancer vaccine strategies.

[0269] X.C.) 158P1D7 as a Target for Cellular Immune Responses

[0270] Vaccines and methods of preparing vaccines that contain an immunogenically effective amount of one or more HLA-binding peptides as described herein are further embodiments of the invention. Furthermore, vaccines in accordance with the invention encompass compositions of one or more of the claimed peptides. A peptide can be present in a vaccine individually. Alternatively, the peptide can exist as a homopolymer comprising multiple copies of the same peptide, or as a heteropolymer of various peptides. Polymers have the advantage of increased immunological reaction and, where different peptide epitopes are used to make up the polymer, the additional ability to induce antibodies and/or CTLs that react with different antigenic determinants of the pathogenic organism or tumor-related peptide targeted for an immune response. The composition can be a naturally occurring region of an antigen or can be prepared, e.g., recombinantly or by chemical synthesis.

[0271] Carriers that can be used with vaccines of the invention are well known in the art, and include, e.g., thyroglobulin, albumins such as human serum albumin, tetanus toxoid, polyamino acids such as poly 1-lysine, poly 1-glutamic acid, influenza, hepatitis B virus core protein, and the like. The vaccines can contain a physiologically tolerable (i.e., acceptable) diluent such as water, or saline, preferably phosphate buffered saline. The vaccines also typically include an adjuvant. Adjuvants such as incomplete Freund's adjuvant, aluminum phosphate, aluminum hydroxide, or alum are examples of materials well known in the art. Additionally, as disclosed herein, CTL responses can be primed by conjugating peptides of the invention to lipids, such as tripalmitoyl-S-glycerylcysteinylserine (P3CSS). Moreover, an adjuvant such as a synthetic cytosine-phosphorothiolated-guanine-containing (CpG) oligonucleotides has been found to increase CTL responses 10- to 100-fold. (see, e.g. Davila and Celis J. Immunol. 165:539-547 (2000))

[0272] Upon immunization with a peptide composition in accordance with the invention, via injection, aerosol, oral, transdermal, transmucosal, intrapleural, intrathecal, or other suitable routes, the immune system of the host responds to the vaccine by producing large amounts of CTLs and/or HTLs specific for the desired antigen. Consequently, the host becomes at least partially immune to later development of cells that express or overexpress 158P1D7 antigen, or derives at least some therapeutic benefit when the antigen was tumor-associated.

[0273] In some embodiments, it may be desirable to combine the class I peptide components with components that induce or facilitate neutralizing antibody and/or helper T cell responses directed to the target antigen. A preferred embodiment of such a composition comprises class I and class II epitopes in accordance with the invention. An alternative embodiment of such a composition comprises a class I and/or class II epitope in accordance with the invention, along with

a cross reactive HTL epitope such as PADRE™ (Epimmune, San Diego, Calif.) molecule (described e.g., in U.S. Pat. No. 5,736,142).

[0274] A vaccine of the invention can also include antigen-presenting cells (APC), such as dendritic cells (DC), as a vehicle to present peptides of the invention. Vaccine compositions can be created in vitro, following dendritic cell mobilization and harvesting, whereby loading of dendritic cells occurs in vitro. For example, dendritic cells are transfected, e.g., with a minigene in accordance with the invention, or are pulsed with peptides. The dendritic cell can then be administered to a patient to elicit immune responses in vivo. Vaccine compositions, either DNA- or peptide-based, can also be administered in vivo in combination with dendritic cell mobilization whereby loading of dendritic cells occurs in vivo.

[0275] Preferably, the following principles are utilized when selecting an array of epitopes for inclusion in a poly-epitopic composition for use in a vaccine, or for selecting discrete epitopes to be included in a vaccine and/or to be encoded by nucleic acids such as a minigene. It is preferred that each of the following principles be balanced in order to make the selection. The multiple epitopes to be incorporated in a given vaccine composition may be, but need not be, contiguous in sequence in the native antigen from which the epitopes are derived.

[0276] 1.) Epitopes are selected which, upon administration, mimic immune responses that have been observed to be correlated with tumor clearance. For HLA Class I this includes 3-4 epitopes that come from at least one tumor associated antigen (TAA). For HLA Class II a similar rationale is employed; again 3-4 epitopes are selected from at least one TAA (see, e.g., Rosenberg et al., Science 278:1447-1450). Epitopes from one TAA may be used in combination with epitopes from one or more additional TAAs to produce a vaccine that targets tumors with varying expression patterns of frequently-expressed TAAs.

[0277] 2.) Epitopes are selected that have the requisite binding affinity established to be correlated with immunogenicity: for HLA Class I an IC50 of 500 nM or less, often 200 nM or less; and for Class II an IC50 of 1000 nM or less.

[0278] 3.) Sufficient supermotif bearing-peptides, or a sufficient array of allele-specific motif-bearing peptides, are selected to give broad population coverage. For example, it is preferable to have at least 80% population coverage. A Monte Carlo analysis, a statistical evaluation known in the art, can be employed to assess the breadth, or redundancy of, population coverage.

[0279] 4.) When selecting epitopes from cancer-related antigens it is often useful to select analogs because the patient may have developed tolerance to the native epitope.

[0280] 5.) Of particular relevance are epitopes referred to as "nested epitopes." Nested epitopes occur where at least two epitopes overlap in a given peptide sequence. A nested peptide sequence can comprise B cell, HLA class I and/or HLA class II epitopes. When providing nested epitopes, a general objective is to provide the greatest number of epitopes per sequence. Thus, an aspect is to avoid providing a peptide that is any longer than the amino terminus of the amino terminal epitope and the carboxyl terminus of the carboxyl terminal epitope in the peptide. When providing a multi-epitopic sequence, such as a sequence comprising nested epitopes, it is generally important to screen the sequence in order to insure that it does not have pathological or other deleterious biological properties.

[0281] 6.) If a polypeptidic protein is created, or when creating a minigene, an objective is to generate the smallest peptide that encompasses the epitopes of interest. This principle is similar, if not the same as that employed when selecting a peptide comprising nested epitopes. However, with an artificial polypeptidic peptide, the size minimization objective is balanced against the need to integrate any spacer sequences between epitopes in the polypeptidic protein. Spacer amino acid residues can, for example, be introduced to avoid junctional epitopes (an epitope recognized by the immune system, not present in the target antigen, and only created by the man-made juxtaposition of epitopes), or to facilitate cleavage between epitopes and thereby enhance epitope presentation. Junctional epitopes are generally to be avoided because the recipient may generate an immune response to that non-native epitope. Of particular concern is a junctional epitope that is a "dominant epitope." A dominant epitope may lead to such a zealous response that immune responses to other epitopes are diminished or suppressed.

[0282] 7.) Where the sequences of multiple variants of the same target protein are present, potential peptide epitopes can also be selected on the basis of their conservancy. For example, a criterion for conservancy may define that the entire sequence of an HLA class I binding peptide or the entire 9-mer core of a class II binding peptide be conserved in a designated percentage of the sequences evaluated for a specific protein antigen.

[0283] X.C.1. Minigene Vaccines

[0284] A number of different approaches are available which allow simultaneous delivery of multiple epitopes. Nucleic acids encoding the peptides of the invention are a particularly useful embodiment of the invention. Epitopes for inclusion in a minigene are preferably selected according to the guidelines set forth in the previous section. A preferred means of administering nucleic acids encoding the peptides of the invention uses minigene constructs encoding a peptide comprising one or multiple epitopes of the invention.

[0285] The use of multi-epitope minigenes is described below and in, Ishioka et al., J. Immunol. 162:3915-3925, 1999; An, L. and Whitton, J. L., J. Virol. 71:2292, 1997; Thomson, S.A. et al., J. Immunol. 157:822, 1996; Whitton, J. L. et al., J. Virol. 67:348, 1993; Hanke, R. et al., Vaccine 16:426, 1998. For example, a multi-epitope DNA plasmid encoding supermotif- and/or motif-bearing epitopes derived 158PID7, the PADRE® universal helper T cell epitope (or multiple HTL epitopes from 158PID7), and an endoplasmic reticulum-translocating signal sequence can be engineered. A vaccine may also comprise epitopes that are derived from other TAAs.

[0286] The immunogenicity of a multi-epitopic minigene can be confirmed in transgenic mice to evaluate the magnitude of CTL induction responses against the epitopes tested. Further, the immunogenicity of DNA-encoded epitopes in vivo can be correlated with the in vitro responses of specific CTL lines against target cells transfected with the DNA plasmid. Thus, these experiments can show that the minigene serves to both: 1.) generate a CTL response and 2.) that the induced CTLs recognized cells expressing the encoded epitopes.

[0287] For example, to create a DNA sequence encoding the selected epitopes (minigene) for expression in human cells, the amino acid sequences of the epitopes may be reverse translated. A human codon usage table can be used to guide the codon choice for each amino acid. These epitope-encod-

ing DNA sequences may be directly adjoined, so that when translated, a continuous polypeptide sequence is created. To optimize expression and/or immunogenicity, additional elements can be incorporated into the minigene design. Examples of amino acid sequences that can be reverse translated and included in the minigene sequence include: HLA class I epitopes, HLA class II epitopes, antibody epitopes, a ubiquitination signal sequence, and/or an endoplasmic reticulum targeting signal. In addition, HLA presentation of CTL and HTL epitopes may be improved by including synthetic (e.g. poly-alanine) or naturally-occurring flanking sequences adjacent to the CTL or HTL epitopes; these larger peptides comprising the epitope(s) are within the scope of the invention.

[0288] The minigene sequence may be converted to DNA by assembling oligonucleotides that encode the plus and minus strands of the minigene. Overlapping oligonucleotides (30-100 bases long) may be synthesized, phosphorylated, purified and annealed under appropriate conditions using well known techniques. The ends of the oligonucleotides can be joined, for example, using T4 DNA ligase. This synthetic minigene, encoding the epitope polypeptide, can then be cloned into a desired expression vector.

[0289] Standard regulatory sequences well known to those of skill in the art are preferably included in the vector to ensure expression in the target cells. Several vector elements are desirable: a promoter with a down-stream cloning site for minigene insertion; a polyadenylation signal for efficient transcription termination; an *E. coli* origin of replication; and an *E. coli* selectable marker (e.g. ampicillin or kanamycin resistance). Numerous promoters can be used for this purpose, e.g., the human cytomegalovirus (hCMV) promoter. See, e.g., U.S. Pat. Nos. 5,580,859 and 5,589,466 for other suitable promoter sequences.

[0290] Additional vector modifications may be desired to optimize minigene expression and immunogenicity. In some cases, introns are required for efficient gene expression, and one or more synthetic or naturally-occurring introns could be incorporated into the transcribed region of the minigene. The inclusion of mRNA stabilization sequences and sequences for replication in mammalian cells may also be considered for increasing minigene expression.

[0291] Once an expression vector is selected, the minigene is cloned into the polylinker region downstream of the promoter. This plasmid is transformed into an appropriate *E. coli* strain, and DNA is prepared using standard techniques. The orientation and DNA sequence of the minigene, as well as all other elements included in the vector, are confirmed using restriction mapping and DNA sequence analysis. Bacterial cells harboring the correct plasmid can be stored as a master cell bank and a working cell bank.

[0292] In addition, immunostimulatory sequences (ISSs or CpGs) appear to play a role in the immunogenicity of DNA vaccines. These sequences may be included in the vector, outside the minigene coding sequence, if desired to enhance immunogenicity.

[0293] In some embodiments, a bi-cistronic expression vector which allows production of both the minigene-encoded epitopes and a second protein (included to enhance or decrease immunogenicity) can be used. Examples of proteins or polypeptides that could beneficially enhance the immune response if co-expressed include cytokines (e.g., IL-2, IL-12, GM-CSF), cytokine-inducing molecules (e.g., LeIF), costimulatory molecules, or for HTL responses, pan-DR

binding proteins (PADRE™, Epimmune, San Diego, Calif.). Helper (HTL) epitopes can be joined to intracellular targeting signals and expressed separately from expressed CTL epitopes; this allows direction of the HTL epitopes to a cell compartment different than that of the CTL epitopes. If required, this could facilitate more efficient entry of HTL epitopes into the HLA class II pathway, thereby improving HTL induction. In contrast to HTL or CTL induction, specifically decreasing the immune response by co-expression of immunosuppressive molecules (e.g. TGF- β) may be beneficial in certain diseases.

[0294] Therapeutic quantities of plasmid DNA can be produced for example, by fermentation in *E. coli*, followed by purification. Aliquots from the working cell bank are used to inoculate growth medium, and grown to saturation in shaker flasks or a bioreactor according to well-known techniques. Plasmid DNA can be purified using standard bioseparation technologies such as solid phase anion-exchange resins supplied by QIAGEN, Inc. (Valencia, Calif.). If required, supercoiled DNA can be isolated from the open circular and linear forms using gel electrophoresis or other methods.

[0295] Purified plasmid DNA can be prepared for injection using a variety of formulations. The simplest of these is reconstitution of lyophilized DNA in sterile phosphate-buffer saline (PBS). This approach, known as “naked DNA,” is currently being used for intramuscular (IM) administration in clinical trials. To maximize the immunotherapeutic effects of minigene DNA vaccines, an alternative method for formulating purified plasmid DNA may be desirable. A variety of methods have been described, and new techniques may become available. Cationic lipids, glycolipids, and fusogenic liposomes can also be used in the formulation (see, e.g., as described by WO 93/24640; Mannino & Gould-Fogerite, *BioTechniques* 6(7): 682 (1988); U.S. Pat. No. 5,279,833; WO 91/06309; and Felgner, et al., *Proc. Nat’l Acad. Sci. USA* 84:7413 (1987). In addition, peptides and compounds referred to collectively as protective, interactive, non-condensing compounds (PINC) could also be complexed to purified plasmid DNA to influence variables such as stability, intramuscular dispersion, or trafficking to specific organs or cell types.

[0296] Target cell sensitization can be used as a functional assay for expression and HLA class I presentation of minigene-encoded CTL epitopes. For example, the plasmid DNA is introduced into a mammalian cell line that is suitable as a target for standard CTL chromium release assays. The transfection method used will be dependent on the final formulation. Electroporation can be used for “naked” DNA, whereas cationic lipids allow direct in vitro transfection. A plasmid expressing green fluorescent protein (GFP) can be co-transfected to allow enrichment of transfected cells using fluorescence activated cell sorting (FACS). These cells are then chromium-51 (51Cr) labeled and used as target cells for epitope-specific CTL lines; cytotoxicity, detected by 51Cr release, indicates both production of, and HLA presentation of, minigene-encoded CTL epitopes. Expression of HTL epitopes may be evaluated in an analogous manner using assays to assess HTL activity.

[0297] In vivo immunogenicity is a second approach for functional testing of minigene DNA formulations. Transgenic mice expressing appropriate human HLA proteins are immunized with the DNA product. The dose and route of administration are formulation dependent (e.g., IM for DNA in PBS, intraperitoneal (i.p.) for lipid-complexed DNA).

Twenty-one days after immunization, splenocytes are harvested and restimulated for one week in the presence of peptides encoding each epitope being tested. Thereafter, for CTL effector cells, assays are conducted for cytolysis of peptide-loaded, 51Cr-labeled target cells using standard techniques. Lysis of target cells that were sensitized by HLA loaded with peptide epitopes, corresponding to minigene-encoded epitopes, demonstrates DNA vaccine function for in vivo induction of CTLs. Immunogenicity of HTL epitopes is confirmed in transgenic mice in an analogous manner.

[0298] Alternatively, the nucleic acids can be administered using ballistic delivery as described, for instance, in U.S. Pat. No. 5,204,253. Using this technique, particles comprised solely of DNA are administered. In a further alternative embodiment, DNA can be adhered to particles, such as gold particles.

[0299] Minigenes can also be delivered using other bacterial or viral delivery systems well known in the art, e.g., an expression construct encoding epitopes of the invention can be incorporated into a viral vector such as vaccinia.

[0300] X.C.2. Combinations of CTL Peptides with Helper Peptides

[0301] Vaccine compositions comprising CTL peptides of the invention can be modified, e.g., analoged, to provide desired attributes, such as improved serum half life, broadened population coverage or enhanced immunogenicity.

[0302] For instance, the ability of a peptide to induce CTL activity can be enhanced by linking the peptide to a sequence which contains at least one epitope that is capable of inducing a T helper cell response. Although a CTL peptide can be directly linked to a T helper peptide, often CTL epitope/HTL epitope conjugates are linked by a spacer molecule. The spacer is typically comprised of relatively small, neutral molecules, such as amino acids or amino acid mimetics, which are substantially uncharged under physiological conditions. The spacers are typically selected from, e.g., Ala, Gly, or other neutral spacers of nonpolar amino acids or neutral polar amino acids. It will be understood that the optionally present spacer need not be comprised of the same residues and thus may be a hetero- or homo-oligomer. When present, the spacer will usually be at least one or two residues, more usually three to six residues and sometimes 10 or more residues. The CTL peptide epitope can be linked to the T helper peptide epitope either directly or via a spacer either at the amino or carboxy terminus of the CTL peptide. The amino terminus of either the immunogenic peptide or the T helper peptide may be acylated.

[0303] In certain embodiments, the T helper peptide is one that is recognized by T helper cells present in a majority of a genetically diverse population. This can be accomplished by selecting peptides that bind to many, most, or all of the HLA class II molecules. Examples of such amino acid bind many HLA Class II molecules include sequences from antigens such as tetanus toxoid at positions 830-843 (QYIKAN-SKFIGITE; SEQ ID NO: 24), *Plasmodium falciparum* circumsporozoite (CS) protein at positions 378-398 (DIEKKI-AKMEKASSVFNVNS; SEQ ID NO: 25), and *Streptococcus* 18 kD protein at positions 116-131 (GAVD-SILGGVATYGAA; SEQ ID NO: 26). Other examples include peptides bearing a DR 1-4-7 supermotif, or either of the DR3 motifs.

[0304] Alternatively, it is possible to prepare synthetic peptides capable of stimulating T helper lymphocytes, in a loosely HLA-restricted fashion, using amino acid sequences

not found in nature (see, e.g., PCT publication WO 95/07707). These synthetic compounds called Pan-DR-binding epitopes (e.g., PADRE™, Epimmune, Inc., San Diego, Calif.) are designed to most preferably bind most HLA-DR (human HLA class II) molecules. For instance, a pan-DR-binding epitope peptide having the formula: aKXVAAWTL-KAAa (SEQ ID NO: 27), where “X” is either cyclohexylalanine, phenylalanine, or tyrosine, and a is either d-alanine or l-alanine, has been found to bind to most HLA-DR alleles, and to stimulate the response of T helper lymphocytes from most individuals, regardless of their HLA type. An alternative of a pan-DR binding epitope comprises all “L” natural amino acids and can be provided in the form of nucleic acids that encode the epitope.

[0305] HTL peptide epitopes can also be modified to alter their biological properties. For example, they can be modified to include d-amino acids to increase their resistance to proteases and thus extend their serum half life, or they can be conjugated to other molecules such as lipids, proteins, carbohydrates, and the like to increase their biological activity. For example, a T helper peptide can be conjugated to one or more palmitic acid chains at either the amino or carboxyl termini.

[0306] X.C.3. Combinations of CTL Peptides with T Cell Priming Agents

[0307] In some embodiments it may be desirable to include in the pharmaceutical compositions of the invention at least one component which primes B lymphocytes or T lymphocytes. Lipids have been identified as agents capable of priming CTL in vivo. For example, palmitic acid residues can be attached to the ϵ - and α -amino groups of a lysine residue and then linked, e.g., via one or more linking residues such as Gly, Gly-Gly-, Ser, Ser-Ser, or the like, to an immunogenic peptide. The lipidated peptide can then be administered either directly in a micelle or particle, incorporated into a liposome, or emulsified in an adjuvant, e.g., incomplete Freund's adjuvant. In a preferred embodiment, a particularly effective immunogenic composition comprises palmitic acid attached to ϵ - and α -amino groups of Lys, which is attached via linkage, e.g., Ser-Ser, to the amino terminus of the immunogenic peptide.

[0308] As another example of lipid priming of CTL responses, *E. coli* lipoproteins, such as tripalmitoyl-S-glycerylcysteinylserine (P3CSS) can be used to prime virus specific CTL when covalently attached to an appropriate peptide (see, e.g., Deres, et al., Nature 342:561, 1989). Peptides of the invention can be coupled to P3CSS, for example, and the lipopeptide administered to an individual to specifically prime an immune response to the target antigen. Moreover, because the induction of neutralizing antibodies can also be primed with P3CSS-conjugated epitopes, two such compositions can be combined to more effectively elicit both humoral and cell-mediated responses.

[0309] X.C.4. Vaccine Compositions Comprising DC Pulsed with CTL and/or HTL Peptides

[0310] An embodiment of a vaccine composition in accordance with the invention comprises ex vivo administration of a cocktail of epitope-bearing peptides to PBMC, or isolated DC therefrom, from the patient's blood. A pharmaceutical to facilitate harvesting of DC can be used, such as Progenipoint™ (Pharmacia-Monsanto, St. Louis, Mo.) or GM-CSF/IL-4. After pulsing the DC with peptides and prior to reinfusion into patients, the DC are washed to remove unbound peptides. In this embodiment, a vaccine comprises peptide-

pulsed DCs which present the pulsed peptide epitopes complexed with HLA molecules on their surfaces.

[0311] The DC can be pulsed ex vivo with a cocktail of peptides, some of which stimulate CTL responses to 158P1D7. Optionally, a helper T cell (HTL) peptide, such as a natural or artificial loosely restricted HLA Class II peptide, can be included to facilitate the CTL response. Thus, a vaccine in accordance with the invention is used to treat a cancer which expresses or overexpresses 158P1D7.

[0312] X.D. Adoptive Immunotherapy

[0313] Antigenic 158P1D7-related peptides are used to elicit a CTL and/or HTL response ex vivo, as well. The resulting CTL or HTL cells, can be used to treat tumors in patients that do not respond to other conventional forms of therapy, or will not respond to a therapeutic vaccine peptide or nucleic acid in accordance with the invention. Ex vivo CTL or HTL responses to a particular antigen are induced by incubating in tissue culture the patient's, or genetically compatible, CTL or HTL precursor cells together with a source of antigen-presenting cells (APC), such as dendritic cells, and the appropriate immunogenic peptide. After an appropriate incubation time (typically about 7-28 days), in which the precursor cells are activated and expanded into effector cells, the cells are infused back into the patient, where they will destroy (CTL) or facilitate destruction (HTL) of their specific target cell (e.g., a tumor cell). Transfected dendritic cells may also be used as antigen presenting cells.

[0314] X.E. Administration of Vaccines for Therapeutic or Prophylactic Purposes

[0315] Pharmaceutical and vaccine compositions of the invention are typically used to treat and/or prevent a cancer that expresses or overexpresses 158P1D7. In therapeutic applications, peptide and/or nucleic acid compositions are administered to a patient in an amount sufficient to elicit an effective B cell, CTL and/or HTL response to the antigen and to cure or at least partially arrest or slow symptoms and/or complications. An amount adequate to accomplish this is defined as “therapeutically effective dose.” Amounts effective for this use will depend on, e.g., the particular composition administered, the manner of administration, the stage and severity of the disease being treated, the weight and general state of health of the patient, and the judgment of the prescribing physician.

[0316] For pharmaceutical compositions, the immunogenic peptides of the invention, or DNA encoding them, are generally administered to an individual already bearing a tumor that expresses 158P1D7. The peptides or DNA encoding them can be administered individually or as fusions of one or more peptide sequences. Patients can be treated with the immunogenic peptides separately or in conjunction with other treatments, such as surgery, as appropriate.

[0317] For therapeutic use, administration should generally begin at the first diagnosis of 158P1D7-associated cancer. This is followed by boosting doses until at least symptoms are substantially abated and for a period thereafter. The embodiment of the vaccine composition (i.e., including, but not limited to embodiments such as peptide cocktails, polypeptidic polypeptides, minigenes, or TAA-specific CTLs or pulsed dendritic cells) delivered to the patient may vary according to the stage of the disease or the patient's health status. For example, in a patient with a tumor that expresses 158P1D7, a vaccine comprising 158P1D7-specific CTL may be more efficacious in killing tumor cells in patient with advanced disease than alternative embodiments.

[0318] It is generally important to provide an amount of the peptide epitope delivered by a mode of administration sufficient to effectively stimulate a cytotoxic T cell response; compositions which stimulate helper T cell responses can also be given in accordance with this embodiment of the invention.

[0319] The dosage for an initial therapeutic immunization generally occurs in a unit dosage range where the lower value is about 1, 5, 50, 500, or 1,000 µg and the higher value is about 10,000; 20,000; 30,000; or 50,000 µg. Dosage values for a human typically range from about 500 µg to about 50,000 µg per 70 kilogram patient. Boosting dosages of between about 1.0 µg to about 50,000 µg of peptide pursuant to a boosting regimen over weeks to months may be administered depending upon the patient's response and condition as determined by measuring the specific activity of CTL and HTL obtained from the patient's blood. Administration should continue until at least clinical symptoms or laboratory tests indicate that the neoplasia, has been eliminated or reduced and for a period thereafter. The dosages, routes of administration, and dose schedules are adjusted in accordance with methodologies known in the art.

[0320] In certain embodiments, the peptides and compositions of the present invention are employed in serious disease states, that is, life-threatening or potentially life threatening situations. In such cases, as a result of the minimal amounts of extraneous substances and the relative nontoxic nature of the peptides in preferred compositions of the invention, it is possible and may be felt desirable by the treating physician to administer substantial excesses of these peptide compositions relative to these stated dosage amounts.

[0321] The vaccine compositions of the invention can also be used purely as prophylactic agents. Generally the dosage for an initial prophylactic immunization generally occurs in a unit dosage range where the lower value is about 1, 5, 50, 500, or 1000 µg and the higher value is about 10,000; 20,000; 30,000; or 50,000 µg. Dosage values for a human typically range from about 500 µg to about 50,000 µg per 70 kilogram patient. This is followed by boosting dosages of between about 1.0 µg to about 50,000 µg of peptide administered at defined intervals from about four weeks to six months after the initial administration of vaccine. The immunogenicity of the vaccine can be assessed by measuring the specific activity of CTL and HTL obtained from a sample of the patient's blood.

[0322] The pharmaceutical compositions for therapeutic treatment are intended for parenteral, topical, oral, nasal, intrathecal, or local (e.g. as a cream or topical ointment) administration. Preferably, the pharmaceutical compositions are administered parentally, e.g., intravenously, subcutaneously, intradermally, or intramuscularly. Thus, the invention provides compositions for parenteral administration which comprise a solution of the immunogenic peptides dissolved or suspended in an acceptable carrier, preferably an aqueous carrier.

[0323] A variety of aqueous carriers may be used, e.g., water, buffered water, 0.8% saline, 0.3% glycine, hyaluronic acid and the like. These compositions may be sterilized by conventional, well-known sterilization techniques, or may be sterile filtered. The resulting aqueous solutions may be packaged for use as is, or lyophilized, the lyophilized preparation being combined with a sterile solution prior to administration.

[0324] The compositions may contain pharmaceutically acceptable auxiliary substances as required to approximate

physiological conditions, such as pH-adjusting and buffering agents, tonicity adjusting agents, wetting agents, preservatives, and the like, for example, sodium acetate, sodium lactate, sodium chloride, potassium chloride, calcium chloride, sorbitan monolaurate, triethanolamine oleate, etc.

[0325] The concentration of peptides of the invention in the pharmaceutical formulations can vary widely, i.e., from less than about 0.1%, usually at or at least about 2% to as much as 20% to 50% or more by weight, and will be selected primarily by fluid volumes, viscosities, etc., in accordance with the particular mode of administration selected.

[0326] A human unit dose form of the peptide composition is typically included in a pharmaceutical composition that comprises a human unit dose of an acceptable carrier, preferably an aqueous carrier, and is administered in a volume of fluid that is known by those of skill in the art to be used for administration of such compositions to humans (see, e.g., Remington's Pharmaceutical Sciences, 17th Edition, A. Gennaro, Editor, Mack Publishing Co., Easton, Pa., 1985).

[0327] Proteins(s) of the invention, and/or nucleic acids encoding the protein(s), can also be administered via liposomes, which may also serve to: 1) target the proteins(s) to a particular tissue, such as lymphoid tissue; 2) to target selectively to diseases cells; or, 3) to increase the half-life of the peptide composition. Liposomes include emulsions, foams, micelles, insoluble monolayers, liquid crystals, phospholipid dispersions, lamellar layers and the like. In these preparations, the peptide to be delivered is incorporated as part of a liposome, alone or in conjunction with a molecule which binds to a receptor prevalent among lymphoid cells, such as monoclonal antibodies which bind to the CD45 antigen, or with other therapeutic or immunogenic compositions. Thus, liposomes either filled or decorated with a desired peptide of the invention can be directed to the site of lymphoid cells, where the liposomes then deliver the peptide compositions. Liposomes for use in accordance with the invention are formed from standard vesicle-forming lipids, which generally include neutral and negatively charged phospholipids and a sterol, such as cholesterol. The selection of lipids is generally guided by consideration of, e.g., liposome size, acid lability and stability of the liposomes in the blood stream. A variety of methods are available for preparing liposomes, as described in, e.g., Szoka, et al., *Ann. Rev. Biophys. Bioeng.* 9:467 (1980), and U.S. Pat. Nos. 4,235,871, 4,501,728, 4,837,028, and 5,019,369.

[0328] For targeting cells of the immune system, a ligand to be incorporated into the liposome can include, e.g., antibodies or fragments thereof specific for cell surface determinants of the desired immune system cells. A liposome suspension containing a peptide may be administered intravenously, locally, topically, etc. in a dose which varies according to, inter alia, the manner of administration, the peptide being delivered, and the stage of the disease being treated.

[0329] For solid compositions, conventional nontoxic solid carriers may be used which include, for example, pharmaceutical grades of mannitol, lactose, starch, magnesium stearate, sodium saccharin, talcum, cellulose, glucose, sucrose, magnesium carbonate, and the like. For oral administration, a pharmaceutically acceptable nontoxic composition is formed by incorporating any of the normally employed excipients, such as those carriers previously listed, and generally 10-95% of active ingredient, that is, one or more peptides of the invention, and more preferably at a concentration of 25%-75%.

[0330] For aerosol administration, immunogenic peptides are preferably supplied in finely divided form along with a surfactant and propellant. Typical percentages of peptides are about 0.01%-20% by weight, preferably about 1%-10%. The surfactant must, of course, be nontoxic, and preferably soluble in the propellant. Representative of such agents are the esters or partial esters of fatty acids containing from about 6 to 22 carbon atoms, such as caproic, octanoic, lauric, palmitic, stearic, linoleic, linolenic, olesteric and oleic acids with an aliphatic polyhydric alcohol or its cyclic anhydride. Mixed esters, such as mixed or natural glycerides may be employed. The surfactant may constitute about 0.1%-20% by weight of the composition, preferably about 0.25-5%. The balance of the composition is ordinarily propellant. A carrier can also be included, as desired, as with, e.g., lecithin for intranasal delivery.

XI.) Diagnostic and Prognostic Embodiments of 158P1D7

[0331] As disclosed herein, 158P1D7 polynucleotides, polypeptides, reactive cytotoxic T cells (CTL), reactive helper T cells (HTL) and anti-polypeptide antibodies are used in well known diagnostic, prognostic and therapeutic assays that examine conditions associated with dysregulated cell growth such as cancer, in particular the cancers listed in Table I (see, e.g., both its specific pattern of tissue expression as well as its overexpression in certain cancers as described for example in Example 4).

[0332] 158P1D7 can be used in a manner analogous to, or as complementary to, the bladder associated antigen combination, mucins and CEA, represented in a diagnostic kit called ImmunoCyt™. ImmunoCyt is a commercially available assay to identify and monitor the presence of bladder cancer (see Fradet et al., 1997, *Can J Urol*, 4(3):400-405). A variety of other diagnostic markers are also used in similar contexts including p53 and H-ras (see, e.g., Tulchinsky et al., *Int J Mol Med* 1999 July 4(1):99-102 and Minimoto et al., *Cancer Detect Prev* 2000; 24(1):1-12). Therefore, this disclosure of the 158P1D7 polynucleotides and polypeptides (as well as the 158P1D7 polynucleotide probes and anti-158P1D7 antibodies used to identify the presence of these molecules) and their properties allows skilled artisans to utilize these molecules in methods that are analogous to those used, for example, in a variety of diagnostic assays directed to examining conditions associated with cancer.

[0333] Typical embodiments of diagnostic methods which utilize the 158P1D7 polynucleotides, polypeptides, reactive T cells and antibodies are analogous to those methods from well-established diagnostic assays which employ, e.g., PSA polynucleotides, polypeptides, reactive T cells and antibodies. For example, just as PSA polynucleotides are used as probes (for example in Northern analysis, see, e.g., Sharief et al., *Biochem. Mol. Biol. Int.* 33(3):567-74(1994)) and primers (for example in PCR analysis, see, e.g., Okegawa et al., *J. Urol.* 163(4): 1189-1190 (2000)) to observe the presence and/or the level of PSA mRNAs in methods of monitoring PSA overexpression or the metastasis of prostate cancers, the 158P1D7 polynucleotides described herein can be utilized to detect 158P1D7 overexpression or the metastasis of bladder and other cancers expressing this gene. Alternatively, just as PSA polypeptides are used to generate antibodies specific for PSA which can then be used to observe the presence and/or the level of PSA proteins in methods to monitor PSA protein overexpression (see, e.g., Stephan et al., *Urology* 55(4):560-3

(2000)) or the metastasis of prostate cells (see, e.g., Alanen et al., *Pathol. Res. Pract.* 192(3):233-7 (1996)), the 158P1D7 polypeptides described herein can be utilized to generate antibodies for use in detecting 158P1D7 overexpression or the metastasis of bladder cells and cells of other cancers expressing this gene.

[0334] Specifically, because metastases involves the movement of cancer cells from an organ of origin (such as the lung or bladder etc.) to a different area of the body (such as a lymph node), assays which examine a biological sample for the presence of cells expressing 158P1D7 polynucleotides and/or polypeptides can be used to provide evidence of metastasis. For example, when a biological sample from tissue that does not normally contain 158P1D7-expressing cells (lymph node) is found to contain 158P1D7-expressing cells such as the 158P1D7 expression seen in LAPC4 and LAPC9, xenografts isolated from lymph node and bone metastasis, respectively, this finding is indicative of metastasis.

[0335] Alternatively 158P1D7 polynucleotides and/or polypeptides can be used to provide evidence of cancer, for example, when cells in a biological sample that do not normally express 158P1D7 or express 158P1D7 at a different level are found to express 158P1D7 or have an increased expression of 158P1D7 (see, e.g., the 158P1D7 expression in the cancers listed in Table I and in patient samples etc. shown in the accompanying Figures). In such assays, artisans may further wish to generate supplementary evidence of metastasis by testing the biological sample for the presence of a second tissue restricted marker (in addition to 158P1D7) such as ImmunoCyt™PSCA etc. (see, e.g., Fradet et al., 1997, *Can J Urol*, 4(3):400-405; Amara et al., 2001, *Cancer Res* 61:4660-4665). Just as PSA polynucleotide fragments and polynucleotide variants are employed by skilled artisans for use in methods of monitoring PSA, 158P1D7 polynucleotide fragments and polynucleotide variants are used in an analogous manner. In particular, typical PSA polynucleotides used in methods of monitoring PSA are probes or primers which consist of fragments of the PSA cDNA sequence. Illustrating this, primers used to PCR amplify a PSA polynucleotide must include less than the whole PSA sequence to function in the polymerase chain reaction. In the context of such PCR reactions, skilled artisans generally create a variety of different polynucleotide fragments that can be used as primers in order to amplify different portions of a polynucleotide of interest or to optimize amplification reactions (see, e.g., Caetano-Anolles, G. *Biotechniques* 25(3): 472-476, 478-480 (1998); Robertson et al., *Methods Mol. Biol.* 98:121-154 (1998)). An additional illustration of the use of such fragments is provided in Example 4, where a 158P1D7 polynucleotide fragment is used as a probe to show the expression of 158P1D7 RNAs in cancer cells. In addition, variant polynucleotide sequences are typically used as primers and probes for the corresponding mRNAs in PCR and Northern analyses (see, e.g., Sawai et al., *Fetal Diagn. Ther.* 1996 November-December 11(6):407-13 and *Current Protocols In Molecular Biology*, Volume 2, Unit 2, Frederick M. Ausubel et al. eds., 1995)). Polynucleotide fragments and variants are useful in this context where they are capable of binding to a target polynucleotide sequence (e.g. the 158P1D7 polynucleotide shown in FIG. 2) under conditions of high stringency.

[0336] Furthermore, PSA polypeptides which contain an epitope that can be recognized by an antibody or T cell that specifically binds to that epitope are used in methods of monitoring PSA. 158P1D7 polypeptide fragments and

polypeptide analogs or variants can also be used in an analogous manner. This practice of using polypeptide fragments or polypeptide variants to generate antibodies (such as anti-PSA antibodies or T cells) is typical in the art with a wide variety of systems such as fusion proteins being used by practitioners (see, e.g., *Current Protocols In Molecular Biology*, Volume 2, Unit 16, Frederick M. Ausubel et al. eds., 1995). In this context, each epitope(s) functions to provide the architecture with which an antibody or T cell is reactive. Typically, skilled artisans create a variety of different polypeptide fragments that can be used in order to generate immune responses specific for different portions of a polypeptide of interest (see, e.g., U.S. Pat. No. 5,840,501 and U.S. Pat. No. 5,939,533). For example it may be preferable to utilize a polypeptide comprising one of the 158P1D7 biological motifs discussed herein or a motif-bearing subsequence which is readily identified by one of skill in the art based on motifs available in the art. Polypeptide fragments, variants or analogs are typically useful in this context as long as they comprise an epitope capable of generating an antibody or T cell specific for a target polypeptide sequence (e.g. the 158P1D7 polypeptide shown in FIG. 2).

[0337] As shown herein, the 158P1D7 polynucleotides and polypeptides (as well as the 158P1D7 polynucleotide probes and anti-158P1D7 antibodies or T cells used to identify the presence of these molecules) exhibit specific properties that make them useful in diagnosing cancers such as those listed in Table I. Diagnostic assays that measure the presence of 158P1D7 gene products, in order to evaluate the presence or onset of a disease condition described herein, such as bladder cancer, are used to identify patients for preventive measures or further monitoring, as has been done so successfully with PSA for monitoring prostate cancer. Materials such as 158P1D7 polynucleotides and polypeptides (as well as the 158P1D7 polynucleotide probes and anti-158P1D7 antibodies used to identify the presence of these molecules) satisfy a need in the art for molecules having similar or complementary characteristics to PSA in situations of bladder cancer. Finally, in addition to their use in diagnostic assays, the 158P1D7 polynucleotides disclosed herein have a number of other utilities such as their use in the identification of oncogenetic associated chromosomal abnormalities in the chromosomal region to which the 158P1D7 gene maps (see Example 3 below). Moreover, in addition to their use in diagnostic assays, the 158P1D7-related proteins and polynucleotides disclosed herein have other utilities such as their use in the forensic analysis of tissues of unknown origin (see, e.g., Takahama K *Forensic Sci Int* 1996 Jun. 28; 80(1-2): 63-9).

[0338] Additionally, 158P1D7-related proteins or polynucleotides of the invention can be used to treat a pathologic condition characterized by the over-expression of 158P1D7. For example, the amino acid or nucleic acid sequence of FIG. 2 or FIG. 3, or fragments of either, can be used to generate an immune response to the 158P1D7 antigen. Antibodies or other molecules that react with 158P1D7 can be used to modulate the function of this molecule, and thereby provide a therapeutic benefit.

XII.) Inhibition of 158P1D7 Protein Function

[0339] The invention includes various methods and compositions for inhibiting the binding of 158P1D7 to its binding partner or its association with other protein(s) as well as methods for inhibiting 158P1D7 function.

[0340] XII.A.) Inhibition of 158P1D7 with Intracellular Antibodies

[0341] In one approach, a recombinant vector that encodes single chain antibodies that specifically bind to 158P1D7 are introduced into 158P1D7 expressing cells via gene transfer technologies. Accordingly, the encoded single chain anti-158P1D7 antibody is expressed intracellularly, binds to 158P1D7 protein, and thereby inhibits its function. Methods for engineering such intracellular single chain antibodies are well known. Such intracellular antibodies, also known as "intrabodies", are specifically targeted to a particular compartment within the cell, providing control over where the inhibitory activity of the treatment is focused. This technology has been successfully applied in the art (for review, see Richardson and Marasco, 1995, *TIBTECH* vol. 13). Intrabodies have been shown to virtually eliminate the expression of otherwise abundant cell surface receptors (see, e.g., Richardson et al., 1995, *Proc. Natl. Acad. Sci. USA* 92: 3137-3141; Beerli et al., 1994, *J. Biol. Chem.* 269: 23931-23936; Deshane et al., 1994, *Gene Ther.* 1: 332-337).

[0342] Single chain antibodies comprise the variable domains of the heavy and light chain joined by a flexible linker polypeptide, and are expressed as a single polypeptide. Optionally, single chain antibodies are expressed as a single chain variable region fragment joined to the light chain constant region. Well-known intracellular trafficking signals are engineered into recombinant polynucleotide vectors encoding such single chain antibodies in order to precisely target the intrabody to the desired intracellular compartment. For example, intrabodies targeted to the endoplasmic reticulum (ER) are engineered to incorporate a leader peptide and, optionally, a C-terminal ER retention signal, such as the KDEL amino acid motif. Intrabodies intended to exert activity in the nucleus are engineered to include a nuclear localization signal. Lipid moieties are joined to intrabodies in order to tether the intrabody to the cytosolic side of the plasma membrane. Intrabodies can also be targeted to exert function in the cytosol. For example, cytosolic intrabodies are used to sequester factors within the cytosol, thereby preventing them from being transported to their natural cellular destination.

[0343] In one embodiment, intrabodies are used to capture 158P1D7 in the nucleus, thereby preventing its activity within the nucleus. Nuclear targeting signals are engineered into such 158P1D7 intrabodies in order to achieve the desired targeting. Such 158P1D7 intrabodies are designed to bind specifically to a particular 158P1D7 domain. In another embodiment, cytosolic intrabodies that specifically bind to the 158P1D7 protein are used to prevent 158P1D7 from gaining access to the nucleus, thereby preventing it from exerting any biological activity within the nucleus (e.g., preventing 158P1D7 from forming transcription complexes with other factors).

[0344] In order to specifically direct the expression of such intrabodies to particular cells, the transcription of the intrabody is placed under the regulatory control of an appropriate tumor-specific promoter and/or enhancer. In order to target intrabody expression specifically to bladder, for example, the PSCA promoter and/or promoter/enhancer can be utilized (See, for example, U.S. Pat. No. 5,919,652 issued 6 Jul. 1999 and Lin et al. *PNAS*, USA 92(3):679-683 (1995)).

[0345] XII.B.) Inhibition of 158P1D7 with Recombinant Proteins

[0346] In another approach, recombinant molecules bind to 158P1D7 and thereby inhibit 158P1D7 function. For

example, these recombinant molecules prevent or inhibit 158P1D7 from accessing/binding to its binding partner(s) or associating with other protein(s). Such recombinant molecules can, for example, contain the reactive part(s) of a 158P1D7 specific antibody molecule. In a particular embodiment, the 158P1D7 binding domain of a 158P1D7 binding partner is engineered into a dimeric fusion protein, whereby the fusion protein comprises two 158P1D7 ligand binding domains linked to the Fc portion of a human IgG, such as human IgG1. Such IgG portion can contain, for example, the C_H2 and C_H3 domains and the hinge region, but not the C_H1 domain. Such dimeric fusion proteins are administered in soluble form to patients suffering from a cancer associated with the expression of 158P1D7, whereby the dimeric fusion protein specifically binds to 158P1D7 and blocks 158P1D7 interaction with a binding partner. Such dimeric fusion proteins are further combined into multimeric proteins using known antibody linking technologies.

[0347] XII.C.) Inhibition of 158P1D7 Transcription or Translation

[0348] The present invention also comprises various methods and compositions for inhibiting the transcription of the 158P1D7 gene. Similarly, the invention also provides methods and compositions for inhibiting the translation of 158P1D7 mRNA into protein.

[0349] In one approach, a method of inhibiting the transcription of the 158P1D7 gene comprises contacting the 158P1D7 gene with a 158P1D7 antisense polynucleotide. In another approach, a method of inhibiting 158P1D7 mRNA translation comprises contacting the 158P1D7 mRNA with an antisense polynucleotide. In another approach, a 158P1D7 specific ribozyme is used to cleave the 158P1D7 message, thereby inhibiting translation. Such antisense and ribozyme based methods can also be directed to the regulatory regions of the 158P1D7 gene, such as the 158P1D7 promoter and/or enhancer elements. Similarly, proteins capable of inhibiting a 158P1D7 gene transcription factor are used to inhibit 158P1D7 mRNA transcription. The various polynucleotides and compositions useful in the aforementioned methods have been described above. The use of antisense and ribozyme molecules to inhibit transcription and translation is well known in the art.

[0350] Other factors that inhibit the transcription of 158P1D7 by interfering with 158P1D7 transcriptional activation are also useful to treat cancers expressing 158P1D7. Similarly, factors that interfere with 158P1D7 processing are useful to treat cancers that express 158P1D7. Cancer treatment methods utilizing such factors are also within the scope of the invention.

[0351] XII.D.) General Considerations for Therapeutic Strategies

[0352] Gene transfer and gene therapy technologies can be used to deliver therapeutic polynucleotide molecules to tumor cells synthesizing 158P1D7 (i.e., antisense, ribozyme, polynucleotides encoding intrabodies and other 158P1D7 inhibitory molecules). A number of gene therapy approaches are known in the art. Recombinant vectors encoding 158P1D7 antisense polynucleotides, ribozymes, factors capable of interfering with 158P1D7 transcription, and so forth, can be delivered to target tumor cells using such gene therapy approaches.

[0353] The above therapeutic approaches can be combined with any one of a wide variety of surgical, chemotherapy or radiation therapy regimens. The therapeutic approaches of

the invention can enable the use of reduced dosages of chemotherapy (or other therapies) and/or less frequent administration, an advantage for all patients and particularly for those that do not tolerate the toxicity of the chemotherapeutic agent well.

[0354] The anti-tumor activity of a particular composition (e.g., antisense, ribozyme, intrabody), or a combination of such compositions, can be evaluated using various in vitro and in vivo assay systems. In vitro assays that evaluate therapeutic activity include cell growth assays, soft agar assays and other assays indicative of tumor promoting activity, binding assays capable of determining the extent to which a therapeutic composition will inhibit the binding of 158P1D7 to a binding partner, etc.

[0355] In vivo, the effect of a 158P1D7 therapeutic composition can be evaluated in a suitable animal model. For example, xenogenic bladder cancer models can be used, wherein human bladder cancer explants or passaged xenograft tissues are introduced into immune compromised animals, such as nude or SCID mice (Shibayama et al., 1991, *J Urol.*, 146(4):1136-7; Beecken et al., 2000, *Urology*, 56(3): 521-526). Efficacy can be predicted using assays that measure inhibition of tumor formation, tumor regression or metastasis, and the like.

[0356] In vivo assays that evaluate the promotion of apoptosis are useful in evaluating therapeutic compositions. In one embodiment, xenografts from tumor bearing mice treated with the therapeutic composition can be examined for the presence of apoptotic foci and compared to untreated control xenograft-bearing mice. The extent to which apoptotic foci are found in the tumors of the treated mice provides an indication of the therapeutic efficacy of the composition.

[0357] The therapeutic compositions used in the practice of the foregoing methods can be formulated into pharmaceutical compositions comprising a carrier suitable for the desired delivery method. Suitable carriers include any material that when combined with the therapeutic composition retains the anti-tumor function of the therapeutic composition and is generally non-reactive with the patient's immune system. Examples include, but are not limited to, any of a number of standard pharmaceutical carriers such as sterile phosphate buffered saline solutions, bacteriostatic water, and the like (see, generally, Remington's Pharmaceutical Sciences 16th Edition, A. Osal., Ed., 1980).

[0358] Therapeutic formulations can be solubilized and administered via any route capable of delivering the therapeutic composition to the tumor site. Potentially effective routes of administration include, but are not limited to, intravenous, parenteral, intraperitoneal, intramuscular, intratumor, intradermal, intraorgan, orthotopic, and the like. A preferred formulation for intravenous injection comprises the therapeutic composition in a solution of preserved bacteriostatic water, sterile unpreserved water, and/or diluted in polyvinylchloride or polyethylene bags containing 0.9% sterile Sodium Chloride for Injection, USP. Therapeutic protein preparations can be lyophilized and stored as sterile powders, preferably under vacuum, and then reconstituted in bacteriostatic water (containing for example, benzyl alcohol preservative) or in sterile water prior to injection.

[0359] Dosages and administration protocols for the treatment of cancers using the foregoing methods will vary with the method and the target cancer, and will generally depend on a number of other factors appreciated in the art.

XIII.) Identification, Characterization and Use of Modulators of 158PID7

[0360] Methods to Identify and Use Modulators

[0361] In one embodiment, screening is performed to identify modulators that induce or suppress a particular expression profile, suppress or induce specific pathways, preferably generating the associated phenotype thereby. In another embodiment, having identified differentially expressed genes important in a particular state; screens are performed to identify modulators that alter expression of individual genes, either increase or decrease. In another embodiment, screening is performed to identify modulators that alter a biological function of the expression product of a differentially expressed gene. Again, having identified the importance of a gene in a particular state, screens are performed to identify agents that bind and/or modulate the biological activity of the gene product.

[0362] In addition, screens are done for genes that are induced in response to a candidate agent. After identifying a modulator (one that suppresses a cancer expression pattern leading to a normal expression pattern, or a modulator of a cancer gene that leads to expression of the gene as in normal tissue) a screen is performed to identify genes that are specifically modulated in response to the agent. Comparing expression profiles between normal tissue and agent-treated cancer tissue reveals genes that are not expressed in normal tissue or cancer tissue, but are expressed in agent treated tissue, and vice versa. These agent-specific sequences are identified and used by methods described herein for cancer genes or proteins. In particular these sequences and the proteins they encode are used in marking or identifying agent-treated cells. In addition, antibodies are raised against the agent-induced proteins and used to target novel therapeutics to the treated cancer tissue sample.

[0363] Modulator-Related Identification and Screening Assays:

[0364] Gene Expression-Related Assays

[0365] Proteins, nucleic acids, and antibodies of the invention are used in screening assays. The cancer-associated proteins, antibodies, nucleic acids, modified proteins and cells containing these sequences are used in screening assays, such as evaluating the effect of drug candidates on a "gene expression profile," expression profile of polypeptides or alteration of biological function. In one embodiment, the expression profiles are used, preferably in conjunction with high throughput screening techniques to allow monitoring for expression profile genes after treatment with a candidate agent (e.g., Davis, G F, et al, J Biol Screen 7:69 (2002); Zlokarnik, et al., Science 279:84-8 (1998); Heid, Genome Res 6:986-94, 1996).

[0366] The cancer proteins, antibodies, nucleic acids, modified proteins and cells containing the native or modified cancer proteins or genes are used in screening assays. That is, the present invention comprises methods for screening for compositions which modulate the cancer phenotype or a physiological function of a cancer protein of the invention. This is done on a gene itself or by evaluating the effect of drug candidates on a "gene expression profile" or biological function. In one embodiment, expression profiles are used, preferably in conjunction with high throughput screening techniques to allow monitoring after treatment with a candidate agent, see Zlokarnik, supra.

[0367] A variety of assays are executed directed to the genes and proteins of the invention. Assays are run on an

individual nucleic acid or protein level. That is, having identified a particular gene as up regulated in cancer, test compounds are screened for the ability to modulate gene expression or for binding to the cancer protein of the invention. "Modulation" in this context includes an increase or a decrease in gene expression. The preferred amount of modulation will depend on the original change of the gene expression in normal versus tissue undergoing cancer, with changes of at least 10%, preferably 50%, more preferably 100-300%, and in some embodiments 300-1000% or greater. Thus, if a gene exhibits a 4-fold increase in cancer tissue compared to normal tissue, a decrease of about four-fold is often desired; similarly, a 10-fold decrease in cancer tissue compared to normal tissue a target value of a 10-fold increase in expression by the test compound is often desired. Modulators that exacerbate the type of gene expression seen in cancer are also useful, e.g., as an upregulated target in further analyses.

[0368] The amount of gene expression is monitored using nucleic acid probes and the quantification of gene expression levels, or, alternatively, a gene product itself is monitored, e.g., through the use of antibodies to the cancer protein and standard immunoassays. Proteomics and separation techniques also allow for quantification of expression.

[0369] Expression Monitoring to Identify Compounds that Modify Gene Expression

[0370] In one embodiment, gene expression monitoring, i.e., an expression profile, is monitored simultaneously for a number of entities. Such profiles will typically involve one or more of the genes of FIG. 2. In this embodiment, e.g., cancer nucleic acid probes are attached to biochips to detect and quantify cancer sequences in a particular cell. Alternatively, PCR can be used. Thus, a series, e.g., wells of a microtiter plate, can be used with dispensed primers in desired wells. A PCR reaction can then be performed and analyzed for each well.

[0371] Expression monitoring is performed to identify compounds that modify the expression of one or more cancer-associated sequences, e.g., a polynucleotide sequence set out in FIG. 2. Generally, a test modulator is added to the cells prior to analysis. Moreover, screens are also provided to identify agents that modulate cancer, modulate cancer proteins of the invention, bind to a cancer protein of the invention, or interfere with the binding of a cancer protein of the invention and an antibody or other binding partner.

[0372] In one embodiment, high throughput screening methods involve providing a library containing a large number of potential therapeutic compounds (candidate compounds). Such "combinatorial chemical libraries" are then screened in one or more assays to identify those library members (particular chemical species or subclasses) that display a desired characteristic activity. The compounds thus identified can serve as conventional "lead compounds," as compounds for screening, or as therapeutics.

[0373] In certain embodiments, combinatorial libraries of potential modulators are screened for an ability to bind to a cancer polypeptide or to modulate activity. Conventionally, new chemical entities with useful properties are generated by identifying a chemical compound (called a "lead compound") with some desirable property or activity, e.g., inhibiting activity, creating variants of the lead compound, and evaluating the property and activity of those variant compounds. Often, high throughput screening (HTS) methods are employed for such an analysis.

[0374] As noted above, gene expression monitoring is conveniently used to test candidate modulators (e.g., protein, nucleic acid or small molecule). After the candidate agent has been added and the cells allowed to incubate for a period, the sample containing a target sequence to be analyzed is, e.g., added to a biochip.

[0375] If required, the target sequence is prepared using known techniques. For example, a sample is treated to lyse the cells, using known lysis buffers, electroporation, etc., with purification and/or amplification such as PCR performed as appropriate. For example, an in vitro transcription with labels covalently attached to the nucleotides is performed. Generally, the nucleic acids are labeled with biotin-FITC or PE, or with cy3 or cy5.

[0376] The target sequence can be labeled with, e.g., a fluorescent, a chemiluminescent, a chemical, or a radioactive signal, to provide a means of detecting the target sequence's specific binding to a probe. The label also can be an enzyme, such as alkaline phosphatase or horseradish peroxidase, which when provided with an appropriate substrate produces a product that is detected. Alternatively, the label is a labeled compound or small molecule, such as an enzyme inhibitor, that binds but is not catalyzed or altered by the enzyme. The label also can be a moiety or compound, such as, an epitope tag or biotin which specifically binds to streptavidin. For the example of biotin, the streptavidin is labeled as described above, thereby, providing a detectable signal for the bound target sequence. Unbound labeled streptavidin is typically removed prior to analysis.

[0377] As will be appreciated by those in the art, these assays can be direct hybridization assays or can comprise "sandwich assays", which include the use of multiple probes, as is generally outlined in U.S. Pat. Nos. 5,681,702; 5,597,909; 5,545,730; 5,594,117; 5,591,584; 5,571,670; 5,580,731; 5,571,670; 5,591,584; 5,624,802; 5,635,352; 5,594,118; 5,359,100; 5,124,246; and 5,681,697. In this embodiment, in general, the target nucleic acid is prepared as outlined above, and then added to the biochip comprising a plurality of nucleic acid probes, under conditions that allow the formation of a hybridization complex.

[0378] A variety of hybridization conditions are used in the present invention, including high, moderate and low stringency conditions as outlined above. The assays are generally run under stringency conditions which allow formation of the label probe hybridization complex only in the presence of target. Stringency can be controlled by altering a step parameter that is a thermodynamic variable, including, but not limited to, temperature, formamide concentration, salt concentration, chaotropic salt concentration pH, organic solvent concentration, etc. These parameters may also be used to control non-specific binding, as is generally outlined in U.S. Pat. No. 5,681,697. Thus, it can be desirable to perform certain steps at higher stringency conditions to reduce non-specific binding.

[0379] The reactions outlined herein can be accomplished in a variety of ways. Components of the reaction can be added simultaneously, or sequentially, in different orders, with preferred embodiments outlined below. In addition, the reaction may include a variety of other reagents. These include salts, buffers, neutral proteins, e.g. albumin, detergents, etc. which can be used to facilitate optimal hybridization and detection, and/or reduce nonspecific or background interactions. Reagents that otherwise improve the efficiency of the assay, such as protease inhibitors, nuclease inhibitors, anti-micro-

bial agents, etc., may also be used as appropriate, depending on the sample preparation methods and purity of the target. The assay data are analyzed to determine the expression levels of individual genes, and changes in expression levels as between states, forming a gene expression profile.

[0380] Biological Activity-Related Assays

[0381] The invention provides methods identify or screen for a compound that modulates the activity of a cancer-related gene or protein of the invention. The methods comprise adding a test compound, as defined above, to a cell comprising a cancer protein of the invention. The cells contain a recombinant nucleic acid that encodes a cancer protein of the invention. In another embodiment, a library of candidate agents is tested on a plurality of cells.

[0382] In one aspect, the assays are evaluated in the presence or absence or previous or subsequent exposure of physiological signals, e.g. hormones, antibodies, peptides, antigens, cytokines, growth factors, action potentials, pharmacological agents including chemotherapeutics, radiation, carcinogenics, or other cells (i.e., cell-cell contacts). In another example, the determinations are made at different stages of the cell cycle process. In this way, compounds that modulate genes or proteins of the invention are identified. Compounds with pharmacological activity are able to enhance or interfere with the activity of the cancer protein of the invention. Once identified, similar structures are evaluated to identify critical structural features of the compound.

[0383] In one embodiment, a method of modulating (e.g., inhibiting) cancer cell division is provided; the method comprises administration of a cancer modulator. In another embodiment, a method of modulating (e.g., inhibiting) cancer is provided; the method comprises administration of a cancer modulator. In a further embodiment, methods of treating cells or individuals with cancer are provided; the method comprises administration of a cancer modulator.

[0384] In one embodiment, a method for modulating the status of a cell that expresses a gene of the invention is provided. As used herein status comprises such art-accepted parameters such as growth, proliferation, survival, function, apoptosis, senescence, location, enzymatic activity, signal transduction, etc. of a cell. In one embodiment, a cancer inhibitor is an antibody as discussed above. In another embodiment, the cancer inhibitor is an antisense molecule. A variety of cell growth, proliferation, and metastasis assays are known to those of skill in the art, as described herein.

[0385] High Throughput Screening to Identify Modulators

[0386] The assays to identify suitable modulators are amenable to high throughput screening. Preferred assays thus detect enhancement or inhibition of cancer gene transcription, inhibition or enhancement of polypeptide expression, and inhibition or enhancement of polypeptide activity.

[0387] In one embodiment, modulators evaluated in high throughput screening methods are proteins, often naturally occurring proteins or fragments of naturally occurring proteins. Thus, e.g., cellular extracts containing proteins, or random or directed digests of proteinaceous cellular extracts, are used. In this way, libraries of proteins are made for screening in the methods of the invention. Particularly preferred in this embodiment are libraries of bacterial, fungal, viral, and mammalian proteins, with the latter being preferred, and human proteins being especially preferred. Particularly useful test compound will be directed to the class of proteins to which the target belongs, e.g., substrates for enzymes, or ligands and receptors.

[0388] Use of Soft Agar Growth and Colony Formation to Identify and Characterize Modulators

[0389] Normal cells require a solid substrate to attach and grow. When cells are transformed, they lose this phenotype and grow detached from the substrate. For example, transformed cells can grow in stirred suspension culture or suspended in semi-solid media, such as semi-solid or soft agar. The transformed cells, when transfected with tumor suppressor genes, can regenerate normal phenotype and once again require a solid substrate to attach to and grow. Soft agar growth or colony formation in assays are used to identify modulators of cancer sequences, which when expressed in host cells, inhibit abnormal cellular proliferation and transformation. A modulator reduces or eliminates the host cells' ability to grow suspended in solid or semisolid media, such as agar.

[0390] Techniques for soft agar growth or colony formation in suspension assays are described in Freshney, *Culture of Animal Cells a Manual of Basic Technique* (3rd ed., 1994). See also, the methods section of Garkavtsev et al. (1996), *supra*.

[0391] Evaluation of Contact Inhibition and Growth Density Limitation to Identify and Characterize Modulators

[0392] Normal cells typically grow in a flat and organized pattern in cell culture until they touch other cells. When the cells touch one another, they are contact inhibited and stop growing. Transformed cells, however, are not contact inhibited and continue to grow to high densities in disorganized foci. Thus, transformed cells grow to a higher saturation density than corresponding normal cells. This is detected morphologically by the formation of a disoriented monolayer of cells or cells in foci. Alternatively, labeling index with (3H)-thymidine at saturation density is used to measure density limitation of growth, similarly an MTT or Alamar blue assay will reveal proliferation capacity of cells and the ability of modulators to affect same. See Freshney (1994), *supra*. Transformed cells, when transfected with tumor suppressor genes, can regenerate a normal phenotype and become contact inhibited and would grow to a lower density.

[0393] In this assay, labeling index with (3H)-thymidine at saturation density is a preferred method of measuring density limitation of growth. Transformed host cells are transfected with a cancer-associated sequence and are grown for 24 hours at saturation density in non-limiting medium conditions. The percentage of cells labeling with (3H)-thymidine is determined by incorporated cpm.

[0394] Contact independent growth is used to identify modulators of cancer sequences, which had led to abnormal cellular proliferation and transformation. A modulator reduces or eliminates contact independent growth, and returns the cells to a normal phenotype.

[0395] Evaluation of Growth Factor or Serum Dependence to Identify and Characterize Modulators

[0396] Transformed cells have lower serum dependence than their normal counterparts (see, e.g., Temin, *J. Natl. Cancer Inst.* 37:167-175 (1966); Eagle et al., *J. Exp. Med* 131: 836-879 (1970)); Freshney, *supra*. This is in part due to release of various growth factors by the transformed cells. The degree of growth factor or serum dependence of transformed host cells can be compared with that of control. For example, growth factor or serum dependence of a cell is monitored in methods to identify and characterize compounds that modulate cancer-associated sequences of the invention.

[0397] Use of Tumor-Specific Marker Levels to Identify and Characterize Modulators

[0398] Tumor cells release an increased amount of certain factors (hereinafter "tumor specific markers") than their normal counterparts. For example, plasminogen activator (PA) is released from human glioma at a higher level than from normal brain cells (see, e.g., Gullino, *Angiogenesis, Tumor Vascularization, and Potential Interference with Tumor Growth*, in *Biological Responses in Cancer*, pp. 178-184 (Mihich (ed.) 1985)). Similarly, Tumor Angiogenesis Factor (TAF) is released at a higher level in tumor cells than their normal counterparts. See, e.g., Folkman, *Angiogenesis and Cancer*, *Sem Cancer Biol.* (1992)), while bFGF is released from endothelial tumors (Ensoli, B et al).

[0399] Various techniques which measure the release of these factors are described in Freshney (1994), *supra*. Also, see, Unkless et al., *J. Biol. Chem.* 249:4295-4305 (1974); Strickland & Beers, *J. Biol. Chem.* 251:5694-5702 (1976); Whur et al., *Br. J. Cancer* 42:305 312 (1980); Gullino, *Angiogenesis, Tumor Vascularization, and Potential Interference with Tumor Growth*, in *Biological Responses in Cancer*, pp. 178-184 (Mihich (ed.) 1985); Freshney, *Anticancer Res.* 5:111-130 (1985). For example, tumor specific marker levels are monitored in methods to identify and characterize compounds that modulate cancer-associated sequences of the invention.

[0400] Invasiveness into Matrigel to Identify and Characterize Modulators

[0401] The degree of invasiveness into Matrigel or an extracellular matrix constituent can be used as an assay to identify and characterize compounds that modulate cancer associated sequences. Tumor cells exhibit a positive correlation between malignancy and invasiveness of cells into Matrigel or some other extracellular matrix constituent. In this assay, tumorigenic cells are typically used as host cells. Expression of a tumor suppressor gene in these host cells would decrease invasiveness of the host cells. Techniques described in *Cancer Res.* 1999; 59:6010; Freshney (1994), *supra*, can be used. Briefly, the level of invasion of host cells is measured by using filters coated with Matrigel or some other extracellular matrix constituent. Penetration into the gel, or through to the distal side of the filter, is rated as invasiveness, and rated histologically by number of cells and distance moved, or by prelabeling the cells with ¹²⁵I and counting the radioactivity on the distal side of the filter or bottom of the dish. See, e.g., Freshney (1984), *supra*.

[0402] Evaluation of Tumor Growth In Vivo to Identify and Characterize Modulators

[0403] Effects of cancer-associated sequences on cell growth are tested in transgenic or immune-suppressed organisms. Transgenic organisms are prepared in a variety of art-accepted ways. For example, knock-out transgenic organisms, e.g., mammals such as mice, are made, in which a cancer gene is disrupted or in which a cancer gene is inserted. Knock-out transgenic mice are made by insertion of a marker gene or other heterologous gene into the endogenous cancer gene site in the mouse genome via homologous recombination. Such mice can also be made by substituting the endogenous cancer gene with a mutated version of the cancer gene, or by mutating the endogenous cancer gene, e.g., by exposure to carcinogens.

[0404] To prepare transgenic chimeric animals, e.g., mice, a DNA construct is introduced into the nuclei of embryonic stem cells. Cells containing the newly engineered genetic

lesion are injected into a host mouse embryo, which is re-implanted into a recipient female. Some of these embryos develop into chimeric mice that possess germ cells some of which are derived from the mutant cell line. Therefore, by breeding the chimeric mice it is possible to obtain a new line of mice containing the introduced genetic lesion (see, e.g., Capecchi et al., *Science* 244:1288 (1989)). Chimeric mice can be derived according to U.S. Pat. No. 6,365,797, issued 2 Apr. 2002; U.S. Pat. No. 6,107,540 issued 22 Aug. 2000; Hogan et al., *Manipulating the Mouse Embryo: A Laboratory Manual*, Cold Spring Harbor Laboratory (1988) and *Teratocarcinomas and Embryonic Stem Cells: A Practical Approach*, Robertson, ed., IRL Press, Washington, D.C., (1987).

[0405] Alternatively, various immune-suppressed or immune-deficient host animals can be used. For example, a genetically athymic “nude” mouse (see, e.g., Giovanella et al., *J. Natl. Cancer Inst.* 52:921 (1974)), a SCID mouse, a thymectomized mouse, or an irradiated mouse (see, e.g., Bradley et al., *Br. J. Cancer* 38:263 (1978); Selby et al., *Br. J. Cancer* 41:52 (1980)) can be used as a host. Transplantable tumor cells (typically about 10⁶ cells) injected into isogenic hosts produce invasive tumors in a high proportion of cases, while normal cells of similar origin will not. In hosts which developed invasive tumors, cells expressing cancer-associated sequences are injected subcutaneously or orthotopically. Mice are then separated into groups, including control groups and treated experimental groups) e.g. treated with a modulator. After a suitable length of time, preferably 4-8 weeks, tumor growth is measured (e.g., by volume or by its two largest dimensions, or weight) and compared to the control. Tumors that have statistically significant reduction (using, e.g., Student’s T test) are said to have inhibited growth.

[0406] In Vitro Assays to Identify and Characterize Modulators

[0407] Assays to identify compounds with modulating activity can be performed in vitro. For example, a cancer polypeptide is first contacted with a potential modulator and incubated for a suitable amount of time, e.g., from 0.5 to 48 hours. In one embodiment, the cancer polypeptide levels are determined in vitro by measuring the level of protein or mRNA. The level of protein is measured using immunoassays such as Western blotting, ELISA and the like with an antibody that selectively binds to the cancer polypeptide or a fragment thereof. For measurement of mRNA, amplification, e.g., using PCR, LCR, or hybridization assays, e.g., Northern hybridization, RNase protection, dot blotting, are preferred. The level of protein or mRNA is detected using directly or indirectly labeled detection agents, e.g., fluorescently or radioactively labeled nucleic acids, radioactively or enzymatically labeled antibodies, and the like, as described herein.

[0408] Alternatively, a reporter gene system can be devised using a cancer protein promoter operably linked to a reporter gene such as luciferase, green fluorescent protein, CAT, or P-gal. The reporter construct is typically transfected into a cell. After treatment with a potential modulator, the amount of reporter gene transcription, translation, or activity is measured according to standard techniques known to those of skill in the art (Davis GF, supra; Gonzalez, J. & Negulescu, P. *Curr. Opin. Biotechnol.* 1998: 9:624).

[0409] As outlined above, in vitro screens are done on individual genes and gene products. That is, having identified a particular differentially expressed gene as important in a

particular state, screening of modulators of the expression of the gene or the gene product itself is performed.

[0410] In one embodiment, screening for modulators of expression of specific gene(s) is performed. Typically, the expression of only one or a few genes is evaluated. In another embodiment, screens are designed to first find compounds that bind to differentially expressed proteins. These compounds are then evaluated for the ability to modulate differentially expressed activity. Moreover, once initial candidate compounds are identified, variants can be further screened to better evaluate structure activity relationships.

[0411] Binding Assays to Identify and Characterize Modulators

[0412] In binding assays in accordance with the invention, a purified or isolated gene product of the invention is generally used. For example, antibodies are generated to a protein of the invention, and immunoassays are run to determine the amount and/or location of protein. Alternatively, cells comprising the cancer proteins are used in the assays.

[0413] Thus, the methods comprise combining a cancer protein of the invention and a candidate compound such as a ligand, and determining the binding of the compound to the cancer protein of the invention. Preferred embodiments utilize the human cancer protein; animal models of human disease of can also be developed and used. Also, other analogous mammalian proteins also can be used as appreciated by those of skill in the art. Moreover, in some embodiments variant or derivative cancer proteins are used.

[0414] Generally, the cancer protein of the invention, or the ligand, is non-diffusibly bound to an insoluble support. The support can, e.g., be one having isolated sample receiving areas (a microtiter plate, an array, etc.). The insoluble supports can be made of any composition to which the compositions can be bound, is readily separated from soluble material, and is otherwise compatible with the overall method of screening. The surface of such supports can be solid or porous and of any convenient shape.

[0415] Examples of suitable insoluble supports include microtiter plates, arrays, membranes and beads. These are typically made of glass, plastic (e.g., polystyrene), polysaccharide, nylon, nitrocellulose, or Teflon™, etc. Microtiter plates and arrays are especially convenient because a large number of assays can be carried out simultaneously, using small amounts of reagents and samples. The particular manner of binding of the composition to the support is not crucial so long as it is compatible with the reagents and overall methods of the invention, maintains the activity of the composition and is nondiffusible. Preferred methods of binding include the use of antibodies which do not sterically block either the ligand binding site or activation sequence when attaching the protein to the support, direct binding to “sticky” or ionic supports, chemical crosslinking, the synthesis of the protein or agent on the surface, etc. Following binding of the protein or ligand/binding agent to the support, excess unbound material is removed by washing. The sample receiving areas may then be blocked through incubation with bovine serum albumin (BSA), casein or other innocuous protein or other moiety.

[0416] Once a cancer protein of the invention is bound to the support, and a test compound is added to the assay. Alternatively, the candidate binding agent is bound to the support and the cancer protein of the invention is then added. Binding

agents include specific antibodies, non-natural binding agents identified in screens of chemical libraries, peptide analogs, etc.

[0417] Of particular interest are assays to identify agents that have a low toxicity for human cells. A wide variety of assays can be used for this purpose, including proliferation assays, cAMP assays, labeled in vitro protein-protein binding assays, electrophoretic mobility shift assays, immunoassays for protein binding, functional assays (phosphorylation assays, etc.) and the like.

[0418] A determination of binding of the test compound (ligand, binding agent, modulator, etc.) to a cancer protein of the invention can be done in a number of ways. The test compound can be labeled, and binding determined directly, e.g., by attaching all or a portion of the cancer protein of the invention to a solid support, adding a labeled candidate compound (e.g., a fluorescent label), washing off excess reagent, and determining whether the label is present on the solid support. Various blocking and washing steps can be utilized as appropriate.

[0419] In certain embodiments, only one of the components is labeled, e.g., a protein of the invention or ligands labeled. Alternatively, more than one component is labeled with different labels, e.g., I125, for the proteins and a fluorophor for the compound. Proximity reagents, e.g., quenching or energy transfer reagents are also useful.

[0420] Competitive Binding to Identify and Characterize Modulators

[0421] In one embodiment, the binding of the "test compound" is determined by competitive binding assay with a "competitor." The competitor is a binding moiety that binds to the target molecule (e.g., a cancer protein of the invention). Competitors include compounds such as antibodies, peptides, binding partners, ligands, etc. Under certain circumstances, the competitive binding between the test compound and the competitor displaces the test compound. In one embodiment, the test compound is labeled. Either the test compound, the competitor, or both, is added to the protein for a time sufficient to allow binding. Incubations are performed at a temperature that facilitates optimal activity, typically between four and 40° C. Incubation periods are typically optimized, e.g., to facilitate rapid high throughput screening; typically between zero and one hour will be sufficient. Excess reagent is generally removed or washed away. The second component is then added, and the presence or absence of the labeled component is followed, to indicate binding.

[0422] In one embodiment, the competitor is added first, followed by the test compound. Displacement of the competitor is an indication that the test compound is binding to the cancer protein and thus is capable of binding to, and potentially modulating, the activity of the cancer protein. In this embodiment, either component can be labeled. Thus, e.g., if the competitor is labeled, the presence of label in the post-test compound wash solution indicates displacement by the test compound. Alternatively, if the test compound is labeled, the presence of the label on the support indicates displacement.

[0423] In an alternative embodiment, the test compound is added first, with incubation and washing, followed by the competitor. The absence of binding by the competitor indicates that the test compound binds to the cancer protein with higher affinity than the competitor. Thus, if the test compound is labeled, the presence of the label on the support, coupled

with a lack of competitor binding, indicates that the test compound binds to and thus potentially modulates the cancer protein of the invention.

[0424] Accordingly, the competitive binding methods comprise differential screening to identify agents that are capable of modulating the activity of the cancer proteins of the invention. In this embodiment, the methods comprise combining a cancer protein and a competitor in a first sample. A second sample comprises a test compound, the cancer protein, and a competitor. The binding of the competitor is determined for both samples, and a change, or difference in binding between the two samples indicates the presence of an agent capable of binding to the cancer protein and potentially modulating its activity. That is, if the binding of the competitor is different in the second sample relative to the first sample, the agent is capable of binding to the cancer protein.

[0425] Alternatively, differential screening is used to identify drug candidates that bind to the native cancer protein, but cannot bind to modified cancer proteins. For example the structure of the cancer protein is modeled and used in rational drug design to synthesize agents that interact with that site, agents which generally do not bind to site-modified proteins. Moreover, such drug candidates that affect the activity of a native cancer protein are also identified by screening drugs for the ability to either enhance or reduce the activity of such proteins.

[0426] Positive controls and negative controls can be used in the assays. Preferably control and test samples are performed in at least triplicate to obtain statistically significant results. Incubation of all samples occurs for a time sufficient to allow for the binding of the agent to the protein. Following incubation, samples are washed free of non-specifically bound material and the amount of bound, generally labeled agent determined. For example, where a radiolabel is employed, the samples can be counted in a scintillation counter to determine the amount of bound compound.

[0427] A variety of other reagents can be included in the screening assays. These include reagents like salts, neutral proteins, e.g. albumin, detergents, etc. which are used to facilitate optimal protein-protein binding and/or reduce non-specific or background interactions. Also reagents that otherwise improve the efficiency of the assay, such as protease inhibitors, nuclease inhibitors, anti-microbial agents, etc., can be used. The mixture of components is added in an order that provides for the requisite binding.

[0428] Use of Polynucleotides to Down-Regulate or Inhibit a Protein of the Invention.

[0429] Polynucleotide modulators of cancer can be introduced into a cell containing the target nucleotide sequence by formation of a conjugate with a ligand-binding molecule, as described in WO 91/04753. Suitable ligand-binding molecules include, but are not limited to, cell surface receptors, growth factors, other cytokines, or other ligands that bind to cell surface receptors. Preferably, conjugation of the ligand binding molecule does not substantially interfere with the ability of the ligand binding molecule to bind to its corresponding molecule or receptor, or block entry of the sense or antisense oligonucleotide or its conjugated version into the cell. Alternatively, a polynucleotide modulator of cancer can be introduced into a cell containing the target nucleic acid sequence, e.g., by formation of a polynucleotide-lipid complex, as described in WO 90/10448. It is understood that the use of antisense molecules or knock out and knock in models

may also be used in screening assays as discussed above, in addition to methods of treatment.

[0430] Inhibitory and Antisense Nucleotides

[0431] In certain embodiments, the activity of a cancer-associated protein is down-regulated, or entirely inhibited, by the use of antisense polynucleotide or inhibitory small nuclear RNA (snRNA), i.e., a nucleic acid complementary to, and which can preferably hybridize specifically to, a coding mRNA nucleic acid sequence, e.g., a cancer protein of the invention, mRNA, or a subsequence thereof. Binding of the antisense polynucleotide to the mRNA reduces the translation and/or stability of the mRNA.

[0432] In the context of this invention, antisense polynucleotides can comprise naturally occurring nucleotides, or synthetic species formed from naturally occurring subunits or their close homologs. Antisense polynucleotides may also have altered sugar moieties or inter-sugar linkages. Exemplary among these are the phosphorothioate and other sulfur containing species which are known for use in the art. Analogs are comprised by this invention so long as they function effectively to hybridize with nucleotides of the invention. See, e.g., Isis Pharmaceuticals, Carlsbad, Calif.; Sequitor, Inc., Natick, Mass.

[0433] Such antisense polynucleotides can readily be synthesized using recombinant means, or can be synthesized in vitro. Equipment for such synthesis is sold by several vendors, including Applied Biosystems. The preparation of other oligonucleotides such as phosphorothioates and alkylated derivatives is also well known to those of skill in the art.

[0434] Antisense molecules as used herein include antisense or sense oligonucleotides. Sense oligonucleotides can, e.g., be employed to block transcription by binding to the anti-sense strand. The antisense and sense oligonucleotide comprise a single stranded nucleic acid sequence (either RNA or DNA) capable of binding to target mRNA (sense) or DNA (antisense) sequences for cancer molecules. Antisense or sense oligonucleotides, according to the present invention, comprise a fragment generally at least about 12 nucleotides, preferably from about 12 to 30 nucleotides. The ability to derive an antisense or a sense oligonucleotide, based upon a cDNA sequence encoding a given protein is described in, e.g., Stein & Cohen (Cancer Res. 48:2659 (1988 and van der Krol et al. (BioTechniques 6:958 (1988)).

[0435] Ribozymes

[0436] In addition to antisense polynucleotides, ribozymes can be used to target and inhibit transcription of cancer-associated nucleotide sequences. A ribozyme is an RNA molecule that catalytically cleaves other RNA molecules. Different kinds of ribozymes have been described, including group I ribozymes, hammerhead ribozymes, hairpin ribozymes, RNase P, and axhead ribozymes (see, e.g., Castanotto et al., Adv. in Pharmacology 25: 289-317 (1994) for a general review of the properties of different ribozymes).

[0437] The general features of hairpin ribozymes are described, e.g., in Hampel et al., Nucl. Acids Res. 18:299-304 (1990); European Patent Publication No. 0360257; U.S. Pat. No. 5,254,678. Methods of preparing are well known to those of skill in the art (see, e.g., WO 94/26877; Ojwang et al., Proc. Natl. Acad. Sci. USA 90:6340-6344 (1993); Yamada et al., Human Gene Therapy 1:39-45 (1994); Leavitt et al., Proc. Natl. Acad. Sci. USA 92:699-703 (1995); Leavitt et al., Human Gene Therapy 5: 1151-120 (1994); and Yamada et al., Virology 205: 121-126 (1994)).

[0438] Use of Modulators in Phenotypic Screening

[0439] In one embodiment, a test compound is administered to a population of cancer cells, which have an associated cancer expression profile. By "administration" or "contacting" herein is meant that the modulator is added to the cells in such a manner as to allow the modulator to act upon the cell, whether by uptake and intracellular action, or by action at the cell surface. In some embodiments, a nucleic acid encoding a proteinaceous agent (i.e., a peptide) is put into a viral construct such as an adenoviral or retroviral construct, and added to the cell, such that expression of the peptide agent is accomplished, e.g., PCT US97/01019. Regulatable gene therapy systems can also be used. Once the modulator has been administered to the cells, the cells are washed if desired and are allowed to incubate under preferably physiological conditions for some period. The cells are then harvested and a new gene expression profile is generated. Thus, e.g., cancer tissue is screened for agents that modulate, e.g., induce or suppress, the cancer phenotype. A change in at least one gene, preferably many, of the expression profile indicates that the agent has an effect on cancer activity. Similarly, altering a biological function or a signaling pathway is indicative of modulator activity. By defining such a signature for the cancer phenotype, screens for new drugs that alter the phenotype are devised. With this approach, the drug target need not be known and need not be represented in the original gene/protein expression screening platform, nor does the level of transcript for the target protein need to change. The modulator inhibiting function will serve as a surrogate marker

[0440] As outlined above, screens are done to assess genes or gene products. That is, having identified a particular differentially expressed gene as important in a particular state, screening of modulators of either the expression of the gene or the gene product itself is performed.

[0441] Use of Modulators to Affect Peptides of the Invention

[0442] Measurements of cancer polypeptide activity, or of the cancer phenotype are performed using a variety of assays. For example, the effects of modulators upon the function of a cancer polypeptide(s) are measured by examining parameters described above. A physiological change that affects activity is used to assess the influence of a test compound on the polypeptides of this invention. When the functional outcomes are determined using intact cells or animals, a variety of effects can be assessed such as, in the case of a cancer associated with solid tumors, tumor growth, tumor metastasis, neovascularization, hormone release, transcriptional changes to both known and uncharacterized genetic markers (e.g., by Northern blots), changes in cell metabolism such as cell growth or pH changes, and changes in intracellular second messengers such as cGNIP.

[0443] Methods of Identifying Characterizing Cancer-Associated Sequences

[0444] Expression of various gene sequences is correlated with cancer. Accordingly, disorders based on mutant or variant cancer genes are determined. In one embodiment, the invention provides methods for identifying cells containing variant cancer genes, e.g., determining the presence of, all or part, the sequence of at least one endogenous cancer gene in a cell. This is accomplished using any number of sequencing techniques. The invention comprises methods of identifying the cancer genotype of an individual, e.g., determining all or part of the sequence of at least one gene of the invention in the individual. This is generally done in at least one tissue of the

individual, e.g., a tissue set forth in Table I, and may include the evaluation of a number of tissues or different samples of the same tissue. The method may include comparing the sequence of the sequenced gene to a known cancer gene, i.e., a wild-type gene to determine the presence of family members, homologies, mutations or variants. The sequence of all or part of the gene can then be compared to the sequence of a known cancer gene to determine if any differences exist. This is done using any number of known homology programs, such as BLAST, Bestfit, etc. The presence of a difference in the sequence between the cancer gene of the patient and the known cancer gene correlates with a disease state or a propensity for a disease state, as outlined herein.

[0445] In a preferred embodiment, the cancer genes are used as probes to determine the number of copies of the cancer gene in the genome. The cancer genes are used as probes to determine the chromosomal localization of the cancer genes. Information such as chromosomal localization finds use in providing a diagnosis or prognosis in particular when chromosomal abnormalities such as translocations, and the like are identified in the cancer gene locus.

XIV.) RNAi and Therapeutic Use of Small Interfering RNA (siRNAs)

[0446] The present invention is also directed towards siRNA oligonucleotides, particularly double stranded RNAs encompassing at least a fragment of the 158P1D7 coding region or 5' UTR regions, or complement, or any antisense oligonucleotide specific to the 158P1D7 sequence. In one embodiment such oligonucleotides are used to elucidate a function of 158P1D7, or are used to screen for or evaluate modulators of 158P1D7 function or expression. In another embodiment, gene expression of 158P1D7 is reduced by using siRNA transfection and results in significantly diminished proliferative capacity of transformed cancer cells that endogenously express the antigen; cells treated with specific 158P1D7 siRNAs show reduced survival as measured, e.g., by a metabolic readout of cell viability, correlating to the reduced proliferative capacity. Thus, 158P1D7 siRNA compositions comprise siRNA (double stranded RNA) that correspond to the nucleic acid ORF sequence of the 158P1D7 protein or subsequences thereof; these subsequences are generally 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 or more than 35 contiguous RNA nucleotides in length and contain sequences that are complementary and non-complementary to at least a portion of the mRNA coding sequence. In a preferred embodiment, the subsequences are 19-25 nucleotides in length, most preferably 21-23 nucleotides in length.

[0447] RNA interference is a novel approach to silencing genes in vitro and in vivo, thus small double stranded RNAs (siRNAs) are valuable therapeutic agents. The power of siRNAs to silence specific gene activities has now been brought to animal models of disease and is used in humans as well. For example, hydrodynamic infusion of a solution of siRNA into a mouse with a siRNA against a particular target has been proven to be therapeutically effective.

[0448] The pioneering work by Song et al. indicates that one type of entirely natural nucleic acid, small interfering RNAs (siRNAs), served as therapeutic agents even without further chemical modification (Song, E., et al. "RNA interference targeting Fas protects mice from fulminant hepatitis" *Nat. Med.* 9(3): 347-51 (2003)). This work provided the first in vivo evidence that infusion of siRNAs into an animal could

alleviate disease. In that case, the authors gave mice injections of siRNA designed to silence the FAS protein (a cell death receptor that when over-activated during inflammatory response induces hepatocytes and other cells to die). The next day, the animals were given an antibody specific to Fas. Control mice died of acute liver failure within a few days, while over 80% of the siRNA-treated mice remained free from serious disease and survived. About 80% to 90% of their liver cells incorporated the naked siRNA oligonucleotides. Furthermore, the RNA molecules functioned for 10 days before losing effect after 3 weeks.

[0449] For use in human therapy, siRNA is delivered by efficient systems that induce long-lasting RNAi activity. A major caveat for clinical use is delivering siRNAs to the appropriate cells. Hepatocytes seem to be particularly receptive to exogenous RNA. Today, targets located in the liver are attractive because liver is an organ that can be readily targeted by nucleic acid molecules and viral vectors. However, other tissue and organs targets are preferred as well.

[0450] Formulations of siRNAs with compounds that promote transit across cell membranes are used to improve administration of siRNAs in therapy. Chemically modified synthetic siRNA, that are resistant to nucleases and have serum stability have concomitant enhanced duration of RNAi effects, are an additional embodiment.

[0451] Thus, siRNA technology is a therapeutic for human malignancy by delivery of siRNA molecules directed to 158P1D7 to individuals with the cancers, such as those listed in Table 1. Such administration of siRNAs leads to reduced growth of cancer cells expressing 158P1D7, and provides an anti-tumor therapy, lessening the morbidity and/or mortality associated with malignancy.

[0452] The effectiveness of this modality of gene product knockdown is significant when measured in vitro or in vivo. Effectiveness in vitro is readily demonstrable through application of siRNAs to cells in culture (as described above) or to aliquots of cancer patient biopsies when in vitro methods are used to detect the reduced expression of 158P1D7 protein.

XV.) Kits/Articles of Manufacture

[0453] For use in the laboratory, prognostic, prophylactic, diagnostic and therapeutic applications described herein, kits are within the scope of the invention. Such kits can comprise a carrier, package, or container that is compartmentalized to receive one or more containers such as vials, tubes, and the like, each of the container(s) comprising one of the separate elements to be used in the method, along with a label or insert comprising instructions for use, such as a use described herein. For example, the container(s) can comprise a probe that is or can be detectably labeled. Such probe can be an antibody or polynucleotide specific for a protein or a gene or message of the invention, respectively. Where the method utilizes nucleic acid hybridization to detect the target nucleic acid, the kit can also have containers containing nucleotide(s) for amplification of the target nucleic acid sequence. Kits can comprise a container comprising a reporter, such as a biotin-binding protein, such as avidin or streptavidin, bound to a reporter molecule, such as an enzymatic, fluorescent, or radioisotope label; such a reporter can be used with, e.g., a nucleic acid or antibody. The kit can include all or part of the amino acid sequences in FIG. 2 or FIG. 3 or analogs thereof, or a nucleic acid molecule that encodes such amino acid sequences.

[0454] The kit of the invention will typically comprise the container described above and one or more other containers associated therewith that comprise materials desirable from a commercial and user standpoint, including buffers, diluents, filters, needles, syringes; carrier, package, container, vial and/or tube labels listing contents and/or instructions for use, and package inserts with instructions for use.

[0455] A label can be present on or with the container to indicate that the composition is used for a specific therapy or non-therapeutic application, such as a prognostic, prophylactic, diagnostic or laboratory application, and can also indicate directions for either in vivo or in vitro use, such as those described herein. Directions and or other information can also be included on an insert(s) or label(s) which is included with or on the kit. The label can be on or associated with the container. A label can be on a container when letters, numbers or other characters forming the label are molded or etched into the container itself; a label can be associated with a container when it is present within a receptacle or carrier that also holds the container, e.g., as a package insert. The label can indicate that the composition is used for diagnosing, treating, prophylaxing or prognosing a condition, such as a neoplasia of a tissue set forth in Table I.

[0456] The terms “kit” and “article of manufacture” can be used as synonyms.

[0457] In another embodiment of the invention, an article (s) of manufacture containing compositions, such as amino acid sequence(s), small molecule(s), nucleic acid sequence(s), and/or antibody(s), e.g., materials useful for the diagnosis, prognosis, prophylaxis and/or treatment of neoplasias of tissues such as those set forth in Table I is provided. The article of manufacture typically comprises at least one container and at least one label. Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers can be formed from a variety of materials such as glass, metal or plastic. The container can hold amino acid sequence(s), small molecule(s), nucleic acid sequence(s), cell population(s) and/or antibody(s). In one embodiment, the container holds a polynucleotide for use in examining the mRNA expression profile of a cell, together with reagents used for this purpose. In another embodiment a container comprises an antibody, binding fragment thereof or specific binding protein for use in evaluating protein expression of 158P1D7 in cells and tissues, or for relevant laboratory, prognostic, diagnostic, prophylactic and therapeutic purposes; indications and/or directions for such uses can be included on or with such container, as can reagents and other compositions or tools used for these purposes. In another embodiment, a container comprises materials for eliciting a cellular or humoral immune response, together with associated indications and/or directions. In another embodiment, a container comprises materials for adoptive immunotherapy, such as cytotoxic T cells (CTL) or helper T cells (HTL), together with associated indications and/or directions; reagents and other compositions or tools used for such purpose can also be included.

[0458] The container can alternatively hold a composition that is effective for treating, diagnosis, prognosing or prophylaxing a condition and can have a sterile access port (for example the container can be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agents in the composition can be an antibody capable of specifically binding 158P1D7 and modulating the function of 158P1D7.

[0459] The article of manufacture can further comprise a second container comprising a pharmaceutically-acceptable buffer, such as phosphate-buffered saline, Ringer's solution and/or dextrose solution. It can further include other materials desirable from a commercial and user standpoint, including other buffers, diluents, filters, stirrers, needles, syringes, and/or package inserts with indications and/or instructions for use.

EXAMPLES

[0460] Various aspects of the invention are further described and illustrated by way of the several examples that follow, none of which are intended to limit the scope of the invention.

Example 1

SSH-Generated Isolation of a cDNA Fragment of the 158P1D7 Gene

[0461] To isolate genes that are over-expressed in bladder cancer we used the Suppression Subtractive Hybridization (SSH) procedure using cDNA derived from bladder cancer tissues, including invasive transitional cell carcinoma. The 158P1D7 SSH cDNA sequence was derived from a bladder cancer pool minus normal bladder cDNA subtraction. Included in the driver were also cDNAs derived from 9 other normal tissues. The 158P1D7 cDNA was identified as highly expressed in the bladder cancer tissue pool, with lower expression seen in a restricted set of normal tissues.

[0462] The SSH DNA sequence of 231 bp (FIG. 1) has high homology (230/231 identity) to a hypothetical protein FLJ22774 (GenBank accession XM_033183) derived from a chromosome 13 genomic clone. A 158P1D7 cDNA clone (TurboScript3PX) of 2,555 bp was isolated from bladder cancer cDNA, revealing an ORF of 841 amino acids (FIG. 2 and FIG. 3).

[0463] The 158P1D7 protein has a signal sequence and a transmembrane domain and is predicted to be localized to the cell surface using the PSORT-I program (URL psort.nibb.ac.jp:8800/form.html). Amino acid sequence analysis of 158P1D7 reveals 100% identity over 798 amino acid region to a human hypothetical protein FLJ22774 (GenBank Accession XP_033182) (FIG. 4).

[0464] Materials and Methods

[0465] Human Tissues:

[0466] The bladder cancer patient tissues were purchased from several sources such as from the NDRI (Philadelphia, Pa.). mRNA for some normal tissues were purchased from Clontech, Palo Alto, Calif.

[0467] RNA Isolation:

[0468] Tissues were homogenized in Trizol reagent (Life Technologies, Gibco BRL) using 10 ml/g tissue isolate total RNA. Poly A RNA was purified from total RNA using Qiagen's Oligotex mRNA Mini and Midi kits. Total and mRNA were quantified by spectrophotometric analysis (O.D. 260/280 nm) and analyzed by gel electrophoresis.

[0469] Oligonucleotides:

[0470] The following HPLC purified oligonucleotides were used:

DPNCDN (cDNA synthesis primer):
 5' TTTT**GAT**CAAGCTT₃₀3' (SEQ ID NO: 28)

Adaptor 1:
 5' CTAATACGACTCACTATAGGGCTCGAGCGGCCCGGGCAG3' (SEQ ID NO: 29)

3' GGCCCGTCCT**AG**5' (SEQ ID NO: 30)

Adaptor 2:
 5' GTAATACGACTCACTATAGGGCAGCGTGGTCGCGGCCGAG3' (SEQ ID NO: 31)

3' CGGCTCC**AG**5' (SEQ ID NO: 32)

PCR primer 1:
 5' CTAATACGACTCACTATAGGGC3' (SEQ ID NO: 33)

Nested primer (NP) 1:
 5' TCGAGCGGCCCGCCGGC**AGGA**3' (SEQ ID NO: 34)

Nested primer (NP) 2:
 5' AGCGTGGTCGCGGCCGAG**GA**3' (SEQ ID NO: 35)

[0471] Suppression Subtractive Hybridization:

[0472] Suppression Subtractive Hybridization (SSH) was used to identify cDNAs corresponding to genes that may be differentially expressed in bladder cancer. The SSH reaction utilized cDNA from bladder cancer and normal tissues.

[0473] The gene 158P1D7 sequence was derived from a bladder cancer pool minus normal bladder cDNA subtraction. The SSH DNA sequence (FIG. 1) was identified.

[0474] The cDNA derived from of pool of normal bladder tissues was used as the source of the "driver" cDNA, while the cDNA from a pool of bladder cancer tissues was used as the source of the "tester" cDNA. Double stranded cDNAs corresponding to tester and driver cDNAs were synthesized from 2 µg of poly(A)⁺ RNA isolated from the relevant xenograft tissue, as described above, using CLONTECH's PCR-Select cDNA Subtraction Kit and 1 ng of oligonucleotide DPNCDN as primer. First- and second-strand synthesis were carried out as described in the Kit's user manual protocol (CLONTECH Protocol No. PT1117-1, Catalog No. K1804-1). The resulting cDNA was digested with Dpn II for 3 hrs at 37° C. Digested cDNA was extracted with phenol/chloroform (1:1) and ethanol precipitated.

[0475] Driver cDNA was generated by combining in a 1:1 ratio Dpn II digested cDNA from the relevant tissue source (see above) with a mix of digested cDNAs derived from the nine normal tissues: stomach, skeletal muscle, lung, brain, liver, kidney, pancreas, small intestine, and heart.

[0476] Tester cDNA was generated by diluting 1 µl of Dpn II digested cDNA from the relevant tissue source (see above) (400 ng) in 5 µl of water. The diluted cDNA (2 µl, 160 ng) was then ligated to 2 µl of Adaptor 1 and Adaptor 2 (10 µM), in separate ligation reactions, in a total volume of 10 µl at 16° C. overnight, using 400 u of T4 DNA ligase (CLONTECH). Ligation was terminated with 1 µl of 0.2 M EDTA and heating at 72° C. for 5 min.

[0477] The first hybridization was performed by adding 1.5 µl (600 ng) of driver cDNA to each of two tubes containing 1.5 µl (20 ng) Adaptor 1- and Adaptor 2-ligated tester cDNA. In a final volume of 4 µl, the samples were overlaid with mineral oil, denatured in an MJ Research thermal cycler at 98° C. for 1.5 minutes, and then were allowed to hybridize for 8 hrs at 68° C. The two hybridizations were then mixed together with an additional 1 µl of fresh denatured driver cDNA and were allowed to hybridize overnight at 68° C. The second hybridization was then diluted in 200 µl of 20 mM Hepes, pH 8.3, 50 mM NaCl, 0.2 mM EDTA, heated at 70° C. for 7 min. and stored at -20° C.

[0478] PCR Amplification, Cloning and Sequencing of Gene Fragments Generated from SSH:

[0479] To amplify gene fragments resulting from SSH reactions, two PCR amplifications were performed. In the primary PCR reaction 1 µl of the diluted final hybridization mix was added to 1 of PCR primer 1 (10 µM), 0.5 µl dNTP mix (10 µM), 2.5 µl 10× reaction buffer (CLONTECH) and 0.5 µl 50× Advantage cDNA polymerase Mix (CLONTECH) in a final volume of 25 µl. PCR 1 was conducted using the following conditions: 75° C. for 5 min., 94° C. for 25 sec., then 27 cycles of 94° C. for 10 sec, 66° C. for 30 sec, 72° C. for 1.5 min. Five separate primary PCR reactions were performed for each experiment. The products were pooled and diluted 1:10 with water. For the secondary PCR reaction, 1 µl from the pooled and diluted primary PCR reaction was added to the same reaction mix as used for PCR 1, except that primers NP1 and NP2 (10 µM) were used instead of PCR primer 1. PCR 2 was performed using 10-12 cycles of 94° C. for 10 sec, 68° C. for 30 sec, and 72° C. for 1.5 minutes. The PCR products were analyzed using 2% agarose gel electrophoresis.

[0480] The PCR products were inserted into pCR2.1 using the T/A vector cloning kit (Invitrogen). Transformed *E. coli* were subjected to blue/white and ampicillin selection. White colonies were picked and arrayed into 96 well plates and were grown in liquid culture overnight. To identify inserts, PCR amplification was performed on 1 ml of bacterial culture using the conditions of PCR1 and NP1 and NP2 as primers. PCR products were analyzed using 2% agarose gel electrophoresis.

[0481] Bacterial clones were stored in 20% glycerol in a 96 well format. Plasmid DNA was prepared, sequenced, and subjected to nucleic acid homology searches of the GenBank, dBest, and NCI-CGAP databases.

[0482] RT-PCR Expression Analysis:

[0483] First strand cDNAs can be generated from 1 µg of mRNA with oligo (dT)12-18 priming using the Gibco-BRL Superscript Preamplification system. The manufacturer's protocol was used which included an incubation for 50 min at 42° C. with reverse transcriptase followed by RNase H treatment at 37° C. for 20 min. After completing the reaction, the volume can be increased to 200 µl with water prior to normalization. First strand cDNAs from 16 different normal human tissues can be obtained from Clontech.

[0484] Normalization of the first strand cDNAs from multiple tissues was performed by using the primers 5' atatcgccgcgtcgctcgacaa3' (SEQ ID NO: 36) and 5' agccacacgcagctcattgtagaagg 3' (SEQ ID NO: 37) to amplify β-actin. First strand cDNA (5 µl) were amplified in a total volume of 50 µl containing 0.4 µM primers, 0.2 µM each dNTPs, 1×PCR buffer (Clontech, 10 mM Tris-HCL, 1.5 mM MgCl₂, 50 mM KCl, pH8.3) and 1× Klentaq DNA polymerase (Clontech).

Five μ l of the PCR reaction can be removed at 18, 20, and 22 cycles and used for agarose gel electrophoresis. PCR was performed using an MJ Research thermal cycler under the following conditions: Initial denaturation can be at 94° C. for 15 sec, followed by a 18, 20, and 22 cycles of 94° C. for 15, 65° C. for 2 min, 72° C. for 5 sec. A final extension at 72° C. was carried out for 2 min. After agarose gel electrophoresis, the band intensities of the 283 b.p. β -actin bands from multiple tissues were compared by visual inspection. Dilution factors for the first strand cDNAs were calculated to result in equal β -actin band intensities in all tissues after 22 cycles of PCR. Three rounds of normalization can be required to achieve equal band intensities in all tissues after 22 cycles of PCR.

[0485] To determine expression levels of the 158P1D7 gene, 5 μ l of normalized first strand cDNA were analyzed by PCR using 26, and 30 cycles of amplification. Semi-quantitative expression analysis can be achieved by comparing the PCR products at cycle numbers that give light band intensities. The primers used for RT-PCR were designed using the 158P1D7 SSH sequence and are listed below:

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158P1D7.1
                                     (SEQ ID NO: 38)
5' ATAAGCTTTCAATGTTGCGCTCCT 3'

158P1D7.2
                                     (SEQ ID NO: 39)
5' TGTCACCTAAGACCACGTCCTCATT3'
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[0486] A typical RT-PCR expression analysis is shown in FIG. 6. RT-PCR expression analysis was performed on first strand cDNAs generated using pools of tissues from multiple samples. The cDNAs were shown to be normalized using beta-actin PCR. Expression of 158P1D7 was observed in bladder cancer pool.

Example 2

Full Length Cloning of 158P1D7

[0487] The 158P1D7 SSH cDNA sequence was derived from a bladder cancer pool minus normal bladder cDNA subtraction. The SSH cDNA sequence (FIG. 1) was designated 158P1D7. The full-length cDNA clone 158P1D7-clone TurboScript3PX (FIG. 2) was cloned from bladder cancer pool cDNA.

[0488] 158P1D7 clone cDNA was deposited under the terms of the Budapest Treaty on 22 Aug. 2001, with the American Type Culture Collection (ATCC; 10801 University Blvd., Manassas, Va. 20110-2209 USA) as plasmid p158P1D7-Turbo/3PX, and has been assigned Accession No. PTA-3662.

Example 3

Chromosomal Mapping of 158P1D7

[0489] Chromosomal localization can implicate genes in disease pathogenesis. Several chromosome mapping approaches are available including fluorescent in situ hybridization (FISH), human/hamster radiation hybrid (RH) panels (Walter et al., 1994; Nature Genetics 7:22; Research Genetics, Huntsville Ala.), human-rodent somatic cell hybrid panels such as is available from the Coriell Institute (Camden,

N.J.), and genomic viewers utilizing BLAST homologies to sequenced and mapped genomic clones (NCBI, Bethesda, Md.).

[0490] 158P1D7 maps to chromosome 13, using 158P1D7 sequence and the NCBI BLAST tool. This is a region of frequent amplification in bladder cancer (Prat et al., Urology 2001 May; 57(5):986-92; Muscheck et al., Carcinogenesis 2000 September; 21(9):1721-26) and is associated with rapid tumor cell proliferation in advanced bladder cancer (Tomovska et al., Int J Oncol 2001 June; 18(6):1239-44).

Example 4

Expression Analysis of 158P1D7 in Normal Tissues and Patient Specimens

[0491] Analysis of 158P1D7 by RT-PCR is shown in FIG. 6. Strong expression of 158P1D7 is observed in bladder cancer pool and breast cancer pool. Lower levels of expression are observed in VP1, VP2, xenograft pool, prostate cancer pool, colon cancer pool, lung cancer pool, ovary cancer pool, and metastasis pool.

[0492] Extensive northern blot analysis of 158P1D7 in 16 human normal tissues confirms the expression observed by RT-PCR (FIG. 7). Two transcripts of approximately 4.6 and 4.2 kb are detected in prostate and, to lower levels, in heart, placenta, liver, small intestine and colon.

[0493] Northern blot analysis on patient tumor specimens shows expression of 158P1D7 in most bladder tumor tissues tested and in the bladder cancer cell line SCaBER (FIGS. 8A and 8B). The expression detected in normal adjacent tissues (isolated from patients) but not in normal tissues (isolated from a healthy donor) may indicate that these tissues are not fully normal and that 158P1D7 may be expressed in early stage tumors. Expression of 158P1D7 is also detected in 2 of 4 lung cancer cell lines, and in all 3 lung cancer tissues tested (FIG. 9). In breast cancer samples, 158P1D7 expression is observed in the MCF7 and CAMA-1 breast cancer cell lines, in breast tumor tissues isolated from breast cancer patients, but not in normal breast tissues (FIG. 10). 158P1D7 shows expression in melanoma cancer. RNA was extracted from normal skin cell line Detroit-551, and from the melanoma cancer cell line A375. Northern blots with 10 μ g of total RNA were probed with the 158P1D7 DNA probe. Results show expression of 158P1D7 in the melanoma cancer cell line but not in the normal cell line (FIG. 20). 158P1D7 shows expression in cervical cancer patient specimens. First strand cDNA was prepared from normal cervix, cervical cancer cell line Hela, and a panel of cervical cancer patient specimens. Normalization was performed by PCR using primers to actin and GAPDH. Semi-quantitative PCR, using primers to 158P1D7, was performed at 26 and 30 cycles of amplification. Results show expression of 158P1D7 in 5 out of 14 tumor specimens tested but not in normal cervix nor in the cell line (FIG. 21).

[0494] The restricted expression of 158P1D7 in normal tissues and the expression detected in prostate cancer, bladder cancer, colon cancer, lung cancer, ovarian cancer, breast cancer, melanoma cancer, and cervical cancer suggest that 158P1D7 is a potential therapeutic target and a diagnostic marker for human cancers.

Example 5

Production of Recombinant 158P1D7 in Prokaryotic Systems

[0495] To express recombinant 158P1D7 and 158P1D7 variants in prokaryotic cells, the full or partial length

158P1D7 and 158P1D7 variant cDNA sequences are cloned into any one of a variety of expression vectors known in the art. One or more of the following regions of 158P1D7 variants are expressed: the full length sequence presented in FIGS. 2 and 3, or any 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 or more contiguous amino acids from 158P1D7, variants, or analogs thereof.

[0496] A. In Vitro Transcription and Translation Constructs:

[0497] pCRII:

[0498] To generate 158P1D7 sense and anti-sense RNA probes for RNA in situ investigations, pCRII constructs (Invitrogen, Carlsbad Calif.) are generated encoding either all or fragments of the 158P1D7 cDNA. The pCRII vector has Sp6 and T7 promoters flanking the insert to drive the transcription of 158P1D7 RNA for use as probes in RNA in situ hybridization experiments. These probes are used to analyze the cell and tissue expression of 158P1D7 at the RNA level. Transcribed 158P1D7 RNA representing the cDNA amino acid coding region of the 158P1D7 gene is used in in vitro translation systems such as the TnT™ Coupled Reticulolysate System (Promega, Corp., Madison, Wis.) to synthesize 158P1D7 protein.

[0499] B. Bacterial Constructs:

[0500] pGEX Constructs:

[0501] To generate recombinant 158P1D7 proteins in bacteria that are fused to the Glutathione S-transferase (GST) protein, all or parts of the 158P1D7 cDNA protein coding sequence are cloned into the pGEX family of GST-fusion vectors (Amersham Pharmacia Biotech, Piscataway, N.J.). These constructs allow controlled expression of recombinant 158P1D7 protein sequences with GST fused at the amino-terminus and a six histidine epitope (6xHis) at the carboxyl-terminus. The GST and 6xHis tags permit purification of the recombinant fusion protein from induced bacteria with the appropriate affinity matrix and allow recognition of the fusion protein with anti-GST and anti-His antibodies. The 6xHis tag is generated by adding 6 histidine codons to the cloning primer at the 3' end, e.g., of the open reading frame (ORF). A proteolytic cleavage site, such as the PreScission™ recognition site in pGEX-6P-1, may be employed such that it permits cleavage of the GST tag from 158P1D7-related protein. The ampicillin resistance gene and pBR322 origin permits selection and maintenance of the pGEX plasmids in *E. coli*.

[0502] pMAL Constructs:

[0503] To generate, in bacteria, recombinant 158P1D7 proteins that are fused to maltose-binding protein (MBP), all or parts of the 158P1D7 cDNA protein coding sequence are fused to the MBP gene by cloning into the pMAL-c2X and pMAL-p2X vectors (New England Biolabs, Beverly, Mass.). These constructs allow controlled expression of recombinant 158P1D7 protein sequences with MBP fused at the amino-terminus and a 6xHis epitope tag at the carboxyl-terminus. The MBP and 6xHis tags permit purification of the recombinant protein from induced bacteria with the appropriate affinity matrix and allow recognition of the fusion protein with anti-MBP and anti-His antibodies. The 6xHis epitope tag is generated by adding 6 histidine codons to the 3' cloning primer. A Factor Xa recognition site permits cleavage of the pMAL tag from 158P1D7. The pMAL-c2X and pMAL-p2X vectors are optimized to express the recombinant protein in the cytoplasm or periplasm respectively. Periplasm expres-

sion enhances folding of proteins with disulfide bonds. Amino acids 356-608 of 158P1D7 variant 1 have been cloned into the pMALc2X vector.

[0504] pET Constructs:

[0505] To express 158P1D7 in bacterial cells, all or parts of the 158P1D7 cDNA protein coding sequence are cloned into the pET family of vectors (Novagen, Madison, Wis.). These vectors allow tightly controlled expression of recombinant 158P1D7 protein in bacteria with and without fusion to proteins that enhance solubility, such as NusA and thioredoxin (Trx), and epitope tags, such as 6xHis and S-Tag™ that aid purification and detection of the recombinant protein. For example, constructs are made utilizing pET NusA fusion system 43.1 such that regions of the 158P1D7 protein are expressed as amino-terminal fusions to NusA.

[0506] C. Yeast Constructs:

[0507] pESC Constructs:

[0508] To express 158P1D7 in the yeast species *Saccharomyces cerevisiae* for generation of recombinant protein and functional studies, all or parts of the 158P1D7 cDNA protein coding sequence are cloned into the pESC family of vectors each of which contain 1 of 4 selectable markers, HIS3, TRP1, LEU2, and URA3 (Stratagene, La Jolla, Calif.). These vectors allow controlled expression from the same plasmid of up to 2 different genes or cloned sequences containing either Flag™ or Myc epitope tags in the same yeast cell. This system is useful to confirm protein-protein interactions of 158P1D7. In addition, expression in yeast yields similar post-translational modifications, such as glycosylations and phosphorylations, that are found when expressed in eukaryotic cells.

[0509] pESP Constructs:

[0510] To express 158P1D7 in the yeast species *Saccharomyces pombe*, all or parts of the 158P1D7 cDNA protein coding sequence are cloned into the pESP family of vectors. These vectors allow controlled high level of expression of a 158P1D7 protein sequence that is fused at either the amino terminus or at the carboxyl terminus to GST which aids purification of the recombinant protein. A Flag™ epitope tag allows detection of the recombinant protein with anti-Flag™ antibody.

Example 6

Production of Recombinant 158P1D7 in Eukaryotic Systems

[0511] A. Mammalian Constructs:

[0512] To express recombinant 158P1D7 in eukaryotic cells, the full or partial length 158P1D7 cDNA sequences were cloned into any one of a variety of expression vectors known in the art. One or more of the following regions of 158P1D7 were expressed in these constructs, amino acids 1 to 841, or any 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 or more contiguous amino acids from 158P1D7 v.1; amino acids 1 to 732 of v.3; amino acids 1 to 395 of v.4; amino acids 1 to 529 of v.6; or any 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 or more contiguous amino acids from 158P1D7 variants, or analogs thereof.

[0513] The constructs can be transfected into any one of a wide variety of mammalian cells such as 293T cells. Transfected 293T cell lysates can be probed with the anti-158P1D7 polyclonal serum, described herein.

[0514] pcDNA4/HisMax Constructs:

[0515] To express 158P1D7 in mammalian cells, a 158P1D7 ORF, or portions thereof, of 158P1D7 are cloned into pcDNA4/H isMax Version A (Invitrogen, Carlsbad, Calif.). Protein expression is driven from the cytomegalovirus (CMV) promoter and the SP16 translational enhancer. The recombinant protein has Xpress™ and six histidine (6xHis) epitopes fused to the amino-terminus. The pcDNA4/H isMax vector also contains the bovine growth hormone (BGH) polyadenylation signal and transcription termination sequence to enhance mRNA stability along with the SV40 origin for episomal replication and simple vector rescue in cell lines expressing the large T antigen. The Zeocin resistance gene allows for selection of mammalian cells expressing the protein and the ampicillin resistance gene and ColE1 origin permits selection and maintenance of the plasmid in *E. coli*.

[0516] pcDNA3.1/MycHis Constructs:

[0517] To express 158P1D7 in mammalian cells, a 158P1D7 ORF, or portions thereof, of 158P1D7 with a consensus Kozak translation initiation site was cloned into pcDNA3.1/MycHis Version A (Invitrogen, Carlsbad, Calif.). Protein expression was driven from the cytomegalovirus (CMV) promoter. The recombinant proteins have the myc epitope and 6xHis epitope fused to the carboxyl-terminus. The pcDNA3.1/MycHis vector also contains the bovine growth hormone (BGH) polyadenylation signal and transcription termination sequence to enhance mRNA stability, along with the SV40 origin for episomal replication and simple vector rescue in cell lines expressing the large T antigen. The Neomycin resistance gene can be used, as it allows for selection of mammalian cells expressing the protein and the ampicillin resistance gene and ColE1 origin permits selection and maintenance of the plasmid in *E. coli*.

[0518] The complete ORF of 158P1D7 v.1 was cloned into the pcDNA3.1/MycHis construct to generate 158P1D7.pcDNA3.1/MycHis. FIG. 23 shows expression of 158P1D7.pcDNA3.1/MycHis following transfection into 293T cells. 293T cells were transfected with either 158P1D7.pcDNA3.1/MycHis or pcDNA3.1/MycHis vector control. Forty hours later, cells were collected and analyzed by flow cytometry using anti-158P1D7 monoclonal antibodies. Results show expression of 158P1D7 from the 158P1D7.pcDNA3.1/MycHis construct on the surface of transfected cells.

[0519] pcDNA3.1/CT-GFP-TOPO Construct:

[0520] To express 158P1D7 in mammalian cells and to allow detection of the recombinant proteins using fluorescence, a 158P1D7 ORF, or portions thereof, with a consensus Kozak translation initiation site are cloned into pcDNA3.1/CT-GFP-TOPO (Invitrogen, CA). Protein expression is driven from the cytomegalovirus (CMV) promoter. The recombinant proteins have the Green Fluorescent Protein (GFP) fused to the carboxyl-terminus facilitating non-invasive, in vivo detection and cell biology studies. The pcDNA3.1/CT-GFP-TOPO vector also contains the bovine growth hormone (BGH) polyadenylation signal and transcription termination sequence to enhance mRNA stability along with the SV40 origin for episomal replication and simple vector rescue in cell lines expressing the large T antigen. The Neomycin resistance gene allows for selection of mammalian cells that express the protein, and the ampicillin resistance gene and ColE1 origin permits selection and maintenance of the plasmid in *E. coli*. Additional constructs with an amino-terminal GFP fusion are made in pcDNA3.1/NT-GFP-TOPO spanning the entire length of a 158P1D7 protein.

[0521] PAPtag:

[0522] A 158P1D7 ORF, or portions thereof, is cloned into pAPtag-5 (GenHunter Corp. Nashville, Tenn.). This construct generates an alkaline phosphatase fusion at the carboxyl-terminus of a 158P1D7 protein while fusing the IgGκ signal sequence to the amino-terminus. Constructs are also generated in which alkaline phosphatase with an amino-terminal IgGκ signal sequence is fused to the amino-terminus of a 158P1D7 protein. The resulting recombinant 158P1D7 proteins are optimized for secretion into the media of transfected mammalian cells and can be used to identify proteins such as ligands or receptors that interact with 158P1D7 proteins. Protein expression is driven from the CMV promoter and the recombinant proteins also contain myc and 6xHis epitopes fused at the carboxyl-terminus that facilitates detection and purification. The Zeocin resistance gene present in the vector allows for selection of mammalian cells expressing the recombinant protein and the ampicillin resistance gene permits selection of the plasmid in *E. coli*.

[0523] pTag5:

[0524] A 158P1D7 ORF, or portions thereof, were cloned into pTag-5. This vector is similar to pAPtag but without the alkaline phosphatase fusion. This construct generated a 158P1D7 protein with an amino-terminal IgGκ signal sequence and myc and 6xHis epitope tags at the carboxyl-terminus that facilitate detection and affinity purification. The resulting recombinant 158P1D7 protein was optimized for secretion into the media of transfected mammalian cells, and was used as immunogen or ligand to identify proteins such as ligands or receptors that interact with the 158P1D7 proteins. Protein expression is driven from the CMV promoter. The Zeocin resistance gene present in the vector allows for selection of mammalian cells expressing the protein, and the ampicillin resistance gene permits selection of the plasmid in *E. coli*.

[0525] The extracellular domain, amino acids 16-608, 27-300, and 301-608, of 158P1D7 v.1 were cloned into the pTag5 construct to generate 158P1D7 (16-608).pTag5, 158P1D7(27-300).pTag5, and 158P1D7(301-608).pTag5 respectively. Expression and secretion of the various segments of the extracellular domain of 158P1D7 following vector transfection into 293T cells was confirmed.

[0526] PsecFc:

[0527] A 158P1D7 ORF, or portions thereof, was also cloned into psecFc. The psecFc vector was assembled by cloning the human immunoglobulin G1 (IgG) Fc (hinge, CH2, CH3 regions) into pSecTag2 (Invitrogen, California). This construct generates an IgG1 Fc fusion at the carboxyl-terminus of the 158P1D7 proteins, while fusing the IgGκ signal sequence to N-terminus. 158P1D7 fusions utilizing the murine IgG1 Fc region are also used. The resulting recombinant 158P1D7 proteins are optimized for secretion into the media of transfected mammalian cells, and can be used as immunogens or to identify proteins such as ligands or receptors that interact with 158P1D7 protein. Protein expression is driven from the CMV promoter. The hygromycin resistance gene present in the vector allows for selection of mammalian cells that express the recombinant protein, and the ampicillin resistance gene permits selection of the plasmid in *E. coli*.

[0528] The extracellular domain amino acids 16-608 of 158P1D7 v.1 was cloned into the psecFc construct to generate 158P1D7(16-608).psecFc.

[0529] pSR α Constructs:

[0530] To generate mammalian cell lines that express 158P1D7 constitutively, 158P1D7 ORF, or portions thereof, of 158P1D7 were cloned into pSR α constructs. Amphotropic and ecotropic retroviruses were generated by transfection of pSR α constructs into the 293T-10A1 packaging line or co-transfection of pSR α and a helper plasmid (containing deleted packaging sequences) into the 293 cells, respectively. The retrovirus is used to infect a variety of mammalian cell lines, resulting in the integration of the cloned gene, 158P1D7, into the host cell-lines. Protein expression is driven from a long terminal repeat (LTR). The Neomycin resistance gene present in the vector allows for selection of mammalian cells that express the protein, and the ampicillin resistance gene and ColE1 origin permit selection and maintenance of the plasmid in *E. coli*. The retroviral vectors can thereafter be used for infection and generation of various cell lines using, for example, PC3, NIH 3T3, TsuPr1, 293 or rat-1 cells.

[0531] The complete ORF of 158P1D7 v.1 was cloned into the pSR α construct to generate 158P1D7.pSR α . FIG. 23 shows expression of 158P1D7.pSR α following transduction into UMUC3 cells. UMUC-3 cells were transduced with either 158P1D7.pSR α or vector control. Forty hours later, cells were collected and analyzed by flow cytometry using anti-158P1D7 monoclonal antibodies. Results show expression of 158P1D7 from the 158P1D7.pSR α construct on the surface of the cells.

[0532] Additional pSR α constructs are made that fuse an epitope tag such as the FLAGTM tag to the carboxyl-terminus of 158P1D7 sequences to allow detection using anti-Flag antibodies. For example, the FLAGTM sequence 5' gat tac aag gat gac gac gat aag 3' (SEQ ID NO: 40) is added to cloning primer at the 3' end of the ORF. Additional pSR α constructs are made to produce both amino-terminal and carboxyl-terminal GFP and myc/6xHis fusion proteins of the full-length 158P1D7 proteins.

[0533] Additional Viral Vectors:

[0534] Additional constructs are made for viral-mediated delivery and expression of 158P1D7. High virus titer leading to high level expression of 158P1D7 is achieved in viral delivery systems such as adenoviral vectors and herpes amplicon vectors. A 158P1D7 coding sequences or fragments thereof are amplified by PCR and subcloned into the AdEasy shuttle vector (Stratagene). Recombination and virus packaging are performed according to the manufacturer's instructions to generate adenoviral vectors. Alternatively, 158P1D7 coding sequences or fragments thereof are cloned into the HSV-1 vector (Imgenex) to generate herpes viral vectors. The viral vectors are thereafter used for infection of various cell lines such as PC3, NIH 3T3, 293 or rat-1 cells.

[0535] Regulated Expression Systems:

[0536] To control expression of 158P1D7 in mammalian cells, coding sequences of 158P1D7, or portions thereof, are cloned into regulated mammalian expression systems such as the T-Rex System (Invitrogen), the GeneSwitch System (Invitrogen) and the tightly-regulated Ecdysone System (Stratagene). These systems allow the study of the temporal and concentration dependent effects of recombinant 158P1D7. These vectors are thereafter used to control expression of 158P1D7 in various cell lines such as PC3, NIH 3T3, 293 or rat-1 cells.

[0537] B. Baculovirus Expression Systems

[0538] To generate recombinant 158P1D7 proteins in a baculovirus expression system, 158P1D7 ORF, or portions

thereof, are cloned into the baculovirus transfer vector pBlueBac 4.5 (Invitrogen), which provides a His-tag at the N-terminus. Specifically, pBlueBac-158P1D7 is co-transfected with helper plasmid pBac-N-Blue (Invitrogen) into SF9 (*Spodoptera frugiperda*) insect cells to generate recombinant baculovirus (see Invitrogen instruction manual for details). Baculovirus is then collected from cell supernatant and purified by plaque assay.

[0539] Recombinant 158P1D7 protein is then generated by infection of HighFive insect cells (Invitrogen) with purified baculovirus. Recombinant 158P1D7 protein can be detected using anti-158P1D7 or anti-His-tag antibody. 158P1D7 protein can be purified and used in various cell-based assays or as immunogen to generate polyclonal and monoclonal antibodies specific for 158P1D7.

Example 7**Antigenicity Profiles and Secondary Structure**

[0540] FIG. 11(a)-(d), FIG. 12(a)-(d), FIG. 13(a)-(d), FIG. 14(a)-(d), and FIG. 15(a)-(d) depict graphically five amino acid profiles each of 158P1D7 protein variants 1, 3, 4, and 6, each assessment available by accessing the ProtScale website located on the World Wide Web at (expasy.ch/cgi-bin/protscale.pl) on the ExPasy molecular biology server.

[0541] These profiles: FIG. 11, Hydrophilicity, (Hopp T. P., Woods K. R., 1981. Proc. Natl. Acad. Sci. U.S.A. 78:3824-3828); FIG. 12, Hydropathicity, (Kyte J., Doolittle R. F., 1982. J. Mol. Biol. 157:105-132); FIG. 13, Percentage Accessible Residues (Janin J., 1979 Nature 277:491-492); FIG. 14, Average Flexibility, (Bhaskaran R., and Ponnuswamy P. K., 1988. Int. J. Pept. Protein Res. 32:242-255); FIG. 15, Beta-turn (Deleage, G., Roux B. 1987 Protein Engineering 1:289-294); and optionally others available in the art, such as on the ProtScale website, were used to identify antigenic regions of each of the 158P1D7 variant proteins. Each of the above amino acid profiles of 158P1D7 variants were generated using the following ProtScale parameters for analysis: 1) A window size of 9; 2) 100% weight of the window edges compared to the window center; and, 3) amino acid profile values normalized to lie between 0 and 1.

[0542] Hydrophilicity (FIG. 11), Hydropathicity (FIG. 12) and Percentage Accessible Residues (FIG. 13) profiles were used to determine stretches of hydrophilic amino acids (i.e., values greater than 0.5 on the Hydrophilicity and Percentage Accessible Residues profile, and values less than 0.5 on the Hydropathicity profile). Such regions are likely to be exposed to the aqueous environment, be present on the surface of the protein, and thus available for immune recognition, such as by antibodies.

[0543] Average Flexibility (FIG. 14) and Beta-turn (FIG. 15) profiles determine stretches of amino acids (i.e., values greater than 0.5 on the Beta-turn profile and the Average Flexibility profile) that are not constrained in secondary structures such as beta sheets and alpha helices. Such regions are also more likely to be exposed on the protein and thus accessible to immune recognition, such as by antibodies.

[0544] Antigenic sequences of the 158P1D7 variant proteins indicated, e.g., by the profiles set forth in FIGS. 11(a)-(d), FIG. 12(a)-(d), FIG. 13(a)-(d), FIG. 14(a)-(d), and FIG. 15(a)-(d) are used to prepare immunogens, either peptides or nucleic acids that encode them, to generate therapeutic and diagnostic anti-158P1D7 antibodies. The immunogen can be any 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21,

22, 23, 24, 25, 30, 35, 40, 45, 50 or more than 50 contiguous amino acids, or the corresponding nucleic acids that encode them, from the 158P1D7 protein variants listed in FIGS. 2 and 3. In particular, peptide immunogens of the invention can comprise, a peptide region of at least 5 amino acids of FIGS. 2 and 3 in any whole number increment that includes an amino acid position having a value greater than 0.5 in the Hydrophilicity profiles of FIG. 11; a peptide region of at least 5 amino acids of FIGS. 2 and 3 in any whole number increment that includes an amino acid position having a value less than 0.5 in the Hydropathicity profile of FIG. 12; a peptide region of at least 5 amino acids of FIGS. 2 and 3 in any whole number increment that includes an amino acid position having a value greater than 0.5 in the Percent Accessible Residues profiles of FIG. 13; a peptide region of at least 5 amino acids of FIGS. 2 and 3 in any whole number increment that includes an amino acid position having a value greater than 0.5 in the Average Flexibility profiles on FIG. 14; and, a peptide region of at least 5 amino acids of FIGS. 2 and 3 in any whole number increment that includes an amino acid position having a value greater than 0.5 in the Beta-turn profile of FIG. 15. Peptide immunogens of the invention can also comprise nucleic acids that encode any of the foregoing.

[0545] All immunogens of the invention, peptide or nucleic acid, can be embodied in human unit dose form, or comprised by a composition that includes a pharmaceutical excipient compatible with human physiology.

[0546] The secondary structure of 158P1D7 protein variants 1, 3, 4, and 6, namely the predicted presence and location of alpha helices, extended strands, and random coils, are predicted from the primary amino acid sequence using the HNN—Hierarchical Neural Network method (NPS@: Network Protein Sequence Analysis TIBS 2000 March Vol. 25, No 3 [291]:147-150 Combet C., Blanchet C., Geourj on C. and Deléage G., http://pbil.ibcp.fr/cgi-bin/npsa_automat.pl?page=npsa_nn.html), accessed from the ExPasy molecular biology server (<http://www.expasy.ch/tools/>). The analysis indicates that 158P1D7 variant 1 is composed of 35.32% alpha helix, 15.93% extended strand, and 48.75% random coil (FIG. 16A). Variant 3 is composed of 34.97% alpha helix, 16.94% extended strand, and 48.09% random coil (FIG. 16B). Variant 4 is composed of 24.56% alpha helix, 20.76% extended strand, and 54.68% random coil (FIG. 16C). Variant 6 is composed of 28.92% alpha helix, 17.96% extended strand, and 53.12% random coil (FIG. 16D).

[0547] Analysis for the potential presence of transmembrane domains in the 158P1D7 variant proteins was carried out using a variety of transmembrane prediction algorithms accessed from the ExPasy molecular biology server (<http://www.expasy.ch/tools/>). Shown graphically in FIG. 16E, 16G, 16I, 16K, are the results of analysis of variants 1, 3, 4, and 6, respectively, using the TMPred program. In FIG. 16F, 16H, 16J, 16L are the results of variants 1, 3, 4, and 6, respectively, using the TMHMM program. Both the TMPred program and the TMHMM program predict the presence of 1 transmembrane domain in variant 1 and 3. Variants 4 and 6 are not predicted to contain transmembrane domains. All variants contain a stretch of hydrophobic amino acid sequence at their amino terminus that may encode a signal peptide. Analyses of 158P1D7 and 158P1D7 variants using other structural prediction programs are summarized in Table LVI.

Example 8

Generation of 158P1D7 Polyclonal Antibodies

[0548] Polyclonal antibodies can be raised in a mammal, for example, by one or more injections of an immunizing agent and, if desired, an adjuvant. Typically, the immunizing agent and/or adjuvant will be injected in the mammal by multiple subcutaneous or intraperitoneal injections. In addition to immunizing with a full length 158P1D7 protein variant, computer algorithms are employed in design of immunogens that, based on amino acid sequence analysis contain characteristics of being antigenic and available for recognition by the immune system of the immunized host (see the Example entitled “Antigenicity Profiles and Secondary Structure”). Such regions would be predicted to be hydrophilic, flexible, in beta-turn conformations, and be exposed on the surface of the protein (see, e.g., FIG. 11, FIG. 12, FIG. 13, FIG. 14, or FIG. 15 for amino acid profiles that indicate such regions of 158P1D7 protein variants 1, 3, 4, and 6).

[0549] For example, recombinant bacterial fusion proteins or peptides containing hydrophilic, flexible, beta-turn regions of 158P1D7 protein variants are used as antigens to generate polyclonal antibodies in New Zealand White rabbits or monoclonal antibodies as described in Example 9. For example, in 158P1D7 variant 1, such regions include, but are not limited to, amino acids 25-45, amino acids 250-385, and amino acids 694-730. It is useful to conjugate the immunizing agent to a protein known to be immunogenic in the mammal being immunized. Examples of such immunogenic proteins include, but are not limited to, keyhole limpet hemocyanin (KLH), serum albumin, bovine thyroglobulin, and soybean trypsin inhibitor. In one embodiment, a peptide encoding amino acids 274-285 of 158P1D7 variant 1 was synthesized and conjugated to KLH. This peptide is then used as immunogen. Alternatively the immunizing agent may include all or portions of the 158P1D7 variant proteins, analogs or fusion proteins thereof. For example, the 158P1D7 variant 1 amino acid sequence can be fused using recombinant DNA techniques to any one of a variety of fusion protein partners that are well known in the art, such as glutathione-S-transferase (GST) and HIS tagged fusion proteins. In another embodiment, amino acids 27-300 of 158P1D7 variant 1 is fused to GST using recombinant techniques and the pGEX expression vector, expressed, purified and used to immunize a rabbit. Such fusion proteins are purified from induced bacteria using the appropriate affinity matrix.

[0550] Other recombinant bacterial fusion proteins that may be employed include maltose binding protein, LacZ, thioredoxin, NusA, or an immunoglobulin constant region (see the section entitled “Production of 158P1D7 in Prokaryotic Systems” and Current Protocols In Molecular Biology, Volume 2, Unit 16, Frederick M. Ausubel et al. eds., 1995; Linsley, P. S., Brady, W., Times, M., Grosmaire, L., Damle, N., and Ledbetter, L. (1991) J. Exp. Med. 174, 561-566).

[0551] In addition to bacterial derived fusion proteins, mammalian expressed protein antigens are also used. These antigens are expressed from mammalian expression vectors such as the Tag5 and Fc-fusion vectors (see the section entitled “Production of Recombinant 158P1D7 in Eukaryotic Systems”), and retain post-translational modifications such as glycosylations found in native protein. In one embodiment, amino acids 16-608 of 158P1D7 variant 1 was cloned into the Tag5 mammalian secretion vector, and expressed in 293T cells. The recombinant protein was purified by metal chelate

chromatography from tissue culture supernatants of 293T cells stably expressing the recombinant vector. The purified Tag5 158P1D7 variant 1 protein is then used as immunogen.

[0552] During the immunization protocol, it is useful to mix or emulsify the antigen in adjuvants that enhance the immune response of the host animal. Examples of adjuvants include, but are not limited to, complete Freund's adjuvant (CFA) and MPL-TDM adjuvant (monophosphoryl Lipid A, synthetic trehalose dicorynomycolate).

[0553] In a typical protocol, rabbits are initially immunized subcutaneously with up to 200 µg, typically 100-200 µg, of fusion protein or peptide conjugated to KLH mixed in complete Freund's adjuvant (CFA). Rabbits are then injected subcutaneously every two weeks with up to 200 µg, typically 100-200 µg, of the immunogen in incomplete Freund's adjuvant (IFA). Test bleeds are taken approximately 7-10 days following each immunization and used to monitor the titer of the antiserum by ELISA.

[0554] To test reactivity and specificity of immune serum, such as the rabbit serum derived from immunization with the GST-fusion of 158P1D7 variant 1 protein, the full-length 158P1D7 variant 1 cDNA is cloned into pcDNA 3.1 myc-his expression vector (Invitrogen, see the Example entitled "Production of Recombinant 158P1D7 in Eukaryotic Systems"). After transfection of the constructs into 293T cells, cell lysates are probed with the anti-158P1D7 serum and with anti-His antibody (Santa Cruz Biotechnologies, Santa Cruz, Calif.) to determine specific reactivity to denatured 158P1D7 protein using the Western blot technique. In addition, the immune serum is tested by fluorescence microscopy, flow cytometry and immunoprecipitation against 293T and other recombinant 158P1D7-expressing cells to determine specific recognition of native protein. Western blot, immunoprecipitation, fluorescent microscopy, and flow cytometric techniques using cells that endogenously express 158P1D7 are also carried out to test reactivity and specificity.

[0555] Anti-serum from rabbits immunized with 158P1D7 variant fusion proteins, such as GST and MBP fusion proteins, are purified by depletion of antibodies reactive to the fusion partner sequence by passage over an affinity column containing the fusion partner either alone or in the context of an irrelevant fusion protein. For example, antiserum derived from a GST-158P1D7 variant 1 fusion protein is first purified by passage over a column of GST protein covalently coupled to AffiGel matrix (BioRad, Hercules, Calif.). The antiserum is then affinity purified by passage over a column composed of a MBP-158P1D7 fusion protein covalently coupled to AffiGel matrix. The serum is then further purified by protein G affinity chromatography to isolate the IgG fraction. Sera from other His-tagged antigens and peptide immunized rabbits as well as fusion partner depleted sera are affinity purified by passage over a column matrix composed of the original protein immunogen or free peptide.

Example 9

Generation of 158P1D7 Monoclonal Antibodies (mAbs)

[0556] In one embodiment, therapeutic mAbs to 158P1D7 variants comprise those that react with epitopes specific for each variant protein or specific to sequences in common between the variants that would bind, internalize, disrupt or modulate the biological function of the 158P1D7 variants, for example those that would disrupt the interaction with ligands

and binding partners. Immunogens for generation of such mAbs include those designed to encode or contain the extracellular domain or the entire 158P1D7 protein variant sequence, regions predicted to contain functional motifs, and regions of the 158P1D7 protein variants predicted to be antigenic from computer analysis of the amino acid sequence (see, e.g., FIG. 11, FIG. 12, FIG. 13, FIG. 14, or FIG. 15, and the Example entitled "Antigenicity Profiles and Secondary Structure"). Immunogens include peptides, recombinant bacterial proteins, and mammalian expressed Tag 5 proteins and human and murine IgG FC fusion proteins. In addition, pTAG5 protein, DNA vectors encoding the pTAG5 cells engineered to express high levels of a respective 158P1D7 variant, such as 293T-158P1D7 variant 1 or 3T3, RAT, or 300.19-158P1D7 variant 1 murine Pre-B cells, are used to immunize mice.

[0557] To generate mAbs to a 158P1D7 variant, mice are first immunized intraperitoneally (IP) with, typically, 10-50 µg of protein immunogen or 10⁷ 158P1D7-expressing cells mixed in complete Freund's adjuvant. Mice are then subsequently immunized IP every 2-4 weeks with, typically, 10-50 µg of protein immunogen or 10⁷ cells mixed in incomplete Freund's adjuvant. Alternatively, MPL-TDM adjuvant is used in immunizations. In addition to the above protein and cell-based immunization strategies, a DNA-based immunization protocol is employed in which a mammalian expression vector encoding a 158P1D7 variant sequence is used to immunize mice by direct injection of the plasmid DNA. For example, amino acids 16-608 of 158P1D7 of variant 1 was cloned into the Tag5 mammalian secretion vector and the recombinant vector was used as immunogen. In another example, the same amino acids were cloned into an Fc-fusion secretion vector in which the 158P1D7 variant 1 sequence is fused at the amino-terminus to an IgK leader sequence and at the carboxyl-terminus to the coding sequence of the human or murine IgG Fc region. This recombinant vector was then used as immunogen. The plasmid immunization protocols were used in combination with purified proteins expressed from the same vector and with cells expressing the respective 158P1D7 variant.

[0558] During the immunization protocol, test bleeds are taken 7-10 days following an injection to monitor titer and specificity of the immune response. Once appropriate reactivity and specificity is obtained as determined by ELISA, Western blotting, immunoprecipitation, fluorescence microscopy, and flow cytometric analyses, fusion and hybridoma generation is then carried out with established procedures well known in the art (see, e.g., Harlow and Lane, 1988).

[0559] In one embodiment for generating 158P1D7 variant 1 monoclonal antibodies, a peptide encoding amino acids 274-285 was synthesized, conjugated to KLH and used as immunogen. ELISA on free peptide was used to identify immunoreactive clones. Reactivity and specificity of the monoclonal antibodies to full length 158P1D7 variant 1 protein was monitored by Western blotting, immunoprecipitation, and flow cytometry using both recombinant and endogenous-expressing 158P1D7 variant 1 cells (See FIGS. 22, 23, 24, 25, and 28).

[0560] The binding affinity of 158P1D7 variant 1 specific monoclonal antibodies was determined using standard technologies. Affinity measurements quantify the strength of antibody to epitope binding and are used to help define which 158P1D7 variant monoclonal antibodies preferred for diagnostic or therapeutic use, as appreciated by one of skill in the

art. The BIAcore system (Uppsala, Sweden) is a preferred method for determining binding affinity. The BIAcore system uses surface plasmon resonance (SPR, Welford K. 1991, Opt. Quant. Elect. 23:1; Morton and Myska, 1998, Methods in Enzymology 295: 268) to monitor biomolecular interactions in real time. BIAcore analysis conveniently generates association rate constants, dissociation rate constants, equilibrium dissociation constants, and affinity constants. Results of BIAcore analysis of 158P1D7 variant 1 monoclonal antibodies is shown in Table LVII.

[0561] To generate monoclonal antibodies specific for other 158P1D7 variants, immunogens are designed to encode amino acid sequences unique to the variants. In one embodiment, a peptide encoding amino acids 382-395 unique to 158P1D7 variant 4 is synthesized, coupled to KLH and used as immunogen. In another embodiment, peptides or bacterial fusion proteins are made that encompass the unique sequence generated by alternative splicing in the variants. In one example, a peptide encoding a consecutive sequence containing amino acids 682 and 683 in 158P1D7 variant 3 is used, such as amino acids 673-693. In another example, a peptide encoding a consecutive sequence containing amino acids 379-381 in 158P1D7 variant 6 is used, such as amino acids 369-391. Hybridomas are then selected that recognize the respective variant specific antigen and also recognize the full length variant protein expressed in cells. Such selection utilizes immunoassays described above such as Western blotting, immunoprecipitation, and flow cytometry.

[0562] To generate 158P1D7 monoclonal antibodies the following protocols were used. 5 Balb/c mice were immunized subcutaneously with 2 µg of peptide in Quiagen ImmuneEasy™ adjuvant. Immunizations were given 2 weeks apart. The peptide used was a 12 amino acid peptide consisting of amino acids 274-285 with the sequence EEHEDPSGSLHL (SEQ ID NO: 41) conjugated to KLH at the C' terminal (Keyhole Limpet Hemocyanin).

[0563] B-cells from spleens of immunized mice were fused with the fusion partner Sp2/0 under the influence of polyethylene glycol. Antibody producing hybridomas were selected by screening on peptide coated ELISA plates indicating specific binding to the peptide and then by FACS on cells expressing 158P1D7. This produced and identified four 158P1D7 extra cellular domain (ECD) specific antibodies designated: M15-68(2)18.1.1; M15-68(2)22.1.1; M15-68(2)31.1.1 and M15-68(2)102.1.1.

[0564] The antibody designated M15-68(2)18.1.1 was sent (via Federal Express) to the American Type Culture Collection (ATCC), P.O. Box 1549, Manassas, Va. 20108 on 6 Feb. 2004 and assigned Accession number PTA-5801.

The characteristics of these four antibodies are set forth in Table LVII.

[0565] To clone the M15-68(2)18.1.1 antibody the following protocols were used. M15-68(2)18.1.1 hybridoma cells were lysed with Trizol reagent (Life Technologies, Gibco BRL). Total RNA was purified and quantified. First strand cDNAs was generated from total RNA with oligo (dT)12-18 priming using the Gibco-BRL Superscript Preamplification system. First strand cDNA was amplified using mouse Ig variable heavy chain primers, and mouse Ig variable light chain primers. PCR products were cloned into the pCRScript vector (Stratagene, La Jolla). Several clones were sequenced and the variable heavy (VH) and variable light (VL) chain regions determined. The nucleic acid and amino acid

sequences of M15-68(2)18 variable heavy and light chain regions are set forth in FIGS. 34A and 34B and FIGS. 35A and 35B.

Example 10

HLA Class I and Class II Binding Assays

[0566] HLA class I and class II binding assays using purified HLA molecules are performed in accordance with disclosed protocols (e.g., PCT publications WO 94/20127 and WO 94/03205; Sidney et al., *Current Protocols in Immunology* 18.3.1 (1998); Sidney, et al., *J. Immunol.* 154:247 (1995); Sette, et al., *Mol. Immunol.* 31:813 (1994)). Briefly, purified MHC molecules (5 to 500 nM) are incubated with various unlabeled peptide inhibitors and 1-10 nM ¹²⁵I-radiolabeled probe peptides as described. Following incubation, MHC-peptide complexes are separated from free peptide by gel filtration and the fraction of peptide bound is determined. Typically, in preliminary experiments, each MHC preparation is titrated in the presence of fixed amounts of radiolabeled peptides to determine the concentration of HLA molecules necessary to bind 10-20% of the total radioactivity. All subsequent inhibition and direct binding assays are performed using these HLA concentrations.

[0567] Since under these conditions [label]<[HLA] and IC₅₀≥[HLA], the measured IC₅₀ values are reasonable approximations of the true K_D values. Peptide inhibitors are typically tested at concentrations ranging from 120 µg/ml to 1.2 ng/ml, and are tested in two to four completely independent experiments. To allow comparison of the data obtained in different experiments, a relative binding figure is calculated for each peptide by dividing the IC₅₀ of a positive control for inhibition by the IC₅₀ for each tested peptide (typically unlabeled versions of the radiolabeled probe peptide). For database purposes, and inter-experiment comparisons, relative binding values are compiled. These values can subsequently be converted back into IC₅₀ nM values by dividing the IC₅₀ nM of the positive controls for inhibition by the relative binding of the peptide of interest. This method of data compilation is accurate and consistent for comparing peptides that have been tested on different days, or with different lots of purified MHC.

[0568] Binding assays as outlined above may be used to analyze HLA supermotif and/or HLA motif-bearing peptides.

Example 11

Identification of HLA Supermotif- and Motif-Bearing CTL Candidate Epitopes

[0569] HLA vaccine compositions of the invention can include multiple epitopes. The multiple epitopes can comprise multiple HLA supermotifs or motifs to achieve broad population coverage. This example illustrates the identification and confirmation of supermotif- and motif-bearing epitopes for the inclusion in such a vaccine composition. Calculation of population coverage is performed using the strategy described below.

[0570] Computer Searches and Algorithms for Identification of Supermotif and/or Motif-Bearing Epitopes

[0571] The searches performed to identify the motif-bearing peptide sequences in the Example entitled "Antigenicity

Profiles" and Tables V-XVIII and XXII-XLIX employ the protein sequence data from the gene product of 158P1D7 set forth in FIGS. 2 and 3.

[0572] Computer searches for epitopes bearing HLA Class I or Class II supermotifs or motifs are performed as follows. All translated 158P1D7 protein sequences are analyzed using a text string search software program to identify potential peptide sequences containing appropriate HLA binding motifs; such programs are readily produced in accordance with information in the art in view of known motif/supermotif disclosures. Furthermore, such calculations can be made mentally.

[0573] Identified A2-, A3-, and DR-supermotif sequences are scored using polynomial algorithms to predict their capacity to bind to specific HLA-Class I or Class II molecules. These polynomial algorithms account for the impact of different amino acids at different positions, and are essentially based on the premise that the overall affinity (or ΔG) of peptide-HLA molecule interactions can be approximated as a linear polynomial function of the type:

$$"\Delta G" = a_{1j} \times a_{2j} \times a_{3j} \dots \times a_{nj}$$

where a_{ji} is a coefficient which represents the effect of the presence of a given amino acid (j) at a given position (i) along the sequence of a peptide of n amino acids. The crucial assumption of this method is that the effects at each position are essentially independent of each other (i.e., independent binding of individual side-chains). When residue j occurs at position i in the peptide, it is assumed to contribute a constant amount j_i to the free energy of binding of the peptide irrespective of the sequence of the rest of the peptide.

[0574] The method of derivation of specific algorithm coefficients has been described in Gulukota et al., *J. Mol. Biol.* 267:1258-126, 1997; (see also Sidney et al., *Human Immunol.* 45:79-93, 1996; and Southwood et al., *J. Immunol.* 160: 3363-3373, 1998). Briefly, for all i positions, anchor and non-anchor alike, the geometric mean of the average relative binding (ARB) of all peptides carrying j is calculated relative to the remainder of the group, and used as the estimate of j_i . For Class II peptides, if multiple alignments are possible, only the highest scoring alignment is utilized, following an iterative procedure. To calculate an algorithm score of a given peptide in a test set, the ARB values corresponding to the sequence of the peptide are multiplied. If this product exceeds a chosen threshold, the peptide is predicted to bind. Appropriate thresholds are chosen as a function of the degree of stringency of prediction desired.

[0575] Selection of HLA-A2 Supertype Cross-Reactive Peptides

[0576] Complete protein sequences from 158P1D7 are scanned utilizing motif identification software, to identify 8-, 9-10- and 11-mer sequences containing the HLA-A2-super-motif main anchor specificity. Typically, these sequences are then scored using the protocol described above and the peptides corresponding to the positive-scoring sequences are synthesized and tested for their capacity to bind purified HLA-A*0201 molecules in vitro (HLA-A*0201 is considered a prototype A2 supertype molecule).

[0577] These peptides are then tested for the capacity to bind to additional A2-supertype molecules (A*0202, A*0203, A*0206, and A*6802). Peptides that bind to at least three of the five A2-supertype alleles tested are typically deemed A2-supertype cross-reactive binders. Preferred pep-

tides bind at an affinity equal to or less than 500 nM to three or more HLA-A2 supertype molecules.

[0578] Selection of HLA-A3 Supermotif-Bearing Epitopes
[0579] The 158P1D7 protein sequence scanned above is also examined for the presence of peptides with the HLA-A3-supermotif primary anchors. Peptides corresponding to the HLA A3 supermotif-bearing sequences are then synthesized and tested for binding to HLA-A*0301 and HLA-A*1101 molecules, the molecules encoded by the two most prevalent A3-supertype alleles. The peptides that bind at least one of the two alleles with binding affinities of ≤ 500 nM, often ≤ 200 nM, are then tested for binding cross-reactivity to the other common A3-supertype alleles (e.g., A*3101, A*3301, and A*6801) to identify those that can bind at least three of the five HLA-A3-supertype molecules tested.

[0580] Selection of HLA-B7 Supermotif Bearing Epitopes
[0581] The 158P1D7 protein is also analyzed for the presence of 8-, 9-10-, or 11-mer peptides with the HLA-B7-supermotif. Corresponding peptides are synthesized and tested for binding to HLA-B*0702, the molecule encoded by the most common B7-supertype allele (i.e., the prototype B7 supertype allele). Peptides binding B*0702 with IC_{50} of ≤ 500 nM are identified using standard methods. These peptides are then tested for binding to other common B7-supertype molecules (e.g., B*3501, B*5101, B*5301, and B*5401). Peptides capable of binding to three or more of the five B7-supertype alleles tested are thereby identified.

[0582] Selection of A1 and A24 Motif-Bearing Epitopes
[0583] To further increase population coverage, HLA-A1 and -A24 epitopes can also be incorporated into vaccine compositions. An analysis of the 158P1D7 protein can also be performed to identify HLA-A1- and A24-motif-containing sequences.

[0584] High affinity and/or cross-reactive binding epitopes that bear other motif and/or supermotifs are identified using analogous methodology.

Example 12

Confirmation of Immunogenicity

[0585] Cross-reactive candidate CTL A2-supermotif-bearing peptides that are identified as described herein are selected to confirm in vitro immunogenicity. Confirmation is performed using the following methodology:

[0586] Target Cell Lines for Cellular Screening:

[0587] The 0.221A2.1 cell line, produced by transferring the HLA-A2.1 gene into the HLA-A, -B, -C null mutant human B-lymphoblastoid cell line 721.221, is used as the peptide-loaded target to measure activity of HLA-A2.1-restricted CTL. This cell line is grown in RPMI-1640 medium supplemented with antibiotics, sodium pyruvate, nonessential amino acids and 10% (v/v) heat inactivated FCS. Cells that express an antigen of interest, or transfectants comprising the gene encoding the antigen of interest, can be used as target cells to confirm the ability of peptide-specific CTLs to recognize endogenous antigen.

[0588] Primary CTL Induction Cultures:

[0589] Generation of Dendritic Cells (DC):

[0590] PBMCs are thawed in RPMI with 30 μ g/ml DNase, washed twice and resuspended in complete medium (RPMI-1640 plus 5% AB human serum, non-essential amino acids, sodium pyruvate, L-glutamine and penicillin/streptomycin). The monocytes are purified by plating 10×10^6 PBMC/well in a 6-well plate. After 2 hours at 37° C., the non-adherent cells

are removed by gently shaking the plates and aspirating the supernatants. The wells are washed a total of three times with 3 ml RPMI to remove most of the non-adherent and loosely adherent cells. Three ml of complete medium containing 50 ng/ml of GM-CSF and 1,000 U/ml of IL-4 are then added to each well. TNF α is added to the DCs on day 6 at 75 ng/ml and the cells are used for CTL induction cultures on day 7.

[0591] Induction of CTL with DC and Peptide:

[0592] CD8+ T-cells are isolated by positive selection with Dynal immunomagnetic beads (Dynabeads® M-450) and the Detacha-Bead® reagent. Typically about 200–250 $\times 10^6$ PBMC are processed to obtain 24 $\times 10^6$ CD8+ T-cells (enough for a 48-well plate culture). Briefly, the PBMCs are thawed in RPMI with 30 μ g/ml DNase, washed once with PBS containing 1% human AB serum and resuspended in PBS/1% AB serum at a concentration of 20 $\times 10^6$ cells/ml. The magnetic beads are washed 3 times with PBS/AB serum, added to the cells (1400 beads/20 $\times 10^6$ cells) and incubated for 1 hour at 4° C. with continuous mixing. The beads and cells are washed 4 $\times$ with PBS/AB serum to remove the nonadherent cells and resuspended at 100 $\times 10^6$ cells/ml (based on the original cell number) in PBS/AB serum containing 100 μ l/ml Detacha-Bead® reagent and 30 μ g/ml DNase. The mixture is incubated for 1 hour at room temperature with continuous mixing. The beads are washed again with PBS/AB/DNase to collect the CD8+ T-cells. The DC are collected and centrifuged at 1300 rpm for 5-7 minutes, washed once with PBS with 1% BSA, counted and pulsed with 40 μ g/ml of peptide at a cell concentration of 1–2 $\times 10^6$ /ml in the presence of 3 μ g/ml β_2 -microglobulin for 4 hours at 20° C. The DC are then irradiated (4,200 rads), washed 1 time with medium and counted again.

[0593] Setting Up Induction Cultures:

[0594] 0.25 ml cytokine-generated DC (at 1 $\times 10^5$ cells/ml) are co-cultured with 0.25 ml of CD8+ T-cells (at 2 $\times 10^6$ cell/ml) in each well of a 48-well plate in the presence of 10 ng/ml of IL-7. Recombinant human IL-10 is added the next day at a final concentration of 10 ng/ml and rhuman IL-2 is added 48 hours later at 10 IU/ml.

[0595] Restimulation of the Induction Cultures with Peptide-Pulsed Adherent Cells:

[0596] Seven and fourteen days after the primary induction, the cells are restimulated with peptide-pulsed adherent cells. The PBMCs are thawed and washed twice with RPMI and DNase. The cells are resuspended at 5 $\times 10^6$ cells/ml and irradiated at ~4200 rads. The PBMCs are plated at 2 $\times 10^6$ in 0.5 ml complete medium per well and incubated for 2 hours at 37° C. The plates are washed twice with RPMI by tapping the plate gently to remove the nonadherent cells and the adherent cells pulsed with 10 μ g/ml of peptide in the presence of 3 μ g/ml β_2 microglobulin in 0.25 ml RPMI/5% AB per well for 2 hours at 37° C. Peptide solution from each well is aspirated and the wells are washed once with RPMI. Most of the media is aspirated from the induction cultures (CD8+ cells) and brought to 0.5 ml with fresh media. The cells are then transferred to the wells containing the peptide-pulsed adherent cells. Twenty four hours later recombinant human IL-10 is added at a final concentration of 10 ng/ml and recombinant human IL2 is added the next day and again 2-3 days later at 50 IU/ml (Tsai et al., *Critical Reviews in Immunology* 18(1-2): 65-75, 1998). Seven days later, the cultures are assayed for CTL activity in a ^{51}Cr release assay. In some experiments the cultures are assayed for peptide-specific recognition in the in situ IFN γ ELISA at the time of the second restimulation

followed by assay of endogenous recognition 7 days later. After expansion, activity is measured in both assays for a side-by-side comparison.

Measurement of CTL Lytic Activity by ^{51}Cr Release

[0597] Seven days after the second restimulation, cytotoxicity is determined in a standard (5 hr) ^{51}Cr release assay by assaying individual wells at a single E:T. Peptide-pulsed targets are prepared by incubating the cells with 10 μ g/ml peptide overnight at 37° C.

[0598] Adherent target cells are removed from culture flasks with trypsin-EDTA. Target cells are labeled with 200 μ Ci of ^{51}Cr sodium chromate (Dupont, Wilmington, Del.) for 1 hour at 37° C. Labeled target cells are resuspended at 10 ^{6} per ml and diluted 1:10 with K562 cells at a concentration of 3.3 $\times 10^6$ /ml (an NK-sensitive erythroblastoma cell line used to reduce non-specific lysis). Target cells (100 μ l) and effectors (100 μ l) are plated in 96 well round-bottom plates and incubated for 5 hours at 37° C. At that time, 100 μ l of supernatant are collected from each well and percent lysis is determined according to the formula:

$$\frac{[(\text{cpm of the test sample} - \text{cpm of the spontaneous } ^{51}\text{Cr} \text{ release sample}) / (\text{cpm of the maximal } ^{51}\text{Cr} \text{ release sample} - \text{cpm of the spontaneous } ^{51}\text{Cr} \text{ release sample})] \times 100.}$$

[0599] Maximum and spontaneous release are determined by incubating the labeled targets with 1% Triton X-100 and media alone, respectively. A positive culture is defined as one in which the specific lysis (sample-background) is 10% or higher in the case of individual wells and is 15% or more at the two highest E:T ratios when expanded cultures are assayed.

[0600] In Situ Measurement of Human IFN γ Production as an Indicator of Peptide-Specific and Endogenous Recognition

[0601] Immulon 2 plates are coated with mouse anti-human IFN γ monoclonal antibody (4 μ g/ml 0.1M NaHCO $_3$, pH8.2) overnight at 4° C. The plates are washed with Ca $^{2+}$, Mg $^{2+}$ -free PBS/0.05% Tween 20 and blocked with PBS/10% FCS for two hours, after which the CTLs (100 μ l/well) and targets (100 μ l/well) are added to each well, leaving empty wells for the standards and blanks (which received media only). The target cells, either peptide-pulsed or endogenous targets, are used at a concentration of 1 $\times 10^6$ cells/ml. The plates are incubated for 48 hours at 37° C. with 5% CO $_2$.

[0602] Recombinant human IFN-gamma is added to the standard wells starting at 400 pg or 1200 pg/100 microliter/well and the plate incubated for two hours at 37° C. The plates are washed and 100 μ l of biotinylated mouse anti-human IFN-gamma monoclonal antibody (2 microgram/ml in PBS/3% FCS/0.05% Tween 20) are added and incubated for 2 hours at room temperature. After washing again, 100 microliter HRP-streptavidin (1:4000) are added and the plates incubated for one hour at room temperature. The plates are then washed 6 $\times$ with wash buffer, 100 microliter/well developing solution (TMB 1:1) are added, and the plates allowed to develop for 5-15 minutes. The reaction is stopped with 50 microliter/well 1M H $_3$ PO $_4$ and read at OD450. A culture is considered positive if it measured at least 50 pg of IFN-gamma/well above background and is twice the background level of expression.

[0603] CTL Expansion.

[0604] Those cultures that demonstrate specific lytic activity against peptide-pulsed targets and/or tumor targets are expanded over a two week period with anti-CD3. Briefly,

5×10^4 CD8⁺ cells are added to a T25 flask containing the following: 1×10^6 irradiated (4,200 rad) PBMC (autologous or allogeneic) per ml, 2×10^5 irradiated (8,000 rad) EBV-transformed cells per ml, and OKT3 (anti-CD3) at 30 ng per ml in RPMI-1640 containing 10% (v/v) human AB serum, non-essential amino acids, sodium pyruvate, 25 μ M 2-mercaptoethanol, L-glutamine and penicillin/streptomycin. Recombinant human IL2 is added 24 hours later at a final concentration of 200 IU/ml and every three days thereafter with fresh media at 50 IU/ml. The cells are split if the cell concentration exceeds 1×10^6 /ml and the cultures are assayed between days 13 and 15 at E:T ratios of 30, 10, 3 and 1:1 in the ^{51} Cr release assay or at 1×10^6 /ml in the in situ IFN γ assay using the same targets as before the expansion.

[0605] Cultures are expanded in the absence of anti-CD3⁺ as follows. Those cultures that demonstrate specific lytic activity against peptide and endogenous targets are selected and 5×10^4 CD8⁺ cells are added to a T25 flask containing the following: 1×10^6 autologous PBMC per ml which have been peptide-pulsed with 10 μ g/ml peptide for two hours at 37° C. and irradiated (4,200 rad); 2×10^5 irradiated (8,000 rad) EBV-transformed cells per ml RPMI-1640 containing 10% (v/v) human AB serum, non-essential AA, sodium pyruvate, 25 mM 2-ME, L-glutamine and gentamicin.

[0606] Immunogenicity of A2 Supermotif-Bearing Peptides

[0607] A2-supermotif cross-reactive binding peptides are tested in the cellular assay for the ability to induce peptide-specific CTL in normal individuals. In this analysis, a peptide is typically considered to be an epitope if it induces peptide-specific CTLs in at least individuals, and preferably, also recognizes the endogenously expressed peptide.

[0608] Immunogenicity can also be confirmed using PBMCs isolated from patients bearing a tumor that expresses 158P1D7. Briefly, PBMCs are isolated from patients, restimulated with peptide-pulsed monocytes and assayed for the ability to recognize peptide-pulsed target cells as well as transfected cells endogenously expressing the antigen.

[0609] Evaluation of A*03/A11 Immunogenicity

[0610] HLA-A3 supermotif-bearing cross-reactive binding peptides are also evaluated for immunogenicity using methodology analogous for that used to evaluate the immunogenicity of the HLA-A2 supermotif peptides.

[0611] Evaluation of B7 Immunogenicity

[0612] Immunogenicity screening of the B7-supertype cross-reactive binding peptides identified as set forth herein are confirmed in a manner analogous to the confirmation of A2- and A3-supermotif-bearing peptides.

[0613] Peptides bearing other supermotifs/motifs, e.g., HLA-A1, HLA-A24 etc. are also confirmed using similar methodology

Example 13

Implementation of the Extended Supermotif to Improve the Binding Capacity of Native Epitopes by Creating Analogs

[0614] HLA motifs and supermotifs (comprising primary and/or secondary residues) are useful in the identification and preparation of highly cross-reactive native peptides, as demonstrated herein. Moreover, the definition of HLA motifs and supermotifs also allows one to engineer highly cross-reactive epitopes by identifying residues within a native peptide sequence which can be analoged to confer upon the peptide

certain characteristics, e.g. greater cross-reactivity within the group of HLA molecules that comprise a supertype, and/or greater binding affinity for some or all of those HLA molecules. Examples of analoging peptides to exhibit modulated binding affinity are set forth in this example.

[0615] Analoging at Primary Anchor Residues

[0616] Peptide engineering strategies are implemented to further increase the cross-reactivity of the epitopes. For example, the main anchors of A2-supermotif-bearing peptides are altered, for example, to introduce a preferred L, I, V, or M at position 2, and I or V at the C-terminus.

[0617] To analyze the cross-reactivity of the analog peptides, each engineered analog is initially tested for binding to the prototype A2 supertype allele A*0201, then, if A*0201 binding capacity is maintained, for A2-supertype cross-reactivity.

[0618] Alternatively, a peptide is confirmed as binding one or all supertype members and then analogued to modulate binding affinity to any one (or more) of the supertype members to add population coverage.

[0619] The selection of analogs for immunogenicity in a cellular screening analysis is typically further restricted by the capacity of the parent wild type (WT) peptide to bind at least weakly, i.e., bind at an IC₅₀ of 5000 nM or less, to three or more A2 supertype alleles. The rationale for this requirement is that the WT peptides must be present endogenously in sufficient quantity to be biologically relevant. Analogued peptides have been shown to have increased immunogenicity and cross-reactivity by T cells specific for the parent epitope (see, e.g., Parkhurst et al., *J. Immunol.* 157:2539, 1996; and Pogue et al., *Proc. Natl. Acad. Sci. USA* 92:8166, 1995).

[0620] In the cellular screening of these peptide analogs, it is important to confirm that analog-specific CTLs are also able to recognize the wild-type peptide and, when possible, target cells that endogenously express the epitope.

[0621] Analoging of HLA-A3 and B7-Supermotif-Bearing Peptides

[0622] Analogs of HLA-A3 supermotif-bearing epitopes are generated using strategies similar to those employed in analoging HLA-A2 supermotif-bearing peptides. For example, peptides binding to $\frac{3}{5}$ of the A3-supertype molecules are engineered at primary anchor residues to possess a preferred residue (V, S, M, or A) at position 2.

[0623] The analog peptides are then tested for the ability to bind A*03 and A*11 (prototype A3 supertype alleles). Those peptides that demonstrate 500 nM binding capacity are then confirmed as having A3-supertype cross-reactivity.

[0624] Similarly to the A2- and A3-motif bearing peptides, peptides binding 3 or more B7-supertype alleles can be improved, where possible, to achieve increased cross-reactive binding or greater binding affinity or binding half life. B7 supermotif-bearing peptides are, for example, engineered to possess a preferred residue (V, I, L, or F) at the C-terminal primary anchor position, as demonstrated by Sidney et al. (*J. Immunol.* 157:3480-3490, 1996).

[0625] Analoging at primary anchor residues of other motif and/or supermotif-bearing epitopes is performed in a like manner.

[0626] The analog peptides are then be confirmed for immunogenicity, typically in a cellular screening assay. Again, it is generally important to demonstrate that analog-specific CTLs are also able to recognize the wild-type peptide and, when possible, targets that endogenously express the epitope.

[0627] Analoging at Secondary Anchor Residues

[0628] Moreover, HLA supermotifs are of value in engineering highly cross-reactive peptides and/or peptides that bind HLA molecules with increased affinity by identifying particular residues at secondary anchor positions that are associated with such properties. For example, the binding capacity of a B7 supermotif-bearing peptide with an F residue at position 1 is analyzed. The peptide is then analoged to, for example, substitute L for F at position 1. The analoged peptide is evaluated for increased binding affinity, binding half life and/or increased cross-reactivity. Such a procedure identifies analoged peptides with enhanced properties.

[0629] Engineered analogs with sufficiently improved binding capacity or cross-reactivity can also be tested for immunogenicity in HLA-B7-transgenic mice, following for example, IFA immunization or lipopeptide immunization. Analogued peptides are additionally tested for the ability to stimulate a recall response using PBMC from patients with 158P1D7-expressing tumors.

[0630] Other Analoguing Strategies

[0631] Another form of peptide analoguing, unrelated to anchor positions, involves the substitution of a cysteine with α -amino butyric acid. Due to its chemical nature, cysteine has the propensity to form disulfide bridges and sufficiently alter the peptide structurally so as to reduce binding capacity. Substitution of α -amino butyric acid for cysteine not only alleviates this problem, but has been shown to improve binding and crossbinding capabilities in some instances (see, e.g., the review by Sette et al., In: Persistent Viral Infections, Eds. R. Ahmed and I. Chen, John Wiley & Sons, England, 1999).

[0632] Thus, by the use of single amino acid substitutions, the binding properties and/or cross-reactivity of peptide ligands for HLA supertype molecules can be modulated.

Example 14

Identification and Confirmation of 158P1D7-Derived Sequences with HLA-DR Binding Motifs

[0633] Peptide epitopes bearing an HLA class II supermotif or motif are identified and confirmed as outlined below using methodology similar to that described for HLA Class I peptides.

[0634] Selection of HLA-DR-Supermotif-Bearing Epitopes.

[0635] To identify 158P1D7-derived, HLA class II HTL epitopes, the 158P1D7 antigen is analyzed for the presence of sequences bearing an HLA-DR-motif or supermotif. Specifically, 15-mer sequences are selected comprising a DR-supermotif, comprising a 9-mer core, and three-residue N- and C-terminal flanking regions (15 amino acids total).

[0636] Protocols for predicting peptide binding to DR molecules have been developed (Southwood et al., *J. Immunol.* 160:3363-3373, 1998). These protocols, specific for individual DR molecules, allow the scoring, and ranking, of 9-mer core regions. Each protocol not only scores peptide sequences for the presence of DR-supermotif primary anchors (i.e., at position 1 and position 6) within a 9-mer core, but additionally evaluates sequences for the presence of secondary anchors. Using allele-specific selection tables (see, e.g., Southwood et al., *ibid.*), it has been found that these protocols efficiently select peptide sequences with a high probability of binding a particular DR molecule. Additionally, it has been found that performing these protocols in

tandem, specifically those for DR1, DR4w4, and DR7, can efficiently select DR cross-reactive peptides.

[0637] The 158P1D7-derived peptides identified above are tested for their binding capacity for various common HLA-DR molecules. All peptides are initially tested for binding to the DR molecules in the primary panel: DR1, DR4w4, and DR7. Peptides binding at least two of these three DR molecules are then tested for binding to DR2w2 β 1, DR2w2 β 2, DR6w19, and DR9 molecules in secondary assays. Finally, peptides binding at least two of the four secondary panel DR molecules, and thus cumulatively at least four of seven different DR molecules, are screened for binding to DR4w15, DR5w11, and DR8w2 molecules in tertiary assays. Peptides binding at least seven of the ten DR molecules comprising the primary, secondary, and tertiary screening assays are considered cross-reactive DR binders. 158P1D7-derived peptides found to bind common HLA-DR alleles are of particular interest.

[0638] Selection of DR3 Motif Peptides

[0639] Because HLA-DR3 is an allele that is prevalent in Caucasian, Black, and Hispanic populations, DR3 binding capacity is a relevant criterion in the selection of HTL epitopes. Thus, peptides shown to be candidates may also be assayed for their DR3 binding capacity. However, in view of the binding specificity of the DR3 motif, peptides binding only to DR3 can also be considered as candidates for inclusion in a vaccine formulation.

[0640] To efficiently identify peptides that bind DR3, target 158P1D7 antigens are analyzed for sequences carrying one of the two DR3-specific binding motifs reported by Geluk et al. (*J. Immunol.* 152:5742-5748, 1994). The corresponding peptides are then synthesized and confirmed as having the ability to bind DR3 with an affinity of 1 μ M or better, i.e., less than 1 μ M. Peptides are found that meet this binding criterion and qualify as HLA class II high affinity binders.

[0641] DR3 binding epitopes identified in this manner are included in vaccine compositions with DR supermotif-bearing peptide epitopes.

[0642] Similarly to the case of HLA class I motif-bearing peptides, the class II motif-bearing peptides are analoged to improve affinity or cross-reactivity. For example, aspartic acid at position 4 of the 9-mer core sequence is an optimal residue for DR3 binding, and substitution for that residue often improves DR 3 binding.

Example 15

Immunogenicity of 158P1D7-Derived HTL Epitopes

[0643] This example determines immunogenic DR supermotif- and DR3 motif-bearing epitopes among those identified using the methodology set forth herein.

[0644] Immunogenicity of HTL epitopes are confirmed in a manner analogous to the determination of immunogenicity of CTL epitopes, by assessing the ability to stimulate HTL responses and/or by using appropriate transgenic mouse models. Immunogenicity is determined by screening for: 1.) in vitro primary induction using normal PBMC or 2.) recall responses from patients who have 158P1D7-expressing tumors.

Example 16

Calculation of Phenotypic Frequencies of
HLA-Supertypes in Various Ethnic Backgrounds to
Determine Breadth of Population Coverage

[0645] This example illustrates the assessment of the breadth of population coverage of a vaccine composition comprised of multiple epitopes comprising multiple supermotifs and/or motifs.

[0646] In order to analyze population coverage, gene frequencies of HLA alleles are determined. Gene frequencies for each HLA allele are calculated from antigen or allele frequencies utilizing the binomial distribution formulae $gf=1-(\text{SQRT}(1-af))$ (see, e.g., Sidney et al., *Human Immunol.* 45:79-93, 1996). To obtain overall phenotypic frequencies, cumulative gene frequencies are calculated, and the cumulative antigen frequencies derived by the use of the inverse formula $[af=1-(1-Cgf)^2]$.

[0647] Where frequency data is not available at the level of DNA typing, correspondence to the serologically defined antigen frequencies is assumed. To obtain total potential supertype population coverage no linkage disequilibrium is assumed, and only alleles confirmed to belong to each of the superotypes are included (minimal estimates). Estimates of total potential coverage achieved by inter-loci combinations are made by adding to the A coverage the proportion of the non-A covered population that could be expected to be covered by the B alleles considered (e.g., $\text{total}=A+B*(1-A)$). Confirmed members of the A3-like supertype are A3, A11, A31, A*3301, and A*6801. Although the A3-like supertype may also include A34, A66, and A*7401, these alleles were not included in overall frequency calculations. Likewise, confirmed members of the A2-like supertype family are A*0201, A*0202, A*0203, A*0204, A*0205, A*0206, A*0207, A*6802, and A*6901. Finally, the B7-like supertype-confirmed alleles are: B7, B*3501-03, B51, B*5301, B*5401, B*5501-2, B*5601, B*6701, and B*7801 (potentially also B*1401, B*3504-06, B*4201, and B*5602).

[0648] Population coverage achieved by combining the A2-, A3- and B7-supertypes is approximately 86% in five major ethnic groups. Coverage may be extended by including peptides bearing the A1 and A24 motifs. On average, A1 is present in 12% and A24 in 29% of the population across five different major ethnic groups (Caucasian, North American Black, Chinese, Japanese, and Hispanic). Together, these alleles are represented with an average frequency of 39% in these same ethnic populations. The total coverage across the major ethnicities when A1 and A24 are combined with the coverage of the A2-, A3- and B7-supertype alleles is >95%. An analogous approach can be used to estimate population coverage achieved with combinations of class II motif-bearing epitopes.

[0649] Immunogenicity studies in humans (e.g., Bertoni et al., *J. Clin. Invest.* 100:503, 1997; Doolan et al., *Immunity* 7:97, 1997; and Threlkeld et al., *J. Immunol.* 159:1648, 1997) have shown that highly cross-reactive binding peptides are almost always recognized as epitopes. The use of highly cross-reactive binding peptides is an important selection criterion in identifying candidate epitopes for inclusion in a vaccine that is immunogenic in a diverse population.

[0650] With a sufficient number of epitopes (as disclosed herein and from the art), an average population coverage is predicted to be greater than 95% in each of five major ethnic populations. The game theory Monte Carlo simulation analy-

sis, which is known in the art (see e.g., Osborne, M. J. and Rubinstein, A. "A course in game theory" MIT Press, 1994), can be used to estimate what percentage of the individuals in a population comprised of the Caucasian, North American Black, Japanese, Chinese, and Hispanic ethnic groups would recognize the vaccine epitopes described herein. A preferred percentage is 90%. A more preferred percentage is 95%.

Example 17

CTL Recognition of Endogenously Processed
Antigens after Priming

[0651] This example confirms that CTL induced by native or analoged peptide epitopes identified and selected as described herein recognize endogenously synthesized, i.e., native antigens.

[0652] Effector cells isolated from transgenic mice that are immunized with peptide epitopes, for example HLA-A2 supermotif-bearing epitopes, are re-stimulated in vitro using peptide-coated stimulator cells. Six days later, effector cells are assayed for cytotoxicity and the cell lines that contain peptide-specific cytotoxic activity are further re-stimulated. An additional six days later, these cell lines are tested for cytotoxic activity on ^{51}Cr labeled Jurkat-A2.1/ K^b target cells in the absence or presence of peptide, and also tested on ^{51}Cr labeled target cells bearing the endogenously synthesized antigen, i.e. cells that are stably transfected with 158P1D7 expression vectors.

[0653] The results demonstrate that CTL lines obtained from animals primed with peptide epitope recognize endogenously synthesized 158P1D7 antigen. The choice of transgenic mouse model to be used for such an analysis depends upon the epitope(s) that are being evaluated. In addition to HLA-A*0201/ K^b transgenic mice, several other transgenic mouse models including mice with human A11, which may also be used to evaluate A3 epitopes, and B7 alleles have been characterized and others (e.g., transgenic mice for HLA-A1 and A24) are being developed. HLA-DR1 and HLA-DR3 mouse models have also been developed, which may be used to evaluate HTL epitopes.

Example 18

Activity of CTL-HTL Conjugated Epitopes in
Transgenic Mice

[0654] This example illustrates the induction of CTLs and HTLs in transgenic mice, by use of a 158P1D7-derived CTL and HTL peptide vaccine compositions. The vaccine composition used herein comprise peptides to be administered to a patient with a 158P1D7-expressing tumor. The peptide composition can comprise multiple CTL and/or HTL epitopes. The epitopes are identified using methodology as described herein. This example also illustrates that enhanced immunogenicity can be achieved by inclusion of one or more HTL epitopes in a CTL vaccine composition; such a peptide composition can comprise an HTL epitope conjugated to a CTL epitope. The CTL epitope can be one that binds to multiple HLA family members at an affinity of 500 nM or less, or analogs of that epitope. The peptides may be lipidated, if desired.

[0655] Immunization Procedures:

[0656] Immunization of transgenic mice is performed as described (Alexander et al., *J. Immunol.* 159:4753-4761, 1997). For example, A2/ K^b mice, which are transgenic for the

human HLA A2.1 allele and are used to confirm the immunogenicity of HLA-A*0201 motif- or HLA-A2 supermotif-bearing epitopes, and are primed subcutaneously (base of the tail) with a 0.1 ml of peptide in Incomplete Freund's Adjuvant, or if the peptide composition is a lipidated CTL/HTL conjugate, in DMSO/saline, or if the peptide composition is a polypeptide, in PBS or Incomplete Freund's Adjuvant. Seven days after priming, splenocytes obtained from these animals are restimulated with syngenic irradiated LPS-activated lymphoblasts coated with peptide.

[0657] Cell Lines:

[0658] Target cells for peptide-specific cytotoxicity assays are Jurkat cells transfected with the HLA-A2.1/K^b chimeric gene (e.g., Vitiello et al., *J. Exp. Med.* 173:1007, 1991)

[0659] In Vitro CTL Activation:

[0660] One week after priming, spleen cells (30×10^6 cells/flask) are co-cultured at 37° C. with syngeneic, irradiated (3000 rads), peptide coated lymphoblasts (10×10^6 cells/flask) in 10 ml of culture medium/T25 flask. After six days, effector cells are harvested and assayed for cytotoxic activity.

[0661] Assay for Cytotoxic Activity:

[0662] Target cells (1.0 to 1.5×10^6) are incubated at 37° C. in the presence of 200 μ l of ^{51}Cr . After 60 minutes, cells are washed three times and resuspended in R10 medium. Peptide is added where required at a concentration of 1 μ g/ml. For the assay, 10^4 ^{51}Cr -labeled target cells are added to different concentrations of effector cells (final volume of 200 μ l) in U-bottom 96-well plates. After a six hour incubation period at 37° C., a 0.1 ml aliquot of supernatant is removed from each well and radioactivity is determined in a Micromedic automatic gamma counter. The percent specific lysis is determined by the formula: percent specific release = $100 \times (\text{experimental release} - \text{spontaneous release}) / (\text{maximum release} - \text{spontaneous release})$. To facilitate comparison between separate CTL assays run under the same conditions, % ^{51}Cr release data is expressed as lytic units/ 10^6 cells. One lytic unit is arbitrarily defined as the number of effector cells required to achieve 30% lysis of 10,000 target cells in a six hour ^{51}Cr release assay. To obtain specific lytic units/ 10^6 , the lytic units/ 10^6 obtained in the absence of peptide is subtracted from the lytic units/ 10^6 obtained in the presence of peptide. For example, if 30% ^{51}Cr release is obtained at the effector (E): target (T) ratio of 50:1 (i.e., 5×10^5 effector cells for 10,000 targets) in the absence of peptide and 5:1 (i.e., 5×10^4 effector cells for 10,000 targets) in the presence of peptide, the specific lytic units would be: $[(1/50,000) - (1/500,000)] \times 10^6 = 18$ LU.

[0663] The results are analyzed to assess the magnitude of the CTL responses of animals injected with the immunogenic CTL/HTL conjugate vaccine preparation and are compared to the magnitude of the CTL response achieved using, for example, CTL epitopes as outlined above in the Example entitled "Confirmation of Immunogenicity". Analyses similar to this may be performed to confirm the immunogenicity of peptide conjugates containing multiple CTL epitopes and/or multiple HTL epitopes. In accordance with these procedures, it is found that a CTL response is induced, and concomitantly that an HTL response is induced upon administration of such compositions.

Example 19

Selection of CTL and HTL Epitopes for Inclusion in an 158PID7-Specific Vaccine

[0664] This example illustrates a procedure for selecting peptide epitopes for vaccine compositions of the invention.

The peptides in the composition can be in the form of a nucleic acid sequence, either single or one or more sequences (i.e., minigene) that encodes peptide(s), or can be single and/or polypeptidic peptides.

[0665] The following principles are utilized when selecting a plurality of epitopes for inclusion in a vaccine composition. Each of the following principles is balanced in order to make the selection.

[0666] Epitopes are selected which, upon administration, mimic immune responses that are correlated with 158PID7 clearance. The number of epitopes used depends on observations of patients who spontaneously clear 158PID7. For example, if it has been observed that patients who spontaneously clear 158PID7 generate an immune response to at least three (3) from 158PID7 antigen, then three or four (3-4) epitopes should be included for HLA class I. A similar rationale is used to determine HLA class II epitopes.

[0667] Epitopes are often selected that have a binding affinity of an IC_{50} of 500 nM or less for an HLA class I molecule, or for class II, an IC_{50} of 1000 nM or less; or HLA Class I peptides with high binding scores from the BIMAS web site, at URL bimas.dcrt.nih.gov/.

[0668] In order to achieve broad coverage of the vaccine through out a diverse population, sufficient supermotif bearing peptides, or a sufficient array of allele-specific motif bearing peptides, are selected to give broad population coverage. In one embodiment, epitopes are selected to provide at least 80% population coverage. A Monte Carlo analysis, a statistical evaluation known in the art, can be employed to assess breadth, or redundancy, of population coverage.

[0669] When creating polypeptidic compositions, or a minigene that encodes same, it is typically desirable to generate the smallest peptide possible that encompasses the epitopes of interest. The principles employed are similar, if not the same, as those employed when selecting a peptide comprising nested epitopes. For example, a protein sequence for the vaccine composition is selected because it has maximal number of epitopes contained within the sequence, i.e., it has a high concentration of epitopes. Epitopes may be nested or overlapping (i.e., frame shifted relative to one another). For example, with overlapping epitopes, two 9-mer epitopes and one 10-mer epitope can be present in a 10 amino acid peptide. Each epitope can be exposed and bound by an HLA molecule upon administration of such a peptide. A multi-epitopic, peptide can be generated synthetically, recombinantly, or via cleavage from the native source. Alternatively, an analog can be made of this native sequence, whereby one or more of the epitopes comprise substitutions that alter the cross-reactivity and/or binding affinity properties of the polypeptidic peptide. Such a vaccine composition is administered for therapeutic or prophylactic purposes. This embodiment provides for the possibility that an as yet undiscovered aspect of immune system processing will apply to the native nested sequence and thereby facilitate the production of therapeutic or prophylactic immune response-inducing vaccine compositions. Additionally such an embodiment provides for the possibility of motif-bearing epitopes for an HLA makeup that is presently unknown. Furthermore, this embodiment (absent the creating of any analogs) directs the immune response to multiple peptide sequences that are actually present in 158PID7, thus avoiding the need to evaluate any junctional epitopes. Lastly, the embodiment provides an economy of scale when producing nucleic acid vaccine compositions. Related to this embodiment, computer programs can be derived in accor-

dance with principles in the art, which identify in a target sequence, the greatest number of epitopes per sequence length.

[0670] A vaccine composition comprised of selected peptides, when administered, is safe, efficacious, and elicits an immune response similar in magnitude to an immune response that controls or clears cells that bear or overexpress 158P1D7.

Example 20

Construction of "Minigene" Multi-Epitope DNA Plasmids

[0671] This example discusses the construction of a minigene expression plasmid. Minigene plasmids may, of course, contain various configurations of B cell, CTL and/or HTL epitopes or epitope analogs as described herein.

[0672] A minigene expression plasmid typically includes multiple CTL and HTL peptide epitopes. In the present example, HLA-A2, -A3, -B7 supermotif-bearing peptide epitopes and HLA-A1 and -A24 motif-bearing peptide epitopes are used in conjunction with DR supermotif-bearing epitopes and/or DR3 epitopes. HLA class I supermotif or motif-bearing peptide epitopes derived 158P1D7, are selected such that multiple supermotifs/motifs are represented to ensure broad population coverage. Similarly, HLA class II epitopes are selected from 158P1D7 to provide broad population coverage, i.e. both HLA DR-1-4-7 supermotif-bearing epitopes and HLA DR-3 motif-bearing epitopes are selected for inclusion in the minigene construct. The selected CTL and HTL epitopes are then incorporated into a minigene for expression in an expression vector.

[0673] Such a construct may additionally include sequences that direct the HTL epitopes to the endoplasmic reticulum. For example, the Ii protein may be fused to one or more HTL epitopes as described in the art, wherein the CLIP sequence of the Ii protein is removed and replaced with an HLA class II epitope sequence so that HLA class II epitope is directed to the endoplasmic reticulum, where the epitope binds to an HLA class II molecules.

[0674] This example illustrates the methods to be used for construction of a minigene-bearing expression plasmid. Other expression vectors that may be used for minigene compositions are available and known to those of skill in the art.

[0675] The minigene DNA plasmid of this example contains a consensus Kozak sequence and a consensus murine kappa Ig-light chain signal sequence followed by CTL and/or HTL epitopes selected in accordance with principles disclosed herein. The sequence encodes an open reading frame fused to the Myc and His antibody epitope tag coded for by the pcDNA 3.1 Myc-His vector.

[0676] Overlapping oligonucleotides that can, for example, average about 70 nucleotides in length with 15 nucleotide overlaps, are synthesized and HPLC-purified. The oligonucleotides encode the selected peptide epitopes as well as appropriate linker nucleotides, Kozak sequence, and signal sequence. The final multi-epitope minigene is assembled by extending the overlapping oligonucleotides in three sets of reactions using PCR. A Perkin/Elmer 9600 PCR machine is used and a total of 30 cycles are performed using the following conditions: 95° C. for 15 sec, annealing temperature (5° below the lowest calculated T_m of each primer pair) for 30 sec, and 72° C. for 1 min.

[0677] For example, a minigene is prepared as follows. For a first PCR reaction, 5 µg of each of two oligonucleotides are annealed and extended: In an example using eight oligonucleotides, i.e., four pairs of primers, oligonucleotides 1+2, 3+4, 5+6, and 7+8 are combined in 100 µl reactions containing Pfu polymerase buffer (1×=10 mM KCL, 10 mM (NH₄)₂SO₄, 20 mM Tris-chloride, pH 8.75, 2 mM MgSO₄, 0.1% Triton X-100, 100 µg/ml BSA), 0.25 mM each dNTP, and 2.5 U of Pfu polymerase. The full-length dimer products are gel-purified, and two reactions containing the product of 1+2 and 3+4, and the product of 5+6 and 7+8 are mixed, annealed, and extended for 10 cycles. Half of the two reactions are then mixed, and 5 cycles of annealing and extension carried out before flanking primers are added to amplify the full length product. The full-length product is gel-purified and cloned into pCR-blunt (Invitrogen) and individual clones are screened by sequencing.

Example 21

The Plasmid Construct and the Degree to which it Induces Immunogenicity

[0678] The degree to which a plasmid construct, for example a plasmid constructed in accordance with the previous Example, is able to induce immunogenicity is confirmed in vitro by determining epitope presentation by APC following transduction or transfection of the APC with an epitope-expressing nucleic acid construct. Such a study determines "antigenicity" and allows the use of human APC. The assay determines the ability of the epitope to be presented by the APC in a context that is recognized by a T cell by quantifying the density of epitope-HLA class I complexes on the cell surface. Quantitation can be performed by directly measuring the amount of peptide eluted from the APC (see, e.g., Sijts et al., J. Immunol. 156:683-692, 1996; Demotz et al., Nature 342:682-684, 1989); or the number of peptide-HLA class I complexes can be estimated by measuring the amount of lysis or lymphokine release induced by diseased or transfected target cells, and then determining the concentration of peptide necessary to obtain equivalent levels of lysis or lymphokine release (see, e.g., Kageyama et al., J. Immunol. 154:567-576, 1995).

[0679] Alternatively, immunogenicity is confirmed through in vivo injections into mice and subsequent in vitro assessment of CTL and HTL activity, which are analyzed using cytotoxicity and proliferation assays, respectively, as detailed e.g., in Alexander et al., Immunity 1:751-761, 1994.

[0680] For example, to confirm the capacity of a DNA minigene construct containing at least one HLA-A2 supermotif peptide to induce CTLs in vivo, HLA-A2.1/Kb transgenic mice, for example, are immunized intramuscularly with 100 µg of naked cDNA. As a means of comparing the level of CTLs induced by cDNA immunization, a control group of animals is also immunized with an actual peptide composition that comprises multiple epitopes synthesized as a single polypeptide as they would be encoded by the minigene.

[0681] Splenocytes from immunized animals are stimulated twice with each of the respective compositions (peptide epitopes encoded in the minigene or the polypeptidic peptide), then assayed for peptide-specific cytotoxic activity in a 51Cr release assay. The results indicate the magnitude of the CTL response directed against the A2-restricted epitope, thus indicating the in vivo immunogenicity of the minigene vaccine and polypeptidic vaccine.

[0682] It is, therefore, found that the minigene elicits immune responses directed toward the HLA-A2 supermotif peptide epitopes as does the polyepitopic peptide vaccine. A similar analysis is also performed using other HLA-A3 and HLA-B7 transgenic mouse models to assess CTL induction by HLA-A3 and HLA-B7 motif or supermotif epitopes, whereby it is also found that the minigene elicits appropriate immune responses directed toward the provided epitopes.

[0683] To confirm the capacity of a class II epitope-encoding minigene to induce HTLs *in vivo*, DR transgenic mice, or for those epitopes that cross react with the appropriate mouse MHC molecule, I-Ab-restricted mice, for example, are immunized intramuscularly with 100 µg of plasmid DNA. As a means of comparing the level of HTLs induced by DNA immunization, a group of control animals is also immunized with an actual peptide composition emulsified in complete Freund's adjuvant. CD4+ T cells, i.e. HTLs, are purified from splenocytes of immunized animals and stimulated with each of the respective compositions (peptides encoded in the minigene). The HTL response is measured using a 3H-thymidine incorporation proliferation assay, (see, e.g., Alexander et al. *Immunity* 1:751-761, 1994). The results indicate the magnitude of the HTL response, thus demonstrating the *in vivo* immunogenicity of the minigene.

[0684] DNA minigenes, constructed as described in the previous Example, can also be confirmed as a vaccine in combination with a boosting agent using a prime boost protocol. The boosting agent can consist of recombinant protein (e.g., Barnett et al., *Aids Res. and Human Retroviruses* 14, Supplement 3:S299-S309, 1998) or recombinant vaccinia, for example, expressing a minigene or DNA encoding the complete protein of interest (see, e.g., Hanke et al., *Vaccine* 16:439-445, 1998; Sedegah et al., *Proc. Natl. Acad. Sci USA* 95:7648-53, 1998; Hanke and McMichael, *Immunol. Letters* 66:177-181, 1999; and Robinson et al., *Nature Med.* 5:526-34, 1999).

[0685] For example, the efficacy of the DNA minigene used in a prime boost protocol is initially evaluated in transgenic mice. In this example, A2.1/Kb transgenic mice are immunized IM with 100 µg of a DNA minigene encoding the immunogenic peptides including at least one HLA-A2 supermotif-bearing peptide. After an incubation period (ranging from 3-9 weeks), the mice are boosted IP with 107 pfu/mouse of a recombinant vaccinia virus expressing the same sequence encoded by the DNA minigene. Control mice are immunized with 100 µg of DNA or recombinant vaccinia without the minigene sequence, or with DNA encoding the minigene, but without the vaccinia boost. After an additional incubation period of two weeks, splenocytes from the mice are immediately assayed for peptide-specific activity in an ELISPOT assay. Additionally, splenocytes are stimulated *in vitro* with the A2-restricted peptide epitopes encoded in the minigene and recombinant vaccinia, then assayed for peptide-specific activity in an alpha, beta and/or gamma IFN ELISA.

[0686] It is found that the minigene utilized in a prime-boost protocol elicits greater immune responses toward the HLA-A2 supermotif peptides than with DNA alone. Such an analysis can also be performed using HLA-A11 or HLA-B7 transgenic mouse models to assess CTL induction by HLA-A3 or HLA-B7 motif or supermotif epitopes. The use of prime boost protocols in humans is described below in the Example entitled "Induction of CTL Responses Using a Prime Boost Protocol."

Example 22

Peptide Composition for Prophylactic Uses

[0687] Vaccine compositions of the present invention can be used to prevent 158P1D7 expression in persons who are at risk for tumors that bear this antigen. For example, a polyepitopic peptide epitope composition (or a nucleic acid comprising the same) containing multiple CTL and HTL epitopes such as those selected in the above Examples, which are also selected to target greater than 80% of the population, is administered to individuals at risk for a 158P1D7-associated tumor.

[0688] For example, a peptide-based composition is provided as a single polypeptide that encompasses multiple epitopes. The vaccine is typically administered in a physiological solution that comprises an adjuvant, such as Incomplete Freund's Adjuvant. The dose of peptide for the initial immunization is from about 1 to about 50,000 µg, generally 100-5,000 µg, for a 70 kg patient. The initial administration of vaccine is followed by booster dosages at 4 weeks followed by evaluation of the magnitude of the immune response in the patient, by techniques that determine the presence of epitope-specific CTL populations in a PBMC sample. Additional booster doses are administered as required. The composition is found to be both safe and efficacious as a prophylaxis against 158P1D7-associated disease.

[0689] Alternatively, a composition typically comprising transfecting agents is used for the administration of a nucleic acid-based vaccine in accordance with methodologies known in the art and disclosed herein.

Example 23

Polyepitopic Vaccine Compositions Derived from Native 158P1D7 Sequences

[0690] A native 158P1D7 polypeptide sequence is analyzed, preferably using computer algorithms defined for each class I and/or class II supermotif or motif, to identify "relatively short" regions of the polypeptide that comprise multiple epitopes. The "relatively short" regions are preferably less in length than an entire native antigen. This relatively short sequence that contains multiple distinct or overlapping, "nested" epitopes is selected; it can be used to generate a minigene construct. The construct is engineered to express the peptide, which corresponds to the native protein sequence. The "relatively short" peptide is generally less than 250 amino acids in length, often less than 100 amino acids in length, preferably less than 75 amino acids in length, and more preferably less than 50 amino acids in length. The protein sequence of the vaccine composition is selected because it has maximal number of epitopes contained within the sequence, i.e., it has a high concentration of epitopes. As noted herein, epitope motifs may be nested or overlapping (i.e., frame shifted relative to one another). For example, with overlapping epitopes, two 9-mer epitopes and one 10-mer epitope can be present in a 10 amino acid peptide. Such a vaccine composition is administered for therapeutic or prophylactic purposes.

[0691] The vaccine composition will include, for example, multiple CTL epitopes from 158P1D7 antigen and at least one HTL epitope. This polyepitopic native sequence is administered either as a peptide or as a nucleic acid sequence which encodes the peptide. Alternatively, an analog can be

made of this native sequence, whereby one or more of the epitopes comprise substitutions that alter the cross-reactivity and/or binding affinity properties of the polypeptidic peptide. **[0692]** The embodiment of this example provides for the possibility that an as yet undiscovered aspect of immune system processing will apply to the native nested sequence and thereby facilitate the production of therapeutic or prophylactic immune response-inducing vaccine compositions. Additionally such an embodiment provides for the possibility of motif-bearing epitopes for an HLA makeup that is presently unknown. Furthermore, this embodiment (excluding an analoged embodiment) directs the immune response to multiple peptide sequences that are actually present in native 158P1D7, thus avoiding the need to evaluate any junctional epitopes. Lastly, the embodiment provides an economy of scale when producing peptide or nucleic acid vaccine compositions.

[0693] Related to this embodiment, computer programs are available in the art which can be used to identify in a target sequence, the greatest number of epitopes per sequence length.

Example 24

Polyepitopic Vaccine Compositions from Multiple Antigens

[0694] The 158P1D7 peptide epitopes of the present invention are used in conjunction with epitopes from other target tumor-associated antigens, to create a vaccine composition that is useful for the prevention or treatment of cancer that expresses 158P1D7 and such other antigens. For example, a vaccine composition can be provided as a single polypeptide that incorporates multiple epitopes from 158P1D7 as well as tumor-associated antigens that are often expressed with a target cancer associated with 158P1D7 expression, or can be administered as a composition comprising a cocktail of one or more discrete epitopes. Alternatively, the vaccine can be administered as a minigene construct or as dendritic cells which have been loaded with the peptide epitopes in vitro.

Example 25

Use of Peptides to Evaluate an Immune Response

[0695] Peptides of the invention may be used to analyze an immune response for the presence of specific antibodies, CTL or HTL directed to 158P1D7. Such an analysis can be performed in a manner described by Ogg et al., *Science* 279: 2103-2106, 1998. In this Example, peptides in accordance with the invention are used as a reagent for diagnostic or prognostic purposes, not as an immunogen.

[0696] In this example highly sensitive human leukocyte antigen tetrameric complexes ("tetramers") are used for a cross-sectional analysis of, for example, 158P1D7 HLA-A*0201-specific CTL frequencies from HLA A*0201-positive individuals at different stages of disease or following immunization comprising an 158P1D7 peptide containing an A*0201 motif. Tetrameric complexes are synthesized as described (Musey et al., *N. Engl. J. Med.* 337:1267, 1997). Briefly, purified HLA heavy chain (A*0201 in this example) and β 2-microglobulin are synthesized by means of a prokaryotic expression system. The heavy chain is modified by deletion of the transmembrane-cytosolic tail and COOH-terminal addition of a sequence containing a BirA enzymatic biotinylation site. The heavy chain, β 2-microglobulin, and peptide

are refolded by dilution. The 45-kD refolded product is isolated by fast protein liquid chromatography and then biotinylated by BirA in the presence of biotin (Sigma, St. Louis, Mo.), adenosine 5' triphosphate and magnesium. Streptavidin-phycoerythrin conjugate is added in a 1:4 molar ratio, and the tetrameric product is concentrated to 1 mg/ml. The resulting product is referred to as tetramer-phycoerythrin.

[0697] For the analysis of patient blood samples, approximately one million PBMCs are centrifuged at 300 g for 5 minutes and resuspended in 50 μ l of cold phosphate-buffered saline. Tri-color analysis is performed with the tetramer-phycoerythrin, along with anti-CD8-Tricolor, and anti-CD38. The PBMCs are incubated with tetramer and antibodies on ice for 30 to 60 min and then washed twice before formaldehyde fixation. Gates are applied to contain >99.98% of control samples. Controls for the tetramers include both A*0201-negative individuals and A*0201-positive non-diseased donors. The percentage of cells stained with the tetramer is then determined by flow cytometry. The results indicate the number of cells in the PBMC sample that contain epitope-restricted CTLs, thereby readily indicating the extent of immune response to the 158P1D7 epitope, and thus the status of exposure to 158P1D7, or exposure to a vaccine that elicits a protective or therapeutic response.

Example 26

Use of Peptide Epitopes to Evaluate Recall Responses

[0698] The peptide epitopes of the invention are used as reagents to evaluate T cell responses, such as acute or recall responses, in patients. Such an analysis may be performed on patients who have recovered from 158P1D7-associated disease or who have been vaccinated with an 158P1D7 vaccine.

[0699] For example, the class I restricted CTL response of persons who have been vaccinated may be analyzed. The vaccine may be any 158P1D7 vaccine. PBMC are collected from vaccinated individuals and HLA typed. Appropriate peptide epitopes of the invention that, optimally, bear supermotifs to provide cross-reactivity with multiple HLA super-type family members, are then used for analysis of samples derived from individuals who bear that HLA type.

[0700] PBMC from vaccinated individuals are separated on Ficoll-Histopaque density gradients (Sigma Chemical Co., St. Louis, Mo.), washed three times in HBSS (GIBCO Laboratories), resuspended in RPMI-1640 (GIBCO Laboratories) supplemented with L-glutamine (2 mM), penicillin (50 U/ml), streptomycin (50 μ g/ml), and Hepes (10 mM) containing 10% heat-inactivated human AB serum (complete RPMI) and plated using microculture formats. A synthetic peptide comprising an epitope of the invention is added at 10 μ g/ml to each well and HBV core 128-140 epitope is added at 1 μ g/ml to each well as a source of T cell help during the first week of stimulation.

[0701] In the microculture format, 4×10^5 PBMC are stimulated with peptide in 8 replicate cultures in 96-well round bottom plate in 100 μ l/well of complete RPMI. On days 3 and 10, 100 μ l of complete RPMI and 20 U/ml final concentration of rIL-2 are added to each well. On day 7 the cultures are transferred into a 96-well flat-bottom plate and restimulated with peptide, rIL-2 and 10^5 irradiated (3,000 rad) autologous feeder cells. The cultures are tested for cytotoxic activity on day 14. A positive CTL response requires two or more of the eight replicate cultures to display greater than 10% specific

⁵¹Cr release, based on comparison with non-diseased control subjects as previously described (Rehermann, et al., *Nature Med.* 2:1104, 1108, 1996; Rehermann et al., *J. Clin. Invest.* 97:1655-1665, 1996; and Rehermann et al. *J. Clin. Invest.* 98:1432-1440, 1996).

[0702] Target cell lines are autologous and allogeneic EBV-transformed B-LCL that are either purchased from the American Society for Histocompatibility and Immunogenetics (ASHI, Boston, Mass.) or established from the pool of patients as described (Guilhot, et al. *J. Virol.* 66:2670-2678, 1992).

[0703] Cytotoxicity assays are performed in the following manner. Target cells consist of either allogeneic HLA-matched or autologous EBV-transformed B lymphoblastoid cell line that are incubated overnight with the synthetic peptide epitope of the invention at 10 μ M, and labeled with 10 μ Ci of ⁵¹Cr (Amersham Corp., Arlington Heights, Ill.) for 1 hour after which they are washed four times with HBSS.

[0704] Cytolytic activity is determined in a standard 4-h, split well ⁵¹Cr release assay using U-bottomed 96 well plates containing 3,000 targets/well. Stimulated PBMC are tested at effector/target (E/T) ratios of 20-50:1 on day 14. Percent cytotoxicity is determined from the formula: $100 \times [(\text{experimental release} - \text{spontaneous release}) / \text{maximum release} - \text{spontaneous release}]$. Maximum release is determined by lysis of targets by detergent (2% Triton X-100; Sigma Chemical Co., St. Louis, Mo.). Spontaneous release is <25% of maximum release for all experiments.

[0705] The results of such an analysis indicate the extent to which HLA-restricted CTL populations have been stimulated by previous exposure to 158P1D7 or an 158P1D7 vaccine.

[0706] Similarly, Class II restricted HTL responses may also be analyzed. Purified PBMC are cultured in a 96-well flat bottom plate at a density of 1.5×10^5 cells/well and are stimulated with 10 μ g/ml synthetic peptide of the invention, whole 158P1D7 antigen, or PHA. Cells are routinely plated in replicates of 4-6 wells for each condition. After seven days of culture, the medium is removed and replaced with fresh medium containing 10 U/ml IL-2. Two days later, 1 μ Ci ³H-thymidine is added to each well and incubation is continued for an additional 18 hours. Cellular DNA is then harvested on glass fiber mats and analyzed for ³H-thymidine incorporation. Antigen-specific T cell proliferation is calculated as the ratio of ³H-thymidine incorporation in the presence of antigen divided by the ³H-thymidine incorporation in the absence of antigen.

Example 27

Induction of Specific CTL Response in Humans

[0707] A human clinical trial for an immunogenic composition comprising CTL and HTL epitopes of the invention is set up as an IND Phase I, dose escalation study and carried out as a randomized, double-blind, placebo-controlled trial. Such a trial is designed, for example, as follows:

[0708] A total of about 27 individuals are enrolled and divided into 3 groups:

[0709] Group I: 3 subjects are injected with placebo and 6 subjects are injected with 5 μ g of peptide composition;

[0710] Group II: 3 subjects are injected with placebo and 6 subjects are injected with 50 μ g peptide composition;

[0711] Group III: 3 subjects are injected with placebo and 6 subjects are injected with 500 μ g of peptide composition.

[0712] After 4 weeks following the first injection, all subjects receive a booster inoculation at the same dosage.

[0713] The endpoints measured in this study relate to the safety and tolerability of the peptide composition as well as its immunogenicity. Cellular immune responses to the peptide composition are an index of the intrinsic activity of this the peptide composition, and can therefore be viewed as a measure of biological efficacy. The following summarize the clinical and laboratory data that relate to safety and efficacy endpoints.

[0714] Safety: The incidence of adverse events is monitored in the placebo and drug treatment group and assessed in terms of degree and reversibility.

[0715] Evaluation of Vaccine Efficacy: For evaluation of vaccine efficacy, subjects are bled before and after injection. Peripheral blood mononuclear cells are isolated from fresh heparinized blood by Ficoll-Hypaque density gradient centrifugation, aliquoted in freezing media and stored frozen. Samples are assayed for CTL and HTL activity.

[0716] The vaccine is found to be both safe and efficacious.

Example 28

Phase II Trials in Patients Expressing 158P1D7

[0717] Phase II trials are performed to study the effect of administering the CTL-HTL peptide compositions to patients having cancer that expresses 158P1D7. The main objectives of the trial are to determine an effective dose and regimen for inducing CTLs in cancer patients that express 158P1D7, to establish the safety of inducing a CTL and HTL response in these patients, and to see to what extent activation of CTLs improves the clinical picture of these patients, as manifested, e.g., by the reduction and/or shrinking of lesions. Such a study is designed, for example, as follows:

[0718] The studies are performed in multiple centers. The trial design is an open-label, uncontrolled, dose escalation protocol wherein the peptide composition is administered as a single dose followed six weeks later by a single booster shot of the same dose. The dosages are 50, 500 and 5,000 micrograms per injection. Drug-associated adverse effects (severity and reversibility) are recorded.

[0719] There are three patient groupings. The first group is injected with 50 micrograms of the peptide composition and the second and third groups with 500 and 5,000 micrograms of peptide composition, respectively. The patients within each group range in age from 21-65 and represent diverse ethnic backgrounds. All of them have a tumor that expresses 158P1D7.

[0720] Clinical manifestations or antigen-specific T-cell responses are monitored to assess the effects of administering the peptide compositions. The vaccine composition is found to be both safe and efficacious in the treatment of 158P1D7-associated disease.

Example 29

Induction of CTL Responses Using a Prime Boost Protocol

[0721] A prime boost protocol similar in its underlying principle to that used to confirm the efficacy of a DNA vaccine in transgenic mice, such as described above in the Example entitled "The Plasmid Construct and the Degree to Which It Induces Immunogenicity," can also be used for the administration of the vaccine to humans. Such a vaccine regimen can

include an initial administration of, for example, naked DNA followed by a boost using recombinant virus encoding the vaccine, or recombinant protein/polypeptide or a peptide mixture administered in an adjuvant.

[0722] For example, the initial immunization may be performed using an expression vector, such as that constructed in the Example entitled "Construction of 'Minigene' Multi-Epitope DNA Plasmids" in the form of naked nucleic acid administered IM (or SC or ID) in the amounts of 0.5-5 mg at multiple sites. The nucleic acid (0.1 to 1000 μ g) can also be administered using a gene gun. Following an incubation period of 3-4 weeks, a booster dose is then administered. The booster can be recombinant fowlpox virus administered at a dose of $5 \cdot 10^7$ to $5 \cdot 10^9$ pfu. An alternative recombinant virus, such as an MVA, canarypox, adenovirus, or adeno-associated virus, can also be used for the booster, or the polypeptidic protein or a mixture of the peptides can be administered. For evaluation of vaccine efficacy, patient blood samples are obtained before immunization as well as at intervals following administration of the initial vaccine and booster doses of the vaccine. Peripheral blood mononuclear cells are isolated from fresh heparinized blood by Ficoll-Hypaque density gradient centrifugation, aliquoted in freezing media and stored frozen. Samples are assayed for CTL and HTL activity.

[0723] Analysis of the results indicates that a magnitude of response sufficient to achieve a therapeutic or protective immunity against 158P1D7 is generated.

Example 30

Administration of Vaccine Compositions Using Dendritic Cells (DC)

[0724] Vaccines comprising peptide epitopes of the invention can be administered using APCs, or "professional" APCs such as DC. In this example, peptide-pulsed DC are administered to a patient to stimulate a CTL response in vivo. In this method, dendritic cells are isolated, expanded, and pulsed with a vaccine comprising peptide CTL and HTL epitopes of the invention. The dendritic cells are infused back into the patient to elicit CTL and HTL responses in vivo. The induced CTL and HTL then destroy or facilitate destruction, respectively, of the target cells that bear the 158P1D7 protein from which the epitopes in the vaccine are derived.

[0725] For example, a cocktail of epitope-comprising peptides is administered ex vivo to PBMC, or isolated DC therefrom. A pharmaceutical to facilitate harvesting of DC can be used, such as Progenipoiectin™ (Monsanto, St. Louis, Mo.) or GM-CSF/IL-4. After pulsing the DC with peptides, and prior to reinfusion into patients, the DC are washed to remove unbound peptides.

[0726] As appreciated clinically, and readily determined by one of skill based on clinical outcomes, the number of DC reinfused into the patient can vary (see, e.g., *Nature Med.* 4:328, 1998; *Nature Med.* 2:52, 1996 and *Prostate* 32:272, 1997). Although $2\text{--}50 \cdot 10^6$ DC per patient are typically administered, larger number of DC, such as 10^7 or 10^8 can also be provided. Such cell populations typically contain between 50-90% DC.

[0727] In some embodiments, peptide-loaded PBMC are injected into patients without purification of the DC. For example, PBMC generated after treatment with an agent such as Progenipoiectin™ are injected into patients without purification of the DC. The total number of PBMC that are administered often ranges from 10^8 to 10^{10} . Generally, the cell doses

injected into patients is based on the percentage of DC in the blood of each patient, as determined, for example, by immunofluorescence analysis with specific anti-DC antibodies. Thus, for example, if Progenipoiectin™ mobilizes 2% DC in the peripheral blood of a given patient, and that patient is to receive $5 \cdot 10^6$ DC, then the patient will be injected with a total of $2.5 \cdot 10^8$ peptide-loaded PBMC. The percent DC mobilized by an agent such as Progenipoiectin™ is typically estimated to be between 2-10%, but can vary as appreciated by one of skill in the art.

[0728] Ex Vivo Activation of CTL/HTL Responses

[0729] Alternatively, ex vivo CTL or HTL responses to 158P1D7 antigens can be induced by incubating, in tissue culture, the patient's, or genetically compatible, CTL or HTL precursor cells together with a source of APC, such as DC, and immunogenic peptides. After an appropriate incubation time (typically about 7-28 days), in which the precursor cells are activated and expanded into effector cells, the cells are infused into the patient, where they will destroy (CTL) or facilitate destruction (HTL) of their specific target cells, i.e., tumor cells.

Example 31

An Alternative Method of Identifying and Confirming Motif-Bearing Peptides

[0730] Another method of identifying and confirming motif-bearing peptides is to elute them from cells bearing defined MHC molecules. For example, EBV transformed B cell lines used for tissue typing have been extensively characterized to determine which HLA molecules they express. In certain cases these cells express only a single type of HLA molecule. These cells can be transfected with nucleic acids that express the antigen of interest, e.g. 158P1D7. Peptides produced by endogenous antigen processing of peptides produced as a result of transfection will then bind to HLA molecules within the cell and be transported and displayed on the cell's surface. Peptides are then eluted from the HLA molecules by exposure to mild acid conditions and their amino acid sequence determined, e.g., by mass spectral analysis (e.g., Kubo et al., *J. Immunol.* 152:3913, 1994). Because the majority of peptides that bind a particular HLA molecule are motif-bearing, this is an alternative modality for obtaining the motif-bearing peptides correlated with the particular HLA molecule expressed on the cell.

[0731] Alternatively, cell lines that do not express endogenous HLA molecules can be transfected with an expression construct encoding a single HLA allele. These cells can then be used as described, i.e., they can then be transfected with nucleic acids that encode 158P1D7 to isolate peptides corresponding to 158P1D7 that have been presented on the cell surface. Peptides obtained from such an analysis will bear motif(s) that correspond to binding to the single HLA allele that is expressed in the cell.

[0732] As appreciated by one in the art, one can perform a similar analysis on a cell bearing more than one HLA allele and subsequently determine peptides specific for each HLA allele expressed. Moreover, one of skill would also recognize that means other than transfection, such as loading with a protein antigen, can be used to provide a source of antigen to the cell.

Example 32

Complementary Polynucleotides

[0733] Sequences complementary to the 158P1D7-encoding sequences, or any parts thereof, are used to detect, decrease, or inhibit expression of naturally occurring 158P1D7. Although use of oligonucleotides comprising from about 15 to 30 base pairs is described, essentially the same procedure is used with smaller or with larger sequence fragments. Appropriate oligonucleotides are designed using, e.g., OLIGO 4.06 software (National Biosciences) and the coding sequence of 158P1D7. To inhibit transcription, a complementary oligonucleotide is designed from the most unique 5' sequence and used to prevent promoter binding to the coding sequence. To inhibit translation, a complementary oligonucleotide is designed to prevent ribosomal binding to the 158P1D7-encoding transcript.

Example 33

Purification of Naturally-Occurring or Recombinant 158P1D7 Using 158P1D7 Specific Antibodies

[0734] Naturally occurring or recombinant 158P1D7 is substantially purified by immunoaffinity chromatography using antibodies specific for 158P1D7. An immunoaffinity column is constructed by covalently coupling anti-158P1D7 antibody to an activated chromatographic resin, such as CNBr-activated SEPHAROSE (Amersham Pharmacia Biotech). After the coupling, the resin is blocked and washed according to the manufacturer's instructions.

[0735] Media containing 158P1D7 are passed over the immunoaffinity column, and the column is washed under conditions that allow the preferential absorbance of 158P1D7 (e.g., high ionic strength buffers in the presence of detergent). The column is eluted under conditions that disrupt antibody/158P1D7 binding (e.g., a buffer of pH 2 to pH 3, or a high concentration of a chaotrope, such as urea or thiocyanate ion), and GCR.P is collected.

Example 34

Identification of Molecules which Interact with 158P1D7

[0736] 158P1D7, or biologically active fragments thereof, are labeled with 121 I Bolton-Hunter reagent.

[0737] (See, e.g., Bolton et al. (1973) *Biochem. J.* 133: 529.) Candidate molecules previously arrayed in the wells of a multi-well plate are incubated with the labeled 158P1D7, washed, and any wells with labeled 158P1D7 complex are assayed. Data obtained using different concentrations of 158P1D7 are used to calculate values for the number, affinity, and association of 158P1D7 with the candidate molecules. Throughout this application, various website data content, publications, applications and patents are referenced. (Websites are referenced by their Uniform Resource Locator, or URL, addresses on the World Wide Web.) The disclosures of each of these items of information are hereby incorporated by reference herein in their entireties.

Example 35

In Vivo Assay for 158P1D7 Tumor Growth Promotion

[0738] The effect of the 158P1D7 protein on tumor cell growth can be confirmed in vivo by gene overexpression in

bladder cancer cells. For example, SCID mice can be injected SQ on each flank with 1×10^6 bladder cancer cells (such as SCaBER, UM-UC-3, HT1376, RT4, T24, TCC-SUP, J82 and SW780 cells) containing tkNeo empty vector or 158P1D7.

[0739] At least two strategies may be used: (1) Constitutive 158P1D7 expression under regulation of a promoter such as a constitutive promoter obtained from the genomes of viruses such as polyoma virus, fowlpox virus (UK 2,211,504 published 5 Jul. 1989), adenovirus (such as Adenovirus 2), bovine papilloma virus, avian sarcoma virus, cytomegalovirus, a retrovirus, hepatitis-B virus and Simian Virus 40 (SV40), or from heterologous mammalian promoters, e.g., the actin promoter or an immunoglobulin promoter, provided such promoters are compatible with the host cell systems. (2) Regulated expression under control of an inducible vector system, such as ecdysone, tet, etc., can be used provided such promoters are compatible with the host cell systems. Tumor volume is then monitored at the appearance of palpable tumors and is followed over time to determine if 158P1D7-expressing cells grow at a faster rate and whether tumors produced by 158P1D7-expressing cells demonstrate characteristics of altered aggressiveness (e.g. enhanced metastasis, vascularization, reduced responsiveness to chemotherapeutic drugs). Additionally, mice can be implanted with the same cells orthotopically to determine if 158P1D7 has an effect on local growth in the bladder or on the ability of the cells to metastasize, specifically to lungs or lymph nodes (Fu, X., et al., *Int. J. Cancer*, 1991. 49: p. 938-939; Chang, S., et al., *Anticancer Res.*, 1997. 17: p. 3239-3242; Peralta, E. A., et al., *J. Urol.*, 1999. 162: p. 1806-1811). Furthermore, this assay is useful to confirm the 158P1D7 inhibitory effect of candidate therapeutic compositions, such as for example, 158P1D7 antibodies or intrabodies, and 158P1D7 antisense molecules or ribozymes.

[0740] The assay was performed using the following protocols. Male ICR-SCID mice, 5-6 weeks old (Charles River Laboratory, Wilmington, Mass.) were used and maintained in a strictly controlled environment in accordance with the NIH Guide for the Care and Use of Laboratory Animals. 158P1D7 transfected UM-UC-3 cells and parental cells were injected into the subcutaneous space of SCID mice. Each mouse received 4×10^6 cells suspended in 50% (v/v) of Matrigel. Tumor size was monitored through caliper measurements twice a week. The longest dimension (L) and the dimension perpendicular to it (W) were taken to calculate tumor volume according to the formula $W^2 \times L / 2$. The Mann-Whitney U test was used to evaluate differences of tumor growth. All tests were two sided with $\alpha=0.05$. The results show that 158P1D7 enhances the growth of bladder cancer in mice (FIG. 27).

Example 36

158P1D7 Monoclonal Antibody-Mediated Inhibition of Bladder and Prostate Tumors In Vivo

[0741] The significant expression of 158P1D7 in cancer tissues, together with its restricted expression in normal tissues, makes 158P1D7 an excellent target for antibody therapy. In cases where the monoclonal antibody target is a cell surface protein, antibodies have been shown to be efficacious at inhibiting tumor growth (See, e.g., (Saffran, D., et al., *PNAS* 10:1073-1078 or URL: pnas.org/cgi/doi/10.1073/pnas.051624698). In cases where the target is not on the cell surface, such as PSA and PAP in prostate cancer, antibodies have still been shown to recognize and inhibit growth of cells

expressing those proteins (Saffran, D. C., et al., *Cancer and Metastasis Reviews*, 1999. 18: p. 437-449). As with any cellular protein with a restricted expression profile, 158P1D7 is a target for T cell-based immunotherapy.

[0742] Accordingly, the therapeutic efficacy of anti-158P1D7 mAbs in human bladder cancer mouse models is modeled in 158P1D7-expressing bladder cancer xenografts or bladder cancer cell lines, such as those described in Example (the Example entitled "In Vivo Assay for 158P1D7 Tumor Growth Promotion", that have been engineered to express 158P1D7.

[0743] Antibody efficacy on tumor growth and metastasis formation is confirmed, e.g., in a mouse orthotopic bladder cancer xenograft model. The antibodies can be unconjugated, as discussed in this Example, or can be conjugated to a therapeutic modality, as appreciated in the art. It is confirmed that anti-158P1D7 mAbs inhibit formation of 158P1D7-expressing bladder tumors. Anti-158P1D7 mAbs also retard the growth of established orthotopic tumors and prolong survival of tumor-bearing mice. These results indicate the utility of anti-158P1D7 mAbs in the treatment of local and advanced stages of bladder cancer. (See, e.g., Saffran, D., et al., *PNAS* 10:1073-1078 or URL: pnas.org/cgi/doi/10.1073/pnas.051624698)

[0744] Administration of anti-158P1D7 mAbs retard established orthotopic tumor growth and inhibit metastasis to distant sites, resulting in a significant prolongation in the survival of tumor-bearing mice. These studies indicate that 158P1D7 is an attractive target for immunotherapy and demonstrate the therapeutic potential of anti-158P1D7 mAbs for the treatment of local and metastatic bladder cancer.

[0745] This example demonstrates that unconjugated 158P1D7 monoclonal antibodies effectively to inhibit the growth of human bladder tumors grown in SCID mice; accordingly a combination of such efficacious monoclonal antibodies is also effective.

[0746] Tumor Inhibition Using Multiple Unconjugated 158P1D7 mAbs

[0747] Materials and Methods

[0748] 158P1D7 Monoclonal Antibodies:

[0749] Monoclonal antibodies are raised against 158P1D7 as described in the Example entitled "Generation of 158P1D7 Monoclonal Antibodies (mAbs)." The antibodies are characterized by ELISA, Western blot, FACS, and immunoprecipitation, in accordance with techniques known in the art, for their capacity to bind 158P1D7. Epitope mapping data for the anti-158P1D7 mAbs, as determined by ELISA and Western analysis, recognize epitopes on the 158P1D7 protein. Immunohistochemical analysis of bladder cancer tissues and cells with these antibodies is performed.

[0750] The monoclonal antibodies are purified from ascites or hybridoma tissue culture supernatants by Protein-G Sepharose chromatography, dialyzed against PBS, filter sterilized, and stored at -20°C . Protein determinations are performed by a Bradford assay (Bio-Rad, Hercules, Calif.). A therapeutic monoclonal antibody or a cocktail comprising a mixture of individual monoclonal antibodies is prepared and used for the treatment of mice receiving subcutaneous or orthotopic injections of bladder tumor xenografts.

[0751] Bladder Cancer Cell Lines

[0752] Bladder cancer cell lines (Scaber, J82, UM-UC-3, HT1376, RT4, T24, TCC-SUP, J82 and SW780) expressing 158P1D7 are generated by retroviral gene transfer as described in Hubert, R. S., et al., STEAP: a prostate-specific

cell-surface antigen highly expressed in human prostate tumors. *Proc Natl Acad Sci USA*, 1999. 96(25):14523-8. Anti-158P1D7 staining is detected by using an FITC-conjugated goat anti-mouse antibody (Southern Biotechnology Associates) followed by analysis on a Coulter Epics-XL flow cytometer.

[0753] In Vivo Mouse Models.

[0754] Subcutaneous (s.c.) tumors are generated by injection of 1×10^6 158P1D7-expressing bladder cancer cells mixed at a 1:1 dilution with Matrigel (Collaborative Research) in the right flank of male SCID mice. To test antibody efficacy on tumor formation, i.p. antibody injections are started on the same day as tumor-cell injections. As a control, mice are injected with either purified mouse IgG (ICN) or PBS; or a purified monoclonal antibody that recognizes an irrelevant antigen not expressed in human cells. In preliminary studies, no difference is found between mouse IgG or PBS on tumor growth. Tumor sizes are determined by vernier caliper measurements, and the tumor volume is calculated as $\text{length} \times \text{width} \times \text{height}$. Mice with s.c. tumors greater than 1.5 cm in diameter are sacrificed. Circulating levels of anti-158P1D7 mAbs are determined by a capture ELISA kit (Bethyl Laboratories, Montgomery, Tex.). (See, e.g., (Saffran, D., et al., *PNAS* 10:1073-1078)

[0755] Orthotopic injections are performed, for example, in two alternative embodiments, under anesthesia by, for example, use of ketamine/xylazine. In a first embodiment, an intravesicular injection of bladder cancer cells is administered directly through the urethra and into the bladder (Peralta, E. A., et al., *J. Urol.*, 1999. 162:1806-1811). In a second embodiment, an incision is made through the abdominal wall, the bladder is exposed, and bladder tumor tissue pieces (1-2 mm in size) derived from a s.c. tumor are surgically glued onto the exterior wall of the bladder, termed "onplantation" (Fu, X., et al., *Int. J. Cancer*, 1991. 49: 938-939; Chang, S., et al., *Anticancer Res.*, 1997. 17: p. 3239-3242). Antibodies can be administered to groups of mice at the time of tumor injection or onplantation, or after 1-2 weeks to allow tumor establishment.

[0756] Anti-158P1D7 mAbs Inhibit Growth of 158P1D7-Expressing Bladder Cancer Tumors

[0757] In one embodiment, the effect of anti-158P1D7 mAbs on tumor formation is tested by using the bladder onplantation orthotopic model. As compared with the s.c. tumor model, the orthotopic model, which requires surgical attachment of tumor tissue directly on the bladder, results in a local tumor growth, development of metastasis in distal sites, and subsequent death (Fu, X., et al., *Int. J. Cancer*, 1991. 49: p. 938-939; Chang, S., et al., *Anticancer Res.*, 1997. 17: p. 3239-3242). This features make the orthotopic model more representative of human disease progression and allows one to follow the therapeutic effect of mAbs, as well as other therapeutic modalities, on clinically relevant end points.

[0758] Accordingly, 158P1D7-expressing tumor cells are onplanted orthotopically, and 2 days later, the mice are segregated into two groups and treated with either: a) 50-2000 μg , usually 200-500 μg , of anti-158P1D7 Ab, or b) PBS, three times per week for two to five weeks. Mice are monitored weekly for indications of tumor growth.

[0759] As noted, a major advantage of the orthotopic bladder cancer model is the ability to study the development of metastases. Formation of metastasis in mice bearing established orthotopic tumors is studied by histological analysis of tissue sections, including lung and lymph nodes (Fu, X., et al.,

Int. J. Cancer, 1991. 49:938-939; Chang, S., et al., Anticancer Res., 1997. 17:3239-3242). Additionally, IHC analysis using anti-158P1D7 antibodies can be performed on the tissue sections.

[0760] Mice bearing established orthotopic 158P1D7-expressing bladder tumors are administered 1000 µg injections of either anti-158P1D7 mAb or PBS over a 4-week period. Mice in both groups are allowed to establish a high tumor burden (1-2 weeks growth), to ensure a high frequency of metastasis formation in mouse lungs and lymph nodes. Mice are then sacrificed and their local bladder tumor and lung and lymph node tissue are analyzed for the presence of tumor cells by histology and IHC analysis.

[0761] In another embodiment, the effect of anti-158P1D7 mAbs on tumor growth was tested using the following protocols. Male ICR—SCID mice, 5-6 weeks old (Charles River Laboratory, Wilmington, Mass.) were used and were maintained in a strictly-controlled environment in accordance with the NIH Guide for the Care and Use of Laboratory Animals. UG-B1, a patient bladder cancer, was used to establish xenograft models. Stock tumors regularly maintained in SCID mice were sterilely dissected, minced, and digested using Pronase (Calbiochem, San Diego, Calif.). Cell suspensions generated were incubated overnight at 37° C. to obtain a homogeneous single-cell suspension. Each mouse received 2.5×10^6 cells at the subcutaneous site of right flank. Murine monoclonal antibodies to 158P1D7 and PSCA were tested at a dose of 500 µg/mouse in the study. PBS was used as control. MABs were dosed intra-peritoneally twice a week for a total of 12 doses, starting on the same day of tumor cell injection. Tumor size was monitored through caliper measurements twice a week. The longest dimension (L) and the dimension perpendicular to it (W) were taken to calculate tumor volume according to the formula: $W^2 \times L/2$. The results show that Anti-158P1D7 mAbs are capable of inhibiting the growth of human bladder carcinoma in mice (FIG. 31).

[0762] Anti-158P1D7 mAbs Inhibit Growth of 158P1D7-Expressing Prostate Cancer Tumors

[0763] In another embodiment, the effect of anti-158P1D7 mAbs on tumor growth was tested using the following protocols. Male ICR-SCID mice, 5-6 weeks old (Charles River Laboratory, Wilmington, Mass.) were used and were maintained in a strictly-controlled environment in accordance with the NIH Guide for the Care and Use of Laboratory Animals. LAPC-9AD, an androgen-dependent human prostate cancer, was used to establish xenograft models. Stock tumors were regularly maintained in SCID mice. At the day of implantation, stock tumors were harvested and trimmed of necrotic tissues and minced to 1 mm³ pieces. Each mouse received 4 pieces of tissues at the subcutaneous site of right flank. Murine monoclonal antibodies to 158P1D7 and PSCA were tested at a dose of 1000 µg/mouse and 500 µg/mouse respectively. PBS and anti-KLH monoclonal antibody were used as controls. The study cohort consisted of 4 groups with 6 mice in each group. MABs were dosed intra-peritoneally twice a week for a total of 8 doses. Treatment was started when tumor volume reached 45 mm³. Tumor size was monitored through caliper measurements twice a week. The longest dimension (L) and the dimension perpendicular to it (W) were taken to calculate tumor volume according to the formula: $W^2 \times L/2$. The Student's t test and the Mann-Whitney U test, where applicable, were used to evaluate differences of tumor growth. All tests were two-sided with $\alpha=0.05$. The results

show that Anti-158P1D7 mAbs are capable of inhibiting the growth of human prostate carcinoma in mice (FIG. 30).

[0764] These studies demonstrate a broad anti-tumor efficacy of anti-158P1D7 antibodies on initiation and progression of bladder cancer and prostate cancer in mouse models. Anti-158P1D7 antibodies inhibit tumor formation and retard the growth of already established tumors and prolong the survival of treated mice. Moreover, anti-158P1D7 mAbs demonstrate a dramatic inhibitory effect on the spread of local bladder tumor to distal sites, even in the presence of a large tumor burden. Thus, anti-158P1D7 mAbs are efficacious on major clinically relevant end points including lessened tumor growth, lessened metastasis, and prolongation of survival.

Example 37

Homology Comparison of 158P1D7 to Known Sequences

[0765] The 158P1D7 protein has 841 amino acids with calculated molecular weight of 95.1 kDa, and pI of 6.07. 158P1D7 is predicted to be a plasma membrane protein (0.46 PSORT <http://psort.nibb.ac.jp/form.html>) with a possibility of it being a nuclear protein (65% by PSORT <http://psort.nibb.ac.jp/form2.html>). 158P1D7 has a potential cleavage site between aa 626 and 627 and a potential signal site at aa 3-25.

[0766] 158P1D7 contains a single transmembrane region from amino acids 611-633 with high probability that the amino-terminus resides outside, consistent with the topology of a Type 1 transmembrane protein (located on the World Wide Web at cbs.dtu.dk/services/TMHMM). Also visualized is a short hydrophobic stretch from amino acids 3-25, consistent with the existence of an amino-terminal signal peptide. Based on the TMpred algorithm of Hofmann and Stoffel which utilizes TMBASE (K. Hofmann, W. Stoffel, TMBASE—A database of membrane spanning protein segments Biol. Chem. Hoppe-Seyler 374:166, 1993), 158P1D7 contains a primary transmembrane region from amino acids 609-633 and a secondary transmembrane region from amino acids 3-25 (contiguous amino acids with values greater than 0 on the plot have high probability of being transmembrane regions) with an orientation in which the amino terminus resides inside and the carboxyl terminus outside. An alternative model is also predicted that 158P1D7 is a Type 1 transmembrane protein in which the amino-terminus resides outside and the protein contains a secondary transmembrane domain signal peptide from amino acids 3-25 and a primary transmembrane domain from aa615-633. The transmembrane prediction algorithms are accessed through the ExPasy molecular biology server located on the World Wide Web at (expasy.ch/tools/).

[0767] By use of the PubMed website of the N.C.B.I. located on the World Wide Web at (ncbi.nlm.nih.gov/entrez), it was found at the protein level that 158P1D7 shows best homology to the hypothetical protein FLJ22774 (PubMed record: gi 14149932) of unknown function, with 97% identity and 97% homology (FIG. 4 and FIG. 5A). The 158P1D7 protein demonstrates homology to a human protein similar to IGFALS (insulin-like growth factor binding protein, acid labile subunit) (PubMed record: gi 6691962) with 36% identity and 52% homology (FIG. 5B), to Slit proteins with 25% identity and 39% homology and to the leucine-rich repeat transmembrane family of proteins FLRT (Fibronectin-like domain-containing leucine-rich transmembrane protein),

including FLRT2 with 26% identity and 43% homology, and FLRT3 with 34% identity and 53% homology.

[0768] Insulin-like growth factors (IGF) have been shown to play an important role in tumor growth including prostate, breast, brain and ovarian cancer (O'Brian et al, *Urology*. 2001, 58:1; Wang J et al *Oncogene*. 2001, 20:3857; Helle S et al, *Br J Cancer*. 2001, 85:74). IGFs produce their oncogenic effect by binding to specific cell surface receptors and activating survival as well as mitogenic pathways (Babajko S et al, *Med Pediatr Oncol*. 2001, 36:154; Scalia P et al, *J Cell Biochem*. 2001, 82:610). The activity of insulin-like growth factors is regulated by IGF binding proteins (IGF-BP) and the acid labile subunit (ALS) of IGF-BP (Zeslawski W et al, *EMBO J*. 2001, 20:3638; Jones J I. and Clemmons D R. *Endocr. Rev*. 1995, 16: 3). In the plasma, most IGFs exist as a ternary complex containing IGF-BP and ALS (Jones J I. and Clemmons D R. *Endocr. Rev*. 1995, 16: 3). Association with ALS allows the retention of the ternary complex in the vasculature and extends its lifespan (Ueki I et al, *Proc Natl Acad Sci USA* 2000, 97:6868). Studies in mice demonstrate the contribution of ALS to cell growth by showing that mice carrying mutant ALS exhibit a growth deficit (Ueki I et al, *Proc Natl Acad Sci USA* 2000, 97:6868), indicating that ALS plays a critical role in the growth of tumor cells. The 158P1D7 protein serves as an IGF-ALS-like protein in that it facilitates the formation of the IGF ternary complex. The 158P1D7-induced IGF complex formation leads to increased growth of tumor cells expressing 158P1D7 which facilitates the growth of this malignancy in vivo. The induction of the IGF complex allows one to assay for monoclonal antibodies with neutralizing ability to disrupt, or enhancing capacity to help form, the ternary interaction.

[0769] Slit proteins were first identified in *Drosophila* as secreted proteins that regulate axon guidance and orientation (Rajagopalan S et al, *Cell*. 2000, 103:1033; Chen J et al, *J Neurosci*. 2001, 21:1548). Mammalian homologs were cloned in mice and humans, where they are shown to regulate migration and chemotaxis (Wu J et al, *Nature*. 2001, 410:948; Brose K and Tessier M, *Curr Opin Neurobiol*. 2001, 10:95). Slit proteins localize at two distinct subcellular sites within epithelial cells depending on cell stage, with Slit 3 predominantly localizing in the mitochondria and targeting to the cell surface in more confluent cells (Little M H et al, *Am J Physiol Cell Physiol*. 2001, 281:C486). The differential Slit localization suggests that Slit may function differently whether it is secreted, associated with the cell surface or retained in the mitochondria. The 158P1D7 protein functions as a Slit-like protein in that it binds to Roundabout receptors (Robos) on the surface of cells. 158P1D7 has homology (83% identity along entire length) with the murine Slitrk6 gene, a member of a new family of Leucine Rich Receptors (LRRs). The Slit family of LRRs is involved in neurite outgrowth and axonal guidance during development. These proteins also play a role in organ development by providing cues for branching morphogenesis in lung, kidney and other organs. The crystal structure for several LRRs has been determined. These proteins are shaped like a horseshoe with LRRs on both sides of a central flexible region. This horseshoe shape likely forms a central pocket where other proteins (binding partners) can interact. The term binding partner includes ligands, receptors, substrates, antibodies, and other molecules that interact with the 158P1D7 polypeptide through contact or proximity between particular portions of the binding partner and the 158P1D7 polypeptide. Binding partners for 158P1D7

polypeptides are expressed on both epithelial and mesenchymal cells within an organ. Known binding partners for the Slit family of LRRs include both the Robo family of genes and glypicans. Both of these potential protein interacting partners are aberrantly expressed in human cancers. Robos are Ig-like proteins that act as adhesion molecules. Interaction of specific Robo and Slit proteins results in cell migration with the ultimate outcome being either repulsion or attraction depending on intracellular signaling cascades. Mutations that disrupt interaction of Slit with Robo result in failure to repel migrating neurons during development. Moreover, mutations that disrupt functional interactions lead to organ failure and hyperproliferation in the developing lung. Mutational analysis has further shown that the LRR region is required for biologic activity of these receptors. 158P1D7 is overexpressed in a variety of human cancers including those derived from bladder and lung. Aberrant expression of this protein leads to enhanced cell growth, survival, increased metastasis and angiogenesis by disrupting or promoting protein interactions between 158P1D7 and specific binding partners on the surface of adjacent cells. Binding of 158P1D7 to Robo receptors (Robo-1, -2, -3 and -4) is observed in vitro, both as recombinant proteins and as cell surface molecules. Biological effects are induced when the Robo-1, -2, -3 or -4 receptors or glypican-binding partners binds to 158P1D7 on the cell surface. These activities are detected by adhesion, enhanced migration or repulsion in cell based assays. The interaction between 158P1D7 and Robo receptors leads to increased adhesion between 158P1D7-expressing tumor cells and endothelium or other cell types expressing Robo receptors, leading to spreading and metastasis of tumor cells as well as enhanced angiogenesis. Further, the association between 158P1D7 and Robo receptors allows one to screen for monoclonal antibodies with the ability to block (or enhance) the interaction in an in vitro assay. Such antibodies have a modulating effect on growth of 158P1D7 expressing tumors.

[0770] The FLRT (Fibronectin-like domain-containing leucine-rich transmembrane protein) family of transmembrane proteins has three members, FLRT1, FLRT2 and FLRT3, which contain 10 leucine-rich repeats flanked by cysteine-rich domains, a fibronectin/collagen-like motif and an intracellular tail (Lacy S E et al, *Genomics* 1999, 62:417). Based on overall structure of the three proteins, a role in cell adhesion and receptor signaling is predicted. A *Xenopus laevis* ortholog of FLRT3 (XFLRT3) was identified that shows co-expression with FGFs (fibroblast growth factors) and is induced after activation and reduced following inhibition of signal transduction through the FGFs (Bottcher R T et al, *Nature Cell Biol* 2004, 6:38). The interaction between FGFRs (FGF receptors) and XFLRT3 indicates that XFLRT3 modulates FGF-induced signal transduction through the MAP kinase pathway. The 158P1D7 protein forms a complex with FGFRs that induces modulation of FGF-induced signal transduction through the MAP kinase (ERK-1 and ERK-2) pathway. FGF-induced signals are potentiated by expression of 158P1D7, which leads to an increase in the proliferative capacity of the cells. This significantly promotes unregulated growth of cancer cells expressing 158P1D7, contributing to their growth advantage in vivo. The interaction between 158P1D7 protein and FGFR allows one to screen for monoclonal antibodies with the ability to disrupt (or enhance) the association of these two molecules. Such antibodies have a modulating effect on growth of 158P1D7 expressing tumors.

Example 38

Identification and Confirmation of Signal Transduction Pathways

[0771] Many mammalian proteins have been reported to interact with signaling molecules and to participate in regulating signaling pathways. (J Neurochem. 2001; 76:217-223). In particular, IGF and IGF-BP have been shown to regulate mitogenic and survival pathways (Babajko S et al, Med Pediatr Oncol. 2001, 36:154; Scalia P et al, J Cell Biochem. 2001, 82:610). Using immunoprecipitation and Western blotting techniques, proteins are identified that associate with 158P1D7 and mediate signaling events. Several pathways known to play a role in cancer biology are regulated by 158P1D7, including phospholipid pathways such as PI3K, AKT, etc, adhesion and migration pathways, including FAK, Rho, Rac-1, etc, as well as mitogenic/survival cascades such as ERK, p38, etc. (Cell Growth Differ. 2000, 11:279; J Biol Chem. 1999, 274:801; Oncogene. 2000, 19:3003; J. Cell Biol. 1997, 138:913.). Bioinformatic analysis revealed that 158P1D7 can become phosphorylated by serine/threonine as well as tyrosine kinases. Thus, the phosphorylation of 158P1D7 is provided by the present invention to lead to activation of the above listed pathways.

[0772] Using, e.g., Western blotting techniques, the ability of 158P1D7 to regulate these pathways is confirmed. Cells expressing or lacking 158P1D7 are either left untreated or stimulated with cytokines, hormones and anti-integrin antibodies. Cell lysates are analyzed using anti-phospho-specific antibodies (Cell Signaling, Santa Cruz Biotechnology) in order to detect phosphorylation and regulation of ERK, p38, AKT, PI3K, PLC and other signaling molecules. When 158P1D7 plays a role in the regulation of signaling pathways, whether individually or communally, it is used as a target for diagnostic, prognostic, preventative and therapeutic purposes.

[0773] To confirm that 158P1D7 directly or indirectly activates known signal transduction pathways in cells, luciferase (luc) based transcriptional reporter assays are carried out in cells expressing individual genes. These transcriptional reporters contain consensus-binding sites for known transcription factors that lie downstream of well-characterized signal transduction pathways. The reporters and examples of these associated transcription factors, signal transduction pathways, and activation stimuli are listed below:

[0774] 1. NFkB-luc, NFkB/Rel; Ik-kinase/SAPK; growth/apoptosis/stress

[0775] 2. SRE-luc, SRF/TCF/ELK1; MAPK/SAPK; growth/differentiation

[0776] 3. AP-1-luc, FOS/JUN; MAPK/SAPK/PKC; growth/apoptosis/stress

[0777] 4. ARE-luc, androgen receptor; steroids/MAPK; growth/differentiation/apoptosis

[0778] 5. p53-luc, p53; SAPK; growth/differentiation/apoptosis

[0779] 6. CRE-luc, CREB/ATF2; PKA/p38; growth/apoptosis/stress

[0780] Gene-mediated effects are assayed in cells showing mRNA expression. Luciferase reporter plasmids are introduced by lipid-mediated transfection (TFX-50, Promega). Luciferase activity, an indicator of relative transcriptional activity, is measured by incubation of cell extracts with luciferin substrate and luminescence of the reaction is monitored in a luminometer.

[0781] Signaling pathways activated by 158P1D7 are mapped and used for the identification and validation of therapeutic targets. When 158P1D7 is involved in cell signaling, it is used as target for diagnostic, prognostic, preventative and therapeutic purposes.

Example 39

Involvement in Tumor Progression

[0782] The 158P1D7 gene can contribute to the growth of cancer cells. The role of 158P1D7 in tumor growth is confirmed in a variety of primary and transfected cell lines including prostate, colon, bladder and kidney cell lines as well as NIH 3T3 cells engineered to stably express 158P1D7. Parental cells lacking 158P1D7 and cells expressing 158P1D7 are evaluated for cell growth using a well-documented proliferation assay (see, e.g., Fraser S P, Grimes J A, Djamgoz M B. Prostate. 2000; 44:61, Johnson D E, Ochieng J, Evans S L. Anticancer Drugs. 1996, 7:288).

[0783] To confirm the role of 158P1D7 in the transformation process, its effect in colony forming assays is investigated. Parental NIH3T3 cells lacking 158P1D7 are compared to NHI-3T3 cells expressing 158P1D7, using a soft agar assay under stringent and more permissive conditions (Song Z. et al. Cancer Res. 2000, 60:6730).

[0784] To confirm the role of 158P1D7 in invasion and metastasis of cancer cells, a well-established assay is used, e.g., a Transwell Insert System assay (Becton Dickinson) (Cancer Res. 1999, 59:6010). Control cells, including prostate, colon, bladder and kidney cell lines lacking 158P1D7 are compared to cells expressing 158P1D7, respectively. Cells are loaded with the fluorescent dye, calcein, and plated in the top well of the Transwell insert coated with a basement membrane analog. Invasion is determined by fluorescence of cells in the lower chamber relative to the fluorescence of the entire cell population.

[0785] 158P1D7 can also play a role in cell cycle and apoptosis. Parental cells and cells expressing 158P1D7 are compared for differences in cell cycle regulation using a well-established BrdU assay (Abdel-Malek Z A. J Cell Physiol. 1988, 136:247). In short, cells are grown under both optimal (full serum) and limiting (low serum) conditions are labeled with BrdU and stained with anti-BrdU Ab and propidium iodide. Cells are analyzed for entry into the G1, S, and G2M phases of the cell cycle. Alternatively, the effect of stress on apoptosis is evaluated in control parental cells and cells expressing 158P1D7, including normal and tumor bladder cells. Engineered and parental cells are treated with various chemotherapeutic agents, such as paclitaxel, gemcitabine, etc, and protein synthesis inhibitors, such as cycloheximide. Cells are stained with annexin V-FITC and cell death is measured by FACS analysis. The modulation of cell death by 158P1D7 can play a critical role in regulating tumor progression and tumor load.

[0786] When 158P1D7 plays a role in cell growth, transformation, invasion or apoptosis, it is used as a target for diagnostic, prognostic, preventative and therapeutic purposes.

Example 40

Involvement in Angiogenesis

[0787] Angiogenesis or new capillary blood vessel formation is necessary for tumor growth (Hanahan D, Folkman J.

Cell. 1996, 86:353; Folkman J. *Endocrinology*. 1998 139: 441). Several assays have been developed to measure angiogenesis in vitro and in vivo, such as the tissue culture assays, endothelial cell tube formation, and endothelial cell proliferation. Using these assays as well as in vitro neo-vascularization, the effect of 158P1D7 on angiogenesis is confirmed. For example, endothelial cells engineered to express 158P1D7 are evaluated using tube formation and proliferation assays. The effect of 158P1D7 is also confirmed in animal models in vivo. For example, cells either expressing or lacking 158P1D7 are implanted subcutaneously in immunocompromised mice. Endothelial cell migration and angiogenesis are evaluated 5-15 days later using immunohistochemistry techniques. When 158P1D7 affects angiogenesis, it is used as a target for diagnostic, prognostic, preventative and therapeutic purposes

Example 41

Regulation of Transcription

[0788] The above-indicated localization of 158P1D7 to the nucleus and its similarity to IGF-BP which has been found to activate signaling pathways and to regulate essential cellular functions, support the present invention use of 158P1D7 based on its role in the transcriptional regulation of eukaryotic genes. Regulation of gene expression is confirmed, e.g., by studying gene expression in cells expressing or lacking 158P1D7. For this purpose, two types of experiments are performed.

[0789] In the first set of experiments, RNA from parental and 158P1D7-expressing cells are extracted and hybridized to commercially available gene arrays (Clontech) (Smid-Koopman E et al. *Br J Cancer*. 2000. 83:246). Resting cells as well as cells treated with FBS or androgen are compared. Differentially expressed genes are identified in accordance with procedures known in the art. The differentially expressed genes are then mapped to biological pathways (Chen K et al., *Thyroid*. 2001. 11:41.).

[0790] In the second set of experiments, specific transcriptional pathway activation is evaluated using commercially available (e.g., Stratagene) luciferase reporter constructs including: NFkB-luc, SRE-luc, ELK1-luc, ARE-luc, p53-luc, and CRE-luc. These transcriptional reporters contain consensus binding sites for known transcription factors that lie downstream of well-characterized signal transduction pathways, and represent a good tool to ascertain pathway activation and screen for positive and negative modulators of pathway activation.

[0791] When 158P1D7 plays a role in gene regulation, it is used as a target for diagnostic, prognostic, preventative and therapeutic purposes.

Example 42

Subcellular Localization of 158P1D7

[0792] The cellular location of 158P1D7 is assessed using subcellular fractionation techniques widely used in cellular biology (Storrie B, et al. *Methods Enzymol*. 1990; 182:203-25). A variety of cell lines, including prostate, kidney and bladder cell lines as well as cell lines engineered to express 158P1D7 are separated into nuclear, cytosolic and membrane fractions. Gene expression and location in nuclei, heavy membranes (lysosomes, peroxisomes, and mitochondria),

light membranes (plasma membrane and endoplasmic reticulum), and soluble protein fractions are tested using Western blotting techniques.

[0793] Alternatively, 293T cells are transfected with an expression vector encoding individual genes, HIS-tagged (PCDNA 3.1 MYC/HIS, Invitrogen) and the subcellular localization of these genes is determined as described above. In short, the transfected cells are harvested and subjected to a differential subcellular fractionation protocol (Pemberton, P. A. et al, 1997, *J of Histochemistry and Cytochemistry*, 45:1697-1706). Location of the HIS-tagged genes is followed by Western blotting.

[0794] Using 158P1D7 antibodies, it is possible to demonstrate cellular localization by immunofluorescence and immunohistochemistry. For example, cells expressing or lacking 158P1D7 are adhered to a microscope slide and stained with anti-158P1D7 specific Ab. Cells are incubated with an FITC-coupled secondary anti-species Ab, and analyzed by fluorescent microscopy. Alternatively, cells and tissues lacking or expressing 158P1D7 are analyzed by IHC as described herein.

[0795] When 158P1D7 is localized to specific cell compartments, it is used as a target for diagnostic, preventative and therapeutic purposes.

Example 43

Involvement of 158P1D7 in Protein Trafficking

[0796] Due to its similarity to Slit proteins, 158P1D7 can regulate intracellular trafficking and retention into mitochondrial and/or nuclear compartments. Its role in the trafficking of proteins can be confirmed using well-established methods (Valetti C. et al. *Mol Biol Cell*. 1999, 10:4107). For example, FITC-conjugated α 2-macroglobulin is incubated with 158P1D7-expressing and 158P1D7-negative cells. The location and uptake of FITC- α 2-macroglobulin is visualized using a fluorescent microscope. In another approach, the co-localization of 158P1D7 with vesicular proteins is confirmed by co-precipitation and Western blotting techniques and fluorescent microscopy.

[0797] Alternatively, 158P1D7-expressing and 158P1D7-lacking cells are compared using bodipy-ceramide labeled bovine serum albumine (Huber L. et al. *Mol. Cell. Biol*. 1995, 15:918). Briefly, cells are allowed to take up the labeled BSA and are placed intermittently at 4° C. and 18° C. to allow for trafficking to take place. Cells are examined under fluorescent microscopy, at different time points, for the presence of labeled BSA in specific vesicular compartments, including Golgi, endoplasmic reticulum, etc.

[0798] In another embodiment, the effect of 158P1D7 on membrane transport is examined using biotin-avidin complexes. Cells either expressing or lacking 158P1D7 are transiently incubated with biotin. The cells are placed at 4° C. or transiently warmed to 37° C. for various periods of time. The cells are fractionated and examined by avidin affinity precipitation for the presence of biotin in specific cellular compartments. Using such assay systems, proteins, antibodies and small molecules are identified that modify the effect of 158P1D7 on vesicular transport. When 158P1D7 plays a role in intracellular trafficking, 158P1D7 is a target for diagnostic, prognostic, preventative and therapeutic purposes

Example 44

Protein-Protein Association

[0799] IGF and IGF-BP proteins have been shown to interact with other proteins, thereby forming protein complexes that can regulate protein localization, biological activity, gene transcription, and cell transformation (Zeslawski W et al, EMBO J. 2001, 20:3638; Yu H, Rohan T, J Natl Cancer Inst. 2000, 92:1472). Using immunoprecipitation techniques as well as two yeast hybrid systems, proteins are identified that associate with 158P1D7. Immunoprecipitates from cells expressing 158P1D7 and cells lacking 158P1D7 are compared for specific protein-protein associations.

[0800] Studies are performed to determine the extent of the association of 158P1D7 with receptors, such as the EGF and IGF receptors, and with intracellular proteins, such as IGF-BP, cytoskeletal proteins etc. Studies comparing 158P1D7 positive and 158P1D7 negative cells, as well as studies comparing unstimulated/resting cells and cells treated with epithelial cell activators, such as cytokines, growth factors and anti-integrin Ab reveal unique protein-protein interactions.

[0801] In addition, protein-protein interactions are confirmed using two yeast hybrid methodology (Curr Opin Chem Biol. 1999, 3:64). A vector carrying a library of proteins fused to the activation domain of a transcription factor is introduced into yeast expressing a 158P1D7-DNA-binding domain fusion protein and a reporter construct. Protein-protein interaction is detected by colorimetric reporter activity. Specific association with surface receptors and effector molecules directs one of skill to the mode of action of 158P1D7, and thus identifies therapeutic, prognostic, preventative and/or diagnostic targets for cancer. This and similar assays are also used to identify and screen for small molecules that interact with 158P1D7.

[0802] When 158P1D7 associates with proteins or small molecules it is used as a target for diagnostic, prognostic, preventative and therapeutic purposes.

Example 45

Transcript Variants of 158P1D7

[0803] Transcript variants are variants of mature mRNA from the same gene which arise by alternative transcription or alternative splicing. Alternative transcripts are transcripts from the same gene but start transcription at different points. Splice variants are mRNA variants spliced differently from the same transcript. In eukaryotes, when a multi-exon gene is transcribed from genomic DNA, the initial RNA is spliced to produce functional mRNA, which has only exons and is used for translation into an amino acid sequence. Accordingly, a given gene can have zero to many alternative transcripts and each transcript can have zero to many splice variants. Each transcript variant has a unique exon makeup, and can have different coding and/or non-coding (5' or 3' end) portions, from the original transcript. Transcript variants can code for similar or different proteins with the same or a similar function or can encode proteins with different functions, and can be expressed in the same tissue at the same time, or in different tissues at the same time, or in the same tissue at different times, or in different tissues at different times. Proteins encoded by transcript variants can have similar or different cellular or extracellular localizations, e.g., secreted versus intracellular.

[0804] Transcript variants are identified by a variety of art-accepted methods. For example, alternative transcripts and splice variants are identified by full-length cloning experiment, or by use of full-length transcript and EST sequences. First, all human ESTs were grouped into clusters which show direct or indirect identity with each other. Second, ESTs in the same cluster were further grouped into sub-clusters and assembled into a consensus sequence. The original gene sequence is compared to the consensus sequence(s) or other full-length sequences. Each consensus sequence is a potential splice variant for that gene (see, e.g., URL www.doubletwin.com/products/c11_agentsOverview.jhtml). Even when a variant is identified that is not a full-length clone, that portion of the variant is very useful for antigen generation and for further cloning of the full-length splice variant, using techniques known in the art.

[0805] Moreover, computer programs are available in the art that identify transcript variants based on genomic sequences. Genomic-based transcript variant identification programs include FgenesH (A. Salamov and V. Solovvey, "Ab initio gene finding in *Drosophila* genomic DNA," Genome Research. 2000 April; 10(4): 516-22); Grail (URL compbio.ornl.gov/Grail-bin/EmptyGrailForm) and GenScan (URL genes.mit.edu/GENSCAN.html). For a general discussion of splice variant identification protocols see, e.g., Southan, C., A genomic perspective on human proteases, FEBS Lett. 2001 Jun. 8; 498(2-3):214-8; de Souza, S. J., et al., Identification of human chromosome 22 transcribed sequences with ORF expressed sequence tags, Proc. Natl. Acad Sci USA. 2000 Nov. 7; 97(23):12690-3.

[0806] To further confirm the parameters of a transcript variant, a variety of techniques are available in the art, such as full-length cloning, proteomic validation, PCR-based validation, and 5' RACE validation, etc. (see e.g., Proteomic Validation: Brennan, S. O., et al., Albumin banks peninsula: a new termination variant characterized by electrospray mass spectrometry, Biochem Biophys Acta. 1999 Aug. 17; 1433(1-2): 321-6; Ferranti P, et al., Differential splicing of pre-messenger RNA produces multiple forms of mature caprine alpha (s1)-casein, Eur J Biochem. 1997 Oct. 1; 249(1):1-7. For PCR-based Validation: Wellmann S, et al., Specific reverse transcription-PCR quantification of vascular endothelial growth factor (VEGF) splice variants by LightCycler technology, Clin Chem. 2001 April; 47(4):654-60; Jia, H. P., et al., Discovery of new human beta-defensins using a genomics-based approach, Gene. 2001 Jan. 24; 263(1-2):211-8. For PCR-based and 5' RACE Validation: Brigle, K. E., et al., Organization of the murine reduced folate carrier gene and identification of variant splice forms, Biochem Biophys Acta. 1997 Aug. 7; 1353(2): 191-8).

[0807] It is known in the art that genomic regions are modulated in cancers. When the genomic region to which a gene maps is modulated in a particular cancer, the alternative transcripts or splice variants of the gene are modulated as well. Disclosed herein is that 158P1D7 has a particular expression profile related to cancer. Alternative transcripts and splice variants of 158P1D7 may also be involved in cancers in the same or different tissues, thus serving as tumor-associated markers/antigens.

[0808] Using the full-length gene and EST sequences, four transcript variants were identified, designated as 158P1D7 v.3, v.4, v.5 and v.6. The boundaries of the exon in the original transcript, 158P1D7 v.1 were shown in Table BILL-I. Compared with 158P1D7 v.1, transcript variant 158P1D7 v.3 has

spliced out 2069-2395 from variant 158P1D7 v.1, as shown in FIG. 12. Variant 158P1D7 v.4 spliced out 1162-2096 of variant 158P1D7 v.1. Variant 158P1D7 v.5 added one exon to the 5' and extended 2 bp to the 5' end and 288 bp to the 3' end of variant 158P1D7 v.1. Theoretically, each different combination of exons in spatial order, e.g. exon 1 of v.5 and exons 1 and 2 of v.3 or v.4, is a potential splice variant.

[0809] The variants of 158P1D7 include those that lack a transmembrane motif, but include a signal peptide indicating that they are secreted proteins (v.4 and v.6). Secreted proteins such as v.4 and v.6 serve as biomarkers of cancer existence and progression. The levels of such variant proteins in the serum of cancer patients serves as a prognostic marker of cancer disease or its progression, particularly of cancers such as those listed in Table I. Moreover, such secreted proteins are targets of monoclonal antibodies and related binding molecules. Accordingly, secreted proteins such as these serve as targets for diagnostics, prognostics, prophylactics and therapeutics for human malignancies. Targeting of secreted variants of 158P1D7 is particularly preferred when they have pathology-related or cancer-related effects on cells/tissues.

[0810] Tables LI (a)-(d) through LIV (a)-(d) are set forth on a variant-by-variant bases. Tables LI(a)-(d) shows nucleotide sequence of the transcript variant. Tables LII(a)-(d) shows the alignment of the transcript variant with nucleic acid sequence of 158P1D7 v.1. Tables LIII (a)-(d) lays out amino acid translation of the transcript variant for the identified reading frame orientation. Tables LIV(a)-(d) displays alignments of the amino acid sequence encoded by the splice variant with that of 158P1D7 v.1.

Example 46

Single Nucleotide Polymorphisms of 158P1D7

[0811] A Single Nucleotide Polymorphism (SNP) is a single base pair variation in a nucleotide sequence at a specific location. At any given point of the genome, there are four possible nucleotide base pairs: A/T, C/G, G/C and T/A. Genotype refers to the specific base pair sequence of one or more locations in the genome of an individual. Haplotype refers to the base pair sequence of more than one location on the same DNA molecule (or the same chromosome in higher organisms), often in the context of one gene or in the context of several tightly linked genes. SNP that occurs on a cDNA is called cSNP. This cSNP may change amino acids of the protein encoded by the gene and thus change the functions of the protein. Some SNP cause inherited diseases; others contribute to quantitative variations in phenotype and reactions to environmental factors including diet and drugs among individuals. Therefore, SNP and/or combinations of alleles (called haplotypes) have many applications, including diagnosis of inherited diseases, determination of drug reactions and dosage, identification of genes responsible for diseases, and analysis of the genetic relationship between individuals (P. Nowotny, J. M. Kwon and A. M. Goate, "SNP analysis to dissect human traits," *Curr. Opin. Neurobiol.* 2001 October; 11(5):637-641; M. Pirmohamed and B. K. Park, "Genetic susceptibility to adverse drug reactions," *Trends Pharmacol. Sci.* 2001 June; 22(6):298-305; J. H. Riley, C. J. Allan, E. Lai and A. Roses, "The use of single nucleotide polymorphisms in the isolation of common disease genes," *Pharmacogenomics*. 2000 February; 1(1):39-47; R. Judson, J. C. Stephens and A. Windemuth, "The predictive power of haplotypes in clinical response," *Pharmacogenomics*. 2000 feb; 1(1):15-26).

[0812] SNP are identified by a variety of art-accepted methods (P. Bean, "The promising voyage of SNP target discovery," *Am. Clin. Lab.* 2001 October-November; 20(9):18-20; K. M. Weiss, "In search of human variation," *Genome Res.* 1998 July; 8(7):691-697; M. M. She, "Enabling large-scale pharmacogenetic studies by high-throughput mutation detection and genotyping technologies," *Clin. Chem.* 2001 February; 47(2):164-172). For example, SNP can be identified by sequencing DNA fragments that show polymorphism by gel-based methods such as restriction fragment length polymorphism (RFLP) and denaturing gradient gel electrophoresis (DGGE). They can also be discovered by direct sequencing of DNA samples pooled from different individuals or by comparing sequences from different DNA samples. With the rapid accumulation of sequence data in public and private databases, one can discover SNP by comparing sequences using computer programs (Z. Gu, L. Hillier and P. Y. Kwok, "Single nucleotide polymorphism hunting in cyberspace," *Hum. Mutat.* 1998; 12(4):221-225). SNP can be verified and genotype or haplotype of an individual can be determined by a variety of methods including direct sequencing and high throughput microarrays (P. Y. Kwok, "Methods for genotyping single nucleotide polymorphisms," *Annu. Rev. Genomics Hum. Genet.* 2001; 2:235-258; M. Kokoris, K. Dix, K. Moynihan, J. Mathis, B. Erwin, P. Grass, B. Hines and A. Dueterhoeft, "High-throughput SNP genotyping with the Masscode system," *Mol. Diagn.* 2000 December; 5(4):329-340).

[0813] Using the methods described above, one SNP was identified in the original transcript, 158P1D7 v.1, at positions 1546 (A/G). The transcripts or proteins with alternative allele was designated as variant 158P1D7 v.2. FIG. 17 shows the schematic alignment of the SNP variants. FIG. 18 shows the schematic alignment of protein variants, corresponding to nucleotide variants. Nucleotide variants that code for the same amino acid sequence as v.1 are not shown in FIG. 18. These alleles of the SNP, though shown separately here, can occur in different combinations (haplotypes) and in any one of the transcript variants (such as 158P1D7 v.5) that contains the site of the SNP.

Example 47

Therapeutic and Diagnostic Use of Anti-158P1D7 Antibodies in Humans

[0814] Anti-158P1D7 monoclonal antibodies are safely and effectively used for diagnostic, prophylactic, prognostic and/or therapeutic purposes in humans. Western blot and immunohistochemical analysis of cancer tissues and cancer xenografts with anti-158P1D7 mAb show strong extensive staining in carcinoma but significantly lower or undetectable levels in normal tissues. Detection of 158P1D7 in carcinoma and in metastatic disease demonstrates the usefulness of the mAb as a diagnostic and/or prognostic indicator. Anti-158P1D7 antibodies are therefore used in diagnostic applications such as immunohistochemistry of kidney biopsy specimens to detect cancer from suspect patients.

[0815] As determined by flow cytometry, anti-158P1D7 mAb specifically binds to carcinoma cells. Thus, anti-158P1D7 antibodies are used in diagnostic whole body imaging applications, such as radioimmunoscintigraphy and radioimmunotherapy, (see, e.g., Potamianos S., et. al. *Anti-cancer Res* 20(2A):925-948 (2000)) for the detection of localized and metastatic cancers that exhibit expression of

158P1D7. Shedding or release of an extracellular domain of 158P1D7 into the extracellular milieu, such as that seen for alkaline phosphodiesterase B10 (Meerson, N. R., *Hepatology* 27:563-568 (1998)), allows diagnostic detection of 158P1D7 by anti-158P1D7 antibodies in serum and/or urine samples from suspect patients.

[0816] Anti-158P1D7 antibodies that specifically bind 158P1D7 are used in therapeutic applications for the treatment of cancers that express 158P1D7. Anti-158P1D7 antibodies are used as an unconjugated modality and as conjugated form in which the antibodies are attached to one of various therapeutic or imaging modalities well known in the art, such as a prodrugs, enzymes or radioisotopes. In preclinical studies, unconjugated and conjugated anti-158P1D7 antibodies are tested for efficacy of tumor prevention and growth inhibition in the SCID mouse cancer xenograft models, e.g., kidney cancer models AGS-K3 and AGS-K6, (see, e.g., the Example entitled "158P1D7 Monoclonal Antibody-mediated Inhibition of Bladder and Lung Tumors In Vivo"). Either conjugated and unconjugated anti-158P1D7 antibodies are used as a therapeutic modality in human clinical trials either alone or in combination with other treatments as described in following Examples.

Example 48

Human Clinical Trials for the Treatment and Diagnosis of Human Carcinomas Through Use of Human Anti-158P1D7 Antibodies In Vivo

[0817] Antibodies are used in accordance with the present invention which recognize an epitope on 158P1D7, and are used in the treatment of certain tumors such as those listed in Table I. Based upon a number of factors, including 158P1D7 expression levels, tumors such as those listed in Table I are presently preferred indications. In connection with each of these indications, three clinical approaches are successfully pursued.

[0818] I.) Adjunctive therapy: In adjunctive therapy, patients are treated with anti-158P1D7 antibodies in combination with a chemotherapeutic or antineoplastic agent and/or radiation therapy. Primary cancer targets, such as those listed in Table I, are treated under standard protocols by the addition anti-158P1D7 antibodies to standard first and second line therapy. Protocol designs address effectiveness as assessed by reduction in tumor mass as well as the ability to reduce usual doses of standard chemotherapy. These dosage reductions allow additional and/or prolonged therapy by reducing dose-related toxicity of the chemotherapeutic agent. Anti-158P1D7 antibodies are utilized in several adjunctive clinical trials in combination with the chemotherapeutic or antineoplastic agents adriamycin (advanced prostrate carcinoma), cisplatin (advanced head and neck and lung carcinomas), taxol (breast cancer), and doxorubicin (preclinical).

[0819] II.) Monotherapy: In connection with the use of the anti-158P1D7 antibodies in monotherapy of tumors, the antibodies are administered to patients without a chemotherapeutic or antineoplastic agent. In one embodiment, monotherapy is conducted clinically in end stage cancer patients with extensive metastatic disease. Patients show some disease stabilization. Trials demonstrate an effect in refractory patients with cancerous tumors.

[0820] III.) Imaging Agent: Through binding a radionuclide (e.g., iodine or yttrium (I^{131} , Y^{90}) to anti-158P1D7 antibodies, the radiolabeled antibodies are utilized as a diag-

nostic and/or imaging agent. In such a role, the labeled antibodies localize to both solid tumors, as well as, metastatic lesions of cells expressing 158P1D7. In connection with the use of the anti-158P1D7 antibodies as imaging agents, the antibodies are used as an adjunct to surgical treatment of solid tumors, as both a pre-surgical screen as well as a post-operative follow-up to determine what tumor remains and/or returns. In one embodiment, a (^{111}In)-158P1D7 antibody is used as an imaging agent in a Phase I human clinical trial in patients having a carcinoma that expresses 158P1D7 (by analogy see, e.g., Divgi et al. *J. Natl. Cancer Inst.* 83:97-104 (1991)). Patients are followed with standard anterior and posterior gamma camera. The results indicate that primary lesions and metastatic lesions are identified.

[0821] Dose and Route of Administration

[0822] As appreciated by those of ordinary skill in the art, dosing considerations can be determined through comparison with the analogous products that are in the clinic. Thus, anti-158P1D7 antibodies can be administered with doses in the range of 5 to 400 mg/m², with the lower doses used, e.g., in connection with safety studies. The affinity of anti-158P1D7 antibodies relative to the affinity of a known antibody for its target is one parameter used by those of skill in the art for determining analogous dose regimens. Further, anti-158P1D7 antibodies that are fully human antibodies, as compared to the chimeric antibody, have slower clearance; accordingly, dosing in patients with such fully human anti-158P1D7 antibodies can be lower, perhaps in the range of 50 to 300 mg/m², and still remain efficacious. Dosing in mg/m², as opposed to the conventional measurement of dose in mg/kg, is a measurement based on surface area and is a convenient dosing measurement that is designed to include patients of all sizes from infants to adults.

[0823] Three distinct delivery approaches are useful for delivery of anti-158P1D7 antibodies. Conventional intravenous delivery is one standard delivery technique for many tumors. However, in connection with tumors in the peritoneal cavity, such as tumors of the ovaries, biliary duct, other ducts, and the like, intraperitoneal administration may prove favorable for obtaining high dose of antibody at the tumor and to also minimize antibody clearance. In a similar manner, certain solid tumors possess vasculature that is appropriate for regional perfusion. Regional perfusion allows for a high dose of antibody at the site of a tumor and minimizes short term clearance of the antibody.

[0824] Clinical Development Plan (CDP)

[0825] Overview: The CDP follows and develops treatments of anti-158P1D7 antibodies in connection with adjunctive therapy, monotherapy, and as an imaging agent. Trials initially demonstrate safety and thereafter confirm efficacy in repeat doses. Trials are open label comparing standard chemotherapy with standard therapy plus anti-158P1D7 antibodies. As will be appreciated, one criteria that can be utilized in connection with enrollment of patients is 158P1D7 expression levels in their tumors as determined by biopsy.

[0826] As with any protein or antibody infusion-based therapeutic, safety concerns are related primarily to (i) cytokine release syndrome, i.e., hypotension, fever, shaking, chills; (ii) the development of an immunogenic response to the material (i.e., development of human antibodies by the patient to the antibody therapeutic, or HAMA response); and, (iii) toxicity to normal cells that express 158P1D7. Standard tests and

follow-up are utilized to monitor each of these safety concerns. Anti-158P1D7 antibodies are found to be safe upon human administration.

Example 49

Human Clinical Trial Adjunctive Therapy with Human Anti-158P1D7 Antibody and Chemotherapeutic Agent

[0827] A phase I human clinical trial is initiated to assess the safety of six intravenous doses of a human anti-158P1D7 antibody in connection with the treatment of a solid tumor, e.g., a cancer of a tissue listed in Table I. In the study, the safety of single doses of anti-158P1D7 antibodies when utilized as an adjunctive therapy to an antineoplastic or chemotherapeutic agent as defined herein, such as, without limitation: cisplatin, topotecan, doxorubicin, adriamycin, taxol, or the like, is assessed. The trial design includes delivery of six single doses of an anti-158P1D7 antibody with dosage of antibody escalating from approximately about 25 mg/m² to about 275 mg/m² over the course of the treatment in accordance with the following schedule:

	Day 0	Day 7	Day 14	Day 21	Day 28	Day 35
mAb Dose	25 mg/m ²	75 mg/m ²	125 mg/m ²	175 mg/m ²	225 mg/m ²	275 mg/m ²
Chemotherapy (standard dose)	+	+	+	+	+	+

[0828] Patients are closely followed for one-week following each administration of antibody and chemotherapy. In particular, patients are assessed for the safety concerns mentioned above: (i) cytokine release syndrome, i.e., hypotension, fever, shaking, chills; (ii) the development of an immunogenic response to the material (i.e., development of human antibodies by the patient to the human antibody therapeutic, or HAHA response); and, (iii) toxicity to normal cells that express 158P1D7. Standard tests and follow-up are utilized to monitor each of these safety concerns. Patients are also assessed for clinical outcome, and particularly reduction in tumor mass as evidenced by MRI or other imaging.

[0829] The anti-158P1D7 antibodies are demonstrated to be safe and efficacious. Phase II trials confirm the efficacy and refine optimum dosing.

Example 50

Human Clinical Trial

Monotherapy with Human Anti-158P1D7 Antibody

[0830] Anti-158P1D7 antibodies are safe in connection with the above-discussed adjunctive trial, a Phase II human clinical trial confirms the efficacy and optimum dosing for monotherapy. Such trial is accomplished, and entails the same safety and outcome analyses, to the above-described adjunctive trial with the exception being that patients do not receive chemotherapy concurrently with the receipt of doses of anti-158P1D7 antibodies.

Example 51

Human Clinical Trial

Diagnostic Imaging with Anti-158P1D7 Antibody

[0831] Once again, as the adjunctive therapy discussed above is safe within the safety criteria discussed above, a human clinical trial is conducted concerning the use of anti-158P1D7 antibodies as a diagnostic imaging agent. The protocol is designed in a substantially similar manner to those described in the art, such as in Divgi et al. *J. Natl. Cancer Inst.* 83:97-104 (1991). The antibodies are found to be both safe and efficacious when used as a diagnostic modality.

Example 52

RNA Interference (RNAi)

[0832] RNA interference (RNAi) technology is implemented to a variety of cell assays relevant to oncology. RNAi is a post-transcriptional gene silencing mechanism activated by double-stranded RNA (dsRNA). RNAi induces specific

mRNA degradation leading to changes in protein expression and subsequently in gene function. In mammalian cells, these dsRNAs called short interfering RNA (siRNA) have the correct composition to activate the RNAi pathway targeting for degradation, specifically some mRNAs. See, Elbashir S. M., et. al., *Duplexes of 21-nucleotide RNAs Mediate RNA interference in Cultured Mammalian Cells*, *Nature* 411(6836): 494-8 (2001). Thus, RNAi technology is used successfully in mammalian cells to silence targeted genes.

[0833] Loss of cell proliferation control is a hallmark of cancerous cells; thus, assessing the role of 158P1D7 in cell survival/proliferation assays is relevant. Accordingly, RNAi was used to investigate the function of the 158P1D7 antigen. To generate siRNA for 158P1D7, algorithms were used that predict oligonucleotides that exhibit the critical molecular parameters (G:C content, melting temperature, etc.) and have the ability to significantly reduce the expression levels of the 158P1D7 protein when introduced into cells. Accordingly, one targeted sequence for the 158P1D7 siRNA is: 5' AAGCT-CATTCTAGCGGGAAAT 3' (SEQ ID NO: 42) (oligo 158P1D7.b). In accordance with this Example, 158P1D7 siRNA compositions are used that comprise siRNA (double stranded, short interfering RNA) that correspond to the nucleic acid ORF sequence of the 158P1D7 protein or subsequences thereof. Thus, siRNA subsequences are used in this manner are generally 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 or more than 35 contiguous RNA nucleotides in length. These siRNA sequences are complementary and non-complementary to at least a portion of the mRNA coding sequence. In a preferred embodiment, the subsequences are 19-25 nucleotides in length, most preferably 21-23 nucle-

otides in length. In preferred embodiments, these siRNA achieve knockdown of 158P1D7 antigen in cells expressing the protein and have functional effects as described below.

[0834] The selected siRNA (158P1D7.b oligo) was tested in numerous cell lines in the survival/proliferation MTS assay (measures cellular metabolic activity). Tetrazolium-based colorimetric assays (i.e., MTS) detect viable cells exclusively, since living cells are metabolically active and therefore can reduce tetrazolium salts to colored formazan compounds; dead cells, however do not. Moreover, this 158P1D7.b oligo achieved knockdown of 158P1D7 antigen in cells expressing the protein and had functional effects as described below using the following protocols.

[0835] Mammalian siRNA Transfections:

[0836] The day before siRNA transfection, the different cell lines were plated in media (RPMI 1640 with 10% FBS w/o antibiotics) at 2×10^3 cells/well in 80 μ l (96 well plate format) for the survival/MTS assay. In parallel with the 158P1D7 specific siRNA oligo, the following sequences were included in every experiment as controls: a) Mock transfected cells with Lipofectamine 2000 (Invitrogen, Carlsbad, Calif.) and annealing buffer (no siRNA); b) Luciferase-4 specific siRNA (targeted sequence: 5'-AAGGGACGAA-GACGAACACUUCTT-3') (SEQ ID NO: 43); and, c) Eg5 specific siRNA (targeted sequence: 5'-AACTGAAGACCT-GAAGACAATAA-3') (SEQ ID NO: 44). SiRNAs were used at 10 nM and 1 μ g/ml Lipofectamine 2000 final concentration.

[0837] The procedure was as follows: The siRNAs were first diluted in OPTIMEM (serum-free transfection media, Invitrogen) at 0.1 μ M (10-fold concentrated) and incubated 5-10 min RT. Lipofectamine 2000 was diluted at 10 μ g/ml (10-fold concentrated) for the total number transfections and incubated 5-10 minutes at room temperature (RT). Appropriate amounts of diluted 10-fold concentrated Lipofectamine 2000 were mixed 1:1 with diluted 10-fold concentrated siRNA and incubated at RT for 20-30" (5-fold concentrated transfection solution). 20 μ l of the 5-fold concentrated transfection solutions were added to the respective samples and incubated at 37° C. for 96 hours before analysis.

[0838] MTS Assay:

[0839] The MTS assay is a colorimetric method for determining the number of viable cells in proliferation, cytotoxicity or chemosensitivity assays based on a tetrazolium compound [3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethoxyphenyl)-2-(4-sulfophenyl)-2H-tetrazolium, inner salt; MTS(b)] and an electron coupling reagent (phenazine ethosulfate; PES). Assays were performed by adding a small amount of the Solution Reagent directly to culture wells, incubating for 1-4 hours and then recording absorbance at 490 nm with a 96-well plate reader. The quantity of colored formazan product as measured by the amount of 490 nm absorbance is directly proportional to the mitochondrial activity and/or the number of living cells in culture.

[0840] In order to address the function of 158P1D7 in cells, 158P1D7 was silenced by transfecting the endogenously expressing 158P1D7 cell lines (LNCaP and PC3) with the 158P1D7 specific siRNA (158P1D7.b) along with negative siRNA controls (Luc4, targeted sequence not represented in the human genome) and a positive siRNA control (targeting Eg5) (FIG. 29). The results indicated that when these cells are treated with siRNA specifically targeting the 158P1D7 mRNA, the resulting "158P1D7 deficient cells" showed diminished cell viability or proliferation as measured by this

assay (see oligo 158P1D7.b treated cells). This effect is likely caused by an active induction of apoptosis. The reduced viability is measured by the increased release (and activity) of a mitochondrial enzyme that occurs predominantly in apoptotic cells.

[0841] As control, 3T3 cells, a cell line with no detectable expression of 158P1D7 mRNA, was also treated with the panel of siRNAs (including oligo 158P1D7.b) and no phenotype was observed. This result reflects the fact that the specific protein knockdown in the LNCaP and PC3 cells is not a function of general toxicity, since the 3T3 cells did not respond to the 158P1D7.b oligo. The differential response of the three cell lines to the Eg5 control is a reflection of differences in levels of cell transfection and responsiveness of the cell lines to oligo treatment (FIG. 29).

[0842] Together, these data indicate that 158P1D7 plays an important role in the proliferation of cancer cells and that the lack of 158P1D7 clearly decreases the survival potential of these cells. It is to be noted that 158P1D7 is constitutively expressed in many tumor cell lines. 158P1D7 serves a role in malignancy; its expression is a primary indicator of disease, where such disease is often characterized by high rates of uncontrolled cell proliferation and diminished apoptosis. Correlating cellular phenotype with gene knockdown following RNAi treatments is important, and allows one to draw valid conclusions and rule out toxicity or other non-specific effects of these reagents. To this end, assays to measure the levels of expression of both protein and mRNA for the target after RNAi treatments are important, including Western blotting, FACS staining with antibody, immunoprecipitation, Northern blotting or RT-PCR (Taqman or standard methods). Any phenotypic effect of the siRNAs in these assays should be correlated with the protein and/or mRNA knockdown levels in the same cell lines. Knockdown of 158P1D7 is achieved using the 158P1D7.b oligo as measured by Western blotting and RT-PCR analysis.

[0843] A method to analyze 158P1D7 related cell proliferation is the measurement of DNA synthesis as a marker for proliferation. Labeled DNA precursors (i.e. ^{3} H-Thymidine) are used and their incorporation to DNA is quantified. Incorporation of the labeled precursor into DNA is directly proportional to the amount of cell division occurring in the culture. Another method used to measure cell proliferation is performing clonogenic assays. In these assays, a defined number of cells are plated onto the appropriate matrix and the number of colonies formed after a period of growth following siRNA treatment is counted.

[0844] In 158P1D7 cancer target validation, complementing the cell survival/proliferation analysis with apoptosis and cell cycle profiling studies are considered. The biochemical hallmark of the apoptotic process is genomic DNA fragmentation, an irreversible event that commits the cell to die. A method to observe fragmented DNA in cells is the immunological detection of histone-complexed DNA fragments by an immunoassay (i.e. cell death detection ELISA) which measures the enrichment of histone-complexed DNA fragments (mono- and oligo-nucleosomes) in the cytoplasm of apoptotic cells. This assay does not require pre-labeling of the cells and can detect DNA degradation in cells that do not proliferate in vitro (i.e. freshly isolated tumor cells).

[0845] The most important effector molecules for triggering apoptotic cell death are caspases. Caspases are proteases that when activated cleave numerous substrates at the carboxy-terminal site of an aspartate residue mediating very

early stages of apoptosis upon activation. All caspases are synthesized as pro-enzymes and activation involves cleavage at aspartate residues. In particular, caspase 3 seems to play a central role in the initiation of cellular events of apoptosis. Assays for determination of caspase 3 activation detect early events of apoptosis. Following RNAi treatments, Western blot detection of active caspase 3 presence or proteolytic cleavage of products (i.e. PARP) found in apoptotic cells further support an active induction of apoptosis. Because the cellular mechanisms that result in apoptosis are complex, each has its advantages and limitations. Consideration of other criteria/endpoints such as cellular morphology, chromatin condensation, membrane blebbing, apoptotic bodies help to further support cell death as apoptotic. Since not all the gene targets that regulate cell growth are anti-apoptotic, the DNA content of permeabilized cells is measured to obtain the profile of DNA content or cell cycle profile. Nuclei of apoptotic cells contain less DNA due to the leaking out to the cytoplasm (sub-G1 population). In addition, the use of DNA stains (i.e., propidium iodide) also differentiate between the different phases of the cell cycle in the cell population due to the presence of different quantities of DNA in G0/G1, S and G2/M. In these studies the subpopulations can be quantified.

[0846] For the 158P1D7 gene, RNAi studies facilitate the understanding of the contribution of the gene product in cancer pathways. Such active RNAi molecules have use in identifying assays to screen for mAbs that are active anti-tumor therapeutics. Further, siRNA are administered as therapeutics to cancer patients for reducing the malignant growth of several cancer types, including those listed in Table 1. When 158P1D7 plays a role in cell survival, cell proliferation, tumorigenesis, or apoptosis, it is used as a target for diagnostic, prognostic, preventative and/or therapeutic purposes

Example 53

158P1D7 Functional Assays

[0847] I. Enhanced Proliferation and Cell Cycle Modulation in 158P1D7 Expressing Cells.

[0848] Enhanced proliferation and entry into S-phase of tumor cells relative to normal cells is a hallmark of the cancer cell phenotype. To address the effect of expression of 158P1D7 on the proliferation rate of normal cells, two rodent cell lines (3T3 and Rat-1) were infected with virus containing the 158P1D7 gene and stable cells expressing 158P1D7 antigen were derived, as well as empty vector control cells expressing the selection marker neomycin (Neo). The cells were grown overnight in 0.5% FBS and then compared to cells treated with 10% FBS. The cells were evaluated for proliferation at 18-96 hr post-treatment by a ³H-thymidine incorporation assay and for cell cycle analysis by a BrdU incorporation/propidium iodide staining assay. The results in FIG. 32 show that the Rat-1 cells expressing the 158P1D7 antigen grew effectively in low serum concentrations (0.1%) compared to the Rat-1-Neo cells. Similar results were obtained for the 3T3 cells expressing 158P1D7 versus Neo only. To assess cell proliferation by another methodology, the cells were stained with BrdU and propidium iodide. Briefly, cells were labeled with 10 μ M BrdU, washed, trypsinized and fixed in 0.4% paraformaldehyde and 70% ethanol. Anti-BrdU-FITC (Pharmingen) was added to the cells, the cells were washed and then incubated with 10 μ g/ml propidium iodide for 20 min prior to washing and analysis for fluorescence at 488 nm. The results in FIG. 33 show that there was

increased labeling of cells in S-phase (DNA synthesis phase of the cell cycle) in 3T3 cells that expressed the 158P1D7 antigen relative to control cells. These results confirm those measured by ³H-thymidine incorporation, and indicate that cells that express 158P1D7 antigen have an enhanced proliferative capacity and survive in low serum conditions. Accordingly, 158P1D7 expressing cells have increased potential for growth as tumor cells in vivo.

[0849] II. Recombinant Extracellular Domain (ECD) Binding to Cell Surface.

[0850] Cell-cell interactions are essential in maintaining tissue/organ integrity and homeostasis, both of which become deregulated during tumor formation and progression. Additionally, cell-cell interactions facilitate tumor cell attachment during metastasis and activation of endothelium for increased angiogenesis. To address interaction between the gene product of 158P1D7 and a putative ligand, an assay was established to identify the interaction between the extracellular domain (ECD) (amino acids 16-608) of 158P1D7 antigen and primary endothelium. Human umbilical vein endothelial cells (HUVEC) were grown in 0.1% FBS in media for 3 hr. Cells were washed, detached in 10 mM EDTA and resuspended in 10% FBS. Recombinant 158P1D7 ECD (described in Example entitled "Production of Recombinant 158P1D7 in Eukaryotic Systems") was added to cells, and the cells were washed prior to the addition of MAb M15/X68.2.22 at 1 μ g/ml. After washing, secondary Ab (anti-mouse-PE, 1:400) was added to cells for 1 hr on ice. Cells were washed and fixed in 1% formalin for 3 hr on ice, then resuspended in PBS and analyzed by flow cytometry. FIG. 26A shows that the 158P1D7 ECD bound directly to the surface of HUVEC cells as detected by the 158P1D7 specific MAb. In a similar embodiment, recombinant ECD of 158P1D7 was iodinated to high specific activity using the iodogen (1,3,4,5-tetrachloro-3a,6a-diphenylglycoluril) method. HUVEC cells at 90% confluency in 6 well plates were incubated with 1 nM of ¹²⁵I-158P1D7 ECD in the presence (non-specific binding) or absence (Total binding) of 50 fold excess unlabeled ECD for 2 hours at either 4° C. or 37° C. Cells were washed, solubilized in 0.5M NaOH, and subjected to gamma counting. The data in FIG. 26B shows specific binding of 158P1D7 ECD to HUVEC cells suggesting the presence of a 158P1D7 receptor on HUVEC cells. These results indicate that 158P1D7 antigen is involved in cell-cell interactions that facilitate tumor growth, activation of endothelium for tumor vascularization or tumor cell metastasis. The data also indicate that 158P1D7 antigen shed from the cell surface of expressing cells may bind to cells in an autocrine or paracrine fashion to induce cell effector functions.

Example 54

Detection of 158P1D7 Protein in Cancer Patient Specimens Using Immunohistochemistry

[0851] To determine the expression of 158P1D7 protein, specimens were obtained from various cancer patients and stained using an affinity purified monoclonal antibody raised against the peptide encoding amino acids 274-285 of 158P1D7 (See the Example Entitled "Generation of 158P1D7 Monoclonal Antibodies (mAbs)"), formalin fixed, paraffin embedded tissues were cut into 4 micron sections and mounted on glass slides. The sections were dewaxed, rehydrated and treated with antigen retrieval solution (Antigen Retrieval Citra Solution; BioGenex, 4600 Norris Canyon

Road, San Ramon, Calif., 94583) at high temperature. Sections were then incubated in mouse monoclonal anti-158P1D7 antibody, M15-68(2)22, for 3 hours. The slides were washed three times in buffer and further incubated with DAKO EnVision+™ peroxidase-conjugated goat anti-mouse immunoglobulin secondary antibody (DAKO Corporation, Carpinteria, Calif.) for 1 hour. The sections were then washed in buffer, developed using the DAB kit (SIGMA Chemicals), counterstained using hematoxylin, and analyzed by bright field microscopy. The results showed expression of 158P1D7 in cancer patients' tissue (FIG. 36). Generally, in bladder transitional cell carcinoma expression of 158P1D7 was mainly around the cell membrane indicating that 158P1D7 is membrane associated in these tissues. 49.3% of bladder transitional cell carcinoma samples tested were positive for 158P1D7 (Table LVIII).

[0852] These results indicate that 158P1D7 is a target for diagnostic, prophylactic, prognostic and therapeutic applications in cancer.

[0853] The present invention is not to be limited in scope by the embodiments disclosed herein, which are intended as single illustrations of individual aspects of the invention, and any that are functionally equivalent are within the scope of the invention. Various modifications to the models and methods of the invention, in addition to those described herein, will become apparent to those skilled in the art from the foregoing description and teachings, and are similarly intended to fall within the scope of the invention. Such modifications or other embodiments can be practiced without departing from the true scope and spirit of the invention.

[0854] All documents and publications recited herein are hereby incorporated in their entirety as if fully set forth.

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<221> NAME/KEY: CDS

<222> LOCATION: (23) ... (2548)

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15 20 25	
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Ser Arg Gly Ser Cys Asp Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly	
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Thr Met Leu Ile Asn Cys Glu Ala Lys Gly Ile Lys Met Val Ser Glu	
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Asn Asn Pro Ser Met Pro Thr Gln Thr Ser Tyr Leu Met Val Thr Thr				
575		580	585	
cct gca aca aca aca aat acg gct gat act att tta cga tct ctt acg				1828
Pro Ala Thr Thr Thr Asn Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr				
590		595	600	
gac gct gtg cca ctg tct gtt cta ata ttg gga ctt ctg att atg ttc				1876
Asp Ala Val Pro Leu Ser Val Leu Ile Leu Gly Leu Leu Ile Met Phe				
605		610	615	
atc act att gtt ttc tgt gct gca ggg ata gtg gtt ctt gtt ctt cac				1924
Ile Thr Ile Val Phe Cys Ala Ala Gly Ile Val Val Leu Val Leu His				
620		625	630	
cgc agg aga aga tac aaa aag aaa caa gta gat gag caa atg aga gac				1972
Arg Arg Arg Arg Tyr Lys Lys Gln Val Asp Glu Gln Met Arg Asp				
635		640	645	650
aac agt cct gtg cat ctt cag tac agc atg tat ggc cat aaa acc act				2020
Asn Ser Pro Val Leu Gln Tyr Ser Met Tyr Gly His Lys Thr Thr				
655		660	665	
cat cac act act gaa aga ccc tct gcc tca ctc tat gaa cag cac atg				2068
His His Thr Thr Glu Arg Pro Ser Ala Ser Leu Tyr Glu Gln His Met				
670		675	680	
gtg agc ccc atg gtt cat gtc tat aga agt cca tcc ttt ggt cca aag				2116
Val Ser Pro Met Val His Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys				
685		690	695	
cat ctg gaa gag gaa gaa gag agg aat gag aaa gaa gga agt gat gca				2164
His Leu Glu Glu Glu Glu Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala				
700		705	710	

aaa Lys 715	cat His	ctc Leu	caa Gln	aga Arg	agt Ser	ctt Leu	ttg Leu	gaa Glu	cag Gln	gaa Glu	aat Asn	cat His	tca Ser	cca Pro	ctc Leu	2212
aca Thr	ggg Gly	tca Ser	aat Asn	atg Met	aaa Lys	tac Tyr	aaa Lys	acc Thr	acg Thr	aac Asn	caa Gln	tca Ser	aca Thr	gaa Glu	ttt Phe	2260
tta Leu	tcc Ser	ttc Phe	caa Gln	gat Asp	gcc Ala	agc Ser	tca Ser	ttg Leu	tac Tyr	aga Arg	aac Asn	att Ile	tta Leu	gaa Glu	aaa Lys	2308
gaa Glu	agg Arg	gaa Glu	ctt Leu	cag Gln	caa Gln	ctg Leu	gga Gly	atc Ile	aca Thr	gaa Glu	tac Tyr	cta Leu	agg Arg	aaa Lys	aac Asn	2356
att Ile	gct Ala	cag Gln	ctc Leu	cag Gln	cct Pro	gat Asp	atg Met	gag Glu	gca Ala	cat His	tat Tyr	cct Pro	gga Gly	gcc Ala	cac His	2404
gaa Glu	gag Glu	ctg Leu	aag Lys	tta Leu	atg Met	gaa Glu	aca Thr	tta Leu	atg Met	tac Tyr	tca Ser	cgt Arg	cca Pro	agg Arg	aag Lys	2452
gta Val	tta Leu	gtg Val	gaa Glu	cag Gln	aca Thr	aaa Lys	aat Asn	gag Glu	tat Tyr	ttt Phe	gaa Glu	ctt Leu	aaa Lys	gct Ala	aat Asn	2500
tta Leu	cat His	gct Ala	gaa Glu	cct Asp	gac Tyr	tat Tyr	tta Leu	gaa Glu	gtc Val	ctg Leu	gag Glu	cag Gln	caa Gln	aca Thr	tag *	2548
atggaga																2555
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<211> LENGTH: 841																
<212> TYPE: PRT																
<213> ORGANISM: Homo sapiens																
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Met 1	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile	
				5					10					15		
Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp	
			20					25					30			
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys	
		35					40					45				
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser	
	50					55					60					
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His	
65					70				75						80	
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly	
			85					90						95		
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly	
			100				105						110			
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys	
		115					120					125				
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp	
	130					135					140					
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn	
145				150					155						160	
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro	
			165					170						175		
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly	

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180							185					190				
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly	
		195					200					205				
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys	
	210					215					220					
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser	
225					230					235					240	
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser	
				245					250					255		
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val	
			260					265					270			
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr	
		275					280					285				
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu	
	290					295					300					
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro	
305					310					315					320	
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys	
				325					330					335		
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile	
			340					345					350			
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu	
		355					360					365				
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val	
	370					375					380					
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu	
385					390					395					400	
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu	
				405					410					415		
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu	
		420						425					430			
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys	
		435					440					445				
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu	
	450					455					460					
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser	
465					470					475					480	
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His	
				485					490					495		
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile	
			500					505					510			
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu	
	515						520					525				
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile	
	530					535					540					
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu	
545					550					555					560	
Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro	
				565					570					575		
Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn	
				580				585						590		

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Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr Asp Ala Val Pro Leu Ser
 595 600 605
 Val Leu Ile Leu Gly Leu Leu Ile Met Phe Ile Thr Ile Val Phe Cys
 610 615 620
 Ala Ala Gly Ile Val Val Leu Val Leu His Arg Arg Arg Arg Tyr Lys
 625 630 635 640
 Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn Ser Pro Val His Leu
 645 650 655
 Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His His Thr Thr Glu Arg
 660 665 670
 Pro Ser Ala Ser Leu Tyr Glu Gln His Met Val Ser Pro Met Val His
 675 680 685
 Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu
 690 695 700
 Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala Lys His Leu Gln Arg Ser
 705 710 715 720
 Leu Leu Glu Gln Glu Asn His Ser Pro Leu Thr Gly Ser Asn Met Lys
 725 730 735
 Tyr Lys Thr Thr Asn Gln Ser Thr Glu Phe Leu Ser Phe Gln Asp Ala
 740 745 750
 Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys Glu Arg Glu Leu Gln Gln
 755 760 765
 Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro
 770 775 780
 Asp Met Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met
 785 790 795 800
 Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr
 805 810 815
 Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp
 820 825 830
 Tyr Leu Glu Val Leu Glu Gln Gln Thr
 835 840

<210> SEQ ID NO 4
 <211> LENGTH: 2555
 <212> TYPE: DNA
 <213> ORGANISM: Homo sapiens
 <220> FEATURE:
 <221> NAME/KEY: CDS
 <222> LOCATION: (23)...(2548)

<400> SEQUENCE: 4

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Met Lys Leu Trp Ile His Leu Phe Tyr Ser	
1 5 10	
tct ctc ctt gcc tgt ata tct tta cac tcc caa act cca gtg ctc tca	100
Ser Leu Leu Ala Cys Ile Ser Leu His Ser Gln Thr Pro Val Leu Ser	
15 20 25	
tcc aga ggc tct tgt gat tct ctt tgc aat tgt gag gaa aaa gat ggc	148
Ser Arg Gly Ser Cys Asp Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly	
30 35 40	
aca atg cta ata aat tgt gaa gca aaa ggt atc aag atg gta tct gaa	196
Thr Met Leu Ile Asn Cys Glu Ala Lys Gly Ile Lys Met Val Ser Glu	
45 50 55	
ata agt gtg cca cca tca cga cct ttc caa cta agc tta tta aat aac	244
Ile Ser Val Pro Pro Ser Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn	

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60	65	70	
ggc ttg acg atg ctt	cac aca aat gac ttt	tct ggg ctt acc aat gct	292
Gly Leu Thr Met Leu	His Thr Asn Asp Phe	Ser Gly Leu Thr Asn Ala	
75	80	85 90	
att tca ata cac ctt	gga ttt aac aat att	gca gat att gag ata ggt	340
Ile Ser Ile His Leu	Gly Phe Asn Asn Ile	Ala Asp Ile Glu Ile Gly	
95	100	105	
gca ttt aat ggc ctt	ggc ctc ctg aaa caa	ctt cat atc aat cac aat	388
Ala Phe Asn Gly Leu	Gly Leu Leu Lys Gln	Leu His Ile Asn His Asn	
110	115	120	
tct tta gaa att ctt	aaa gag gat act ttc	cat gga ctg gaa aac ctg	436
Ser Leu Glu Ile Leu	Lys Glu Asp Thr Phe	His Gly Leu Glu Asn Leu	
125	130	135	
gaa ttc ctg caa gca	gat aac aat ttt atc	aca gtg att gaa cca agt	484
Glu Phe Leu Gln Ala	Asp Asn Asn Phe Ile	Thr Val Ile Glu Pro Ser	
140	145	150	
gcc ttt agc aag ctc	aac aga ctc aaa gtg	tta att tta aat gac aat	532
Ala Phe Ser Lys Leu	Asn Arg Leu Lys Val	Ile Leu Asn Asp Asn	
155	160	165 170	
gct att gag agt ctt	cct cca aac atc ttc	cga ttt gtt cct tta acc	580
Ala Ile Glu Ser Leu	Pro Pro Asn Ile Phe	Arg Phe Val Pro Leu Thr	
175	180	185	
cat cta gat ctt cgt	gga aat caa tta caa	aca ttg cct tat gtt ggt	628
His Leu Asp Leu Arg	Gly Asn Gln Leu Gln	Thr Leu Pro Tyr Val Gly	
190	195	200	
ttt ctc gaa cac att	ggc cga ata ttg gat	ctt cag ttg gag gac aac	676
Phe Leu Glu His Ile	Gly Arg Ile Leu Asp	Leu Gln Leu Glu Asp Asn	
205	210	215	
aaa tgg gcc tgc aat	tgt gac tta ttg cag	tta aaa act tgg ttg gag	724
Lys Trp Ala Cys Asn	Cys Asp Leu Leu Gln	Leu Lys Thr Trp Leu Glu	
220	225	230	
aac atg cct cca cag	tct ata att ggt gat	gtt gtc tgc aac agc cct	772
Asn Met Pro Pro Gln	Ser Ile Ile Gly Asp	Val Val Cys Asn Ser Pro	
235	240	245 250	
cca ttt ttt aaa gga	agt ata ctc agt aga	cta aag aag gaa tct att	820
Pro Phe Phe Lys Gly	Ser Ile Leu Ser Arg	Leu Lys Lys Glu Ser Ile	
255	260	265	
tgc cct act cca cca	gtg tat gaa gaa cat	gag gat cct tca gga tca	868
Cys Pro Thr Pro Pro	Val Tyr Glu Glu His	Glu Asp Pro Ser Gly Ser	
270	275	280	
tta cat ctg gca gca	aca tct tca ata aat	gat agt cgc atg tca act	916
Leu His Leu Ala Ala	Thr Ser Ser Ile Asn	Asp Ser Arg Met Ser Thr	
285	290	295	
aag acc acg tcc att	cta aaa cta ccc acc	aaa gca cca ggt ttg ata	964
Lys Thr Thr Ser Ile	Leu Lys Leu Pro Thr	Lys Ala Pro Gly Leu Ile	
300	305	310	
cct tat att aca aag	cca tcc act caa ctt	cca gga cct tac tgc cct	1012
Pro Tyr Ile Thr Lys	Pro Ser Thr Gln Leu	Pro Gly Pro Tyr Cys Pro	
315	320	325 330	
att cct tgt aac tgc	aaa gtc cta tcc cca	tca gga ctt cta ata cat	1060
Ile Pro Cys Asn Cys	Lys Val Leu Ser Pro	Ser Gly Leu Leu Ile His	
335	340	345	
tgt cag gag cgc aac	att gaa agc tta tca	gat ctg aga cct cct ccg	1108
Cys Gln Glu Arg Asn	Ile Glu Ser Leu Ser	Asp Leu Arg Pro Pro Pro	
350	355	360	
caa aat cct aga aag	ctc att cta gcg gga	aat att att cac agt tta	1156
Gln Asn Pro Arg Lys	Leu Ile Leu Ala Gly	Asn Ile Ile His Ser Leu	
365	370	375	

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atg aag tct gat cta gtg gaa tat ttc act ttg gaa atg ctt cac ttg	1204
Met Lys Ser Asp Leu Val Glu Tyr Phe Thr Leu Glu Met Leu His Leu	
380 385 390	
gga aac aat cgt att gaa gtt ctt gaa gaa gga tcg ttt atg aac cta	1252
Gly Asn Asn Arg Ile Glu Val Leu Glu Glu Gly Ser Phe Met Asn Leu	
395 400 405 410	
acg aga tta caa aaa ctc tat cta aat ggt aac cac ctg acc aaa tta	1300
Thr Arg Leu Gln Lys Leu Tyr Leu Asn Gly Asn His Leu Thr Lys Leu	
415 420 425	
agt aaa ggc atg ttc ctt ggt ctc cat aat ctt gaa tac tta tat ctt	1348
Ser Lys Gly Met Phe Leu Gly Leu His Asn Leu Glu Tyr Leu Tyr Leu	
430 435 440	
gaa tac aat gcc att aag gaa ata ctg cca gga acc ttt aat cca atg	1396
Glu Tyr Asn Ala Ile Lys Glu Ile Leu Pro Gly Thr Phe Asn Pro Met	
445 450 455	
cct aaa ctt aaa gtc ctg tat tta aat aac aac ctc ctc caa gtt tta	1444
Pro Lys Leu Lys Val Leu Tyr Leu Asn Asn Asn Leu Leu Gln Val Leu	
460 465 470	
cca cca cat att ttt tca ggg gtt cct cta act aag gta aat ctt aaa	1492
Pro Pro His Ile Phe Ser Gly Val Pro Leu Thr Lys Val Asn Leu Lys	
475 480 485 490	
aca aac cag ttt acc cat cta cct gta agt aat att ttg gat gat ctt	1540
Thr Asn Gln Phe Thr His Leu Pro Val Ser Asn Ile Leu Asp Asp Leu	
495 500 505	
gat ttg cta acc cag att gac ctt gag gat aac ccc tgg gac tgc tcc	1588
Asp Leu Leu Thr Gln Ile Asp Leu Glu Asp Asn Pro Trp Asp Cys Ser	
510 515 520	
tgt gac ctg gtt gga ctg cag caa tgg ata caa aag tta agc aag aac	1636
Cys Asp Leu Val Gly Leu Gln Trp Ile Gln Lys Leu Ser Lys Asn	
525 530 535	
aca gtg aca gat gac atc ctc tgc act tcc ccc ggg cat ctc gac aaa	1684
Thr Val Thr Asp Asp Ile Leu Cys Thr Ser Pro Gly His Leu Asp Lys	
540 545 550	
aag gaa ttg aaa gcc cta aat agt gaa att ctc tgt cca ggt tta gta	1732
Lys Glu Leu Lys Ala Leu Asn Ser Glu Ile Leu Cys Pro Gly Leu Val	
555 560 565 570	
aat aac cca tcc atg cca aca cag act agt tac ctt atg gtc acc act	1780
Asn Asn Pro Ser Met Pro Thr Gln Thr Ser Tyr Leu Met Val Thr Thr	
575 580 585	
cct gca aca aca aat acg gct gat act att tta cga tct ctt acg	1828
Pro Ala Thr Thr Thr Asn Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr	
590 595 600	
gac gct gtg cca ctg tct gtt cta ata ttg gga ctt ctg att atg ttc	1876
Asp Ala Val Pro Leu Ser Val Leu Ile Leu Gly Leu Leu Ile Met Phe	
605 610 615	
atc act att gtt ttc tgt gct gca ggg ata gtg gtt ctt gtt ctt cac	1924
Ile Thr Ile Val Phe Cys Ala Ala Gly Ile Val Val Leu Val Leu His	
620 625 630	
cgc agg aga aga tac aaa aag aaa caa gta gat gag caa atg aga gac	1972
Arg Arg Arg Arg Tyr Lys Lys Lys Gln Val Asp Glu Gln Met Arg Asp	
635 640 645 650	
aac agt cct gtg cat ctt cag tac agc atg tat ggc cat aaa acc act	2020
Asn Ser Pro Val His Leu Gln Tyr Ser Met Tyr Gly His Lys Thr Thr	
655 660 665	
cat cac act act gaa aga ccc tct gcc tca ctc tat gaa cag cac atg	2068
His His Thr Thr Glu Arg Pro Ser Ala Ser Leu Tyr Glu Gln His Met	
670 675 680	

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gtg agc ccc atg gtt cat gtc tat aga agt cca tcc ttt ggt cca aag	2116
Val Ser Pro Met Val His Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys	
685 690 695	
cat ctg gaa gag gaa gaa gag agg aat gag aaa gaa gga agt gat gca	2164
His Leu Glu Glu Glu Glu Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala	
700 705 710	
aaa cat ctc caa aga agt ctt ttg gaa cag gaa aat cat tca cca ctc	2212
Lys His Leu Gln Arg Ser Leu Leu Glu Gln Glu Asn His Ser Pro Leu	
715 720 725 730	
aca ggg tca aat atg aaa tac aaa acc acg aac caa tca aca gaa ttt	2260
Thr Gly Ser Asn Met Lys Tyr Lys Thr Thr Asn Gln Ser Thr Glu Phe	
735 740 745	
tta tcc ttc caa gat gcc agc tca ttg tac aga aac att tta gaa aaa	2308
Leu Ser Phe Gln Asp Ala Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys	
750 755 760	
gaa agg gaa ctt cag caa ctg gga atc aca gaa tac cta agg aaa aac	2356
Glu Arg Glu Leu Gln Gln Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn	
765 770 775	
att gct cag ctc cag cct gat atg gag gca cat tat cct gga gcc cac	2404
Ile Ala Gln Leu Gln Pro Asp Met Glu Ala His Tyr Pro Gly Ala His	
780 785 790	
gaa gag ctg aag tta atg gaa aca tta atg tac tca cgt cca agg aag	2452
Glu Glu Leu Lys Leu Met Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys	
795 800 805 810	
gta tta gtg gaa cag aca aaa aat gag tat ttt gaa ctt aaa gct aat	2500
Val Leu Val Glu Gln Thr Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn	
815 820 825	
tta cat gct gaa cct gac tat tta gaa gtc ctg gag cag caa aca tag	2548
Leu His Ala Glu Pro Asp Tyr Leu Glu Val Leu Glu Gln Gln Thr *	
830 835 840	
atggaga	2555

<210> SEQ ID NO 5

<211> LENGTH: 841

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 5

Met Lys Leu Trp	Ile His Leu Phe	Tyr Ser Ser	Leu Leu Ala	Cys Ile
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Ser Leu His Ser	Gln Thr Pro Val	Leu Ser Ser	Arg Gly Ser	Cys Asp
20 25 30				
Ser Leu Cys Asn	Cys Glu Glu Lys	Asp Gly Thr	Met Leu Ile	Asn Cys
35 40 45				
Glu Ala Lys Gly	Ile Lys Met Val	Ser Glu Ile	Ser Val Pro	Pro Ser
50 55 60				
Arg Pro Phe Gln	Leu Ser Leu Leu	Asn Asn Gly	Leu Thr Met	Leu His
65 70 75 80				
Thr Asn Asp Phe	Ser Gly Leu Thr	Asn Ala Ile	Ser Ile His	Leu Gly
85 90 95				
Phe Asn Asn Ile	Ala Asp Ile Glu	Ile Gly Ala	Phe Asn Gly	Leu Gly
100 105 110				
Leu Leu Lys Gln	Leu His Ile Asn	His Asn Ser	Leu Glu Ile	Leu Lys
115 120 125				
Glu Asp Thr Phe	His Gly Leu Glu	Asn Leu Glu	Phe Leu Gln	Ala Asp
130 135 140				

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Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145					150					155					160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165						170					175	
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
			180					185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
	195						200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225					230					235					240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
				245					250					255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
		260						265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
	275						280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
	290					295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
				325					330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
		340						345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355					360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370				375						380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
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Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
		420						425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys
		435					440					445			
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
	450					455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475					480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
				485					490					495	
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile
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Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu
	515						520					525			
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile
	530					535					540				
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu
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Asn Ser Glu Ile Leu Cys Pro Gly Leu Val Asn Asn Pro Ser Met Pro
 565 570 575
 Thr Gln Thr Ser Tyr Leu Met Val Thr Thr Pro Ala Thr Thr Thr Asn
 580 585 590
 Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr Asp Ala Val Pro Leu Ser
 595 600 605
 Val Leu Ile Leu Gly Leu Leu Ile Met Phe Ile Thr Ile Val Phe Cys
 610 615 620
 Ala Ala Gly Ile Val Val Leu Val Leu His Arg Arg Arg Arg Tyr Lys
 625 630 635 640
 Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn Ser Pro Val His Leu
 645 650 655
 Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His His Thr Thr Glu Arg
 660 665 670
 Pro Ser Ala Ser Leu Tyr Glu Gln His Met Val Ser Pro Met Val His
 675 680 685
 Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu
 690 695 700
 Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala Lys His Leu Gln Arg Ser
 705 710 715 720
 Leu Leu Glu Gln Glu Asn His Ser Pro Leu Thr Gly Ser Asn Met Lys
 725 730 735
 Tyr Lys Thr Thr Asn Gln Ser Thr Glu Phe Leu Ser Phe Gln Asp Ala
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 Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys Glu Arg Glu Leu Gln Gln
 755 760 765
 Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro
 770 775 780
 Asp Met Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met
 785 790 795 800
 Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr
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 Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp
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 Tyr Leu Glu Val Leu Glu Gln Gln Thr
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<210> SEQ ID NO 6
 <211> LENGTH: 2228
 <212> TYPE: DNA
 <213> ORGANISM: Homo sapiens
 <220> FEATURE:
 <221> NAME/KEY: CDS
 <222> LOCATION: (23) ... (2221)

<400> SEQUENCE: 6

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 Ser Leu Leu Ala Cys Ile Ser Leu His Ser Gln Thr Pro Val Leu Ser
 15 20 25
 tcc aga ggc tct tgt gat tct ctt tgc aat tgt gag gaa aaa gat ggc 148
 Ser Arg Gly Ser Cys Asp Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly
 30 35 40

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aca atg cta ata aat tgt gaa gca aaa ggt atc aag atg gta tct gaa	196
Thr Met Leu Ile Asn Cys Glu Ala Lys Gly Ile Lys Met Val Ser Glu	
45 50 55	
ata agt gtg cca cca tca cga cct ttc caa cta agc tta tta aat aac	244
Ile Ser Val Pro Pro Ser Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn	
60 65 70	
ggc ttg acg atg ctt cac aca aat gac ttt tct ggg ctt acc aat gct	292
Gly Leu Thr Met Leu His Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala	
75 80 85 90	
att tca ata cac ctt gga ttt aac aat att gca gat att gag ata ggt	340
Ile Ser Ile His Leu Gly Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly	
95 100 105	
gca ttt aat ggc ctt ggc ctc ctg aaa caa ctt cat atc aat cac aat	388
Ala Phe Asn Gly Leu Gly Leu Leu Lys Gln Leu His Ile Asn His Asn	
110 115 120	
tct tta gaa att ctt aaa gag gat act ttc cat gga ctg gaa aac ctg	436
Ser Leu Glu Ile Leu Lys Glu Asp Thr Phe His Gly Leu Glu Asn Leu	
125 130 135	
gaa ttc ctg caa gca gat aac aat ttt atc aca gtg att gaa cca agt	484
Glu Phe Leu Gln Ala Asp Asn Asn Phe Ile Thr Val Ile Glu Pro Ser	
140 145 150	
gcc ttt agc aag ctc aac aga ctc aaa gtg tta att tta aat gac aat	532
Ala Phe Ser Lys Leu Asn Arg Leu Lys Val Leu Ile Leu Asn Asp Asn	
155 160 165 170	
gct att gag agt ctt cct cca aac atc ttc cga ttt gtt cct tta acc	580
Ala Ile Glu Ser Leu Pro Pro Asn Ile Phe Arg Phe Val Pro Leu Thr	
175 180 185	
cat cta gat ctt cgt gga aat caa tta caa aca ttg cct tat gtt ggt	628
His Leu Asp Leu Arg Gly Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly	
190 195 200	
ttt ctc gaa cac att ggc cga ata ttg gat ctt cag ttg gag gac aac	676
Phe Leu Glu His Ile Gly Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn	
205 210 215	
aaa tgg gcc tgc aat tgt gac tta ttg cag tta aaa act tgg ttg gag	724
Lys Trp Ala Cys Asn Cys Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu	
220 225 230	
aac atg cct cca cag tct ata att ggt gat gtt gtc tgc aac agc cct	772
Asn Met Pro Pro Gln Ser Ile Ile Gly Asp Val Val Cys Asn Ser Pro	
235 240 245 250	
cca ttt ttt aaa gga agt ata ctc agt aga cta aag aag gaa tct att	820
Pro Phe Phe Lys Gly Ser Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile	
255 260 265	
tgc cct act cca cca gtg tat gaa gaa cat gag gat cct tca gga tca	868
Cys Pro Thr Pro Pro Val Tyr Glu Glu His Glu Asp Pro Ser Gly Ser	
270 275 280	
tta cat ctg gca gca aca tct tca ata aat gat agt cgc atg tca act	916
Leu His Leu Ala Ala Thr Ser Ser Ile Asn Asp Ser Arg Met Ser Thr	
285 290 295	
aag acc acg tcc att cta aaa cta ccc acc aaa gca cca ggt ttg ata	964
Lys Thr Thr Ser Ile Leu Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile	
300 305 310	
cct tat att aca aag cca tcc act caa ctt cca gga cct tac tgc cct	1012
Pro Tyr Ile Thr Lys Pro Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro	
315 320 325 330	
att cct tgt aac tgc aaa gtc cta tcc cca tca gga ctt cta ata cat	1060
Ile Pro Cys Asn Cys Lys Val Leu Ser Pro Ser Gly Leu Leu Ile His	
335 340 345	

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tgt cag gag cgc aac att gaa agc tta tca gat ctg aga cct cct ccg	1108
Cys Gln Glu Arg Asn Ile Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro	
350 355 360	
caa aat cct aga aag ctc att cta gcg gga aat att att cac agt tta	1156
Gln Asn Pro Arg Lys Leu Ile Leu Ala Gly Asn Ile Ile His Ser Leu	
365 370 375	
atg aag tct gat cta gtg gaa tat ttc act ttg gaa atg ctt cac ttg	1204
Met Lys Ser Asp Leu Val Glu Tyr Phe Thr Leu Glu Met Leu His Leu	
380 385 390	
gga aac aat cgt att gaa gtt ctt gaa gaa gga tcg ttt atg aac cta	1252
Gly Asn Asn Arg Ile Glu Val Leu Glu Glu Gly Ser Phe Met Asn Leu	
395 400 405 410	
acg aga tta caa aaa ctc tat cta aat ggt aac cac ctg acc aaa tta	1300
Thr Arg Leu Gln Lys Leu Tyr Leu Asn Gly Asn His Leu Thr Lys Leu	
415 420 425	
agt aaa ggc atg ttc ctt ggt ctc cat aat ctt gaa tac tta tat ctt	1348
Ser Lys Gly Met Phe Leu Gly Leu His Asn Leu Glu Tyr Leu Tyr Leu	
430 435 440	
gaa tac aat gcc att aag gaa ata ctg cca gga acc ttt aat cca atg	1396
Glu Tyr Asn Ala Ile Lys Glu Ile Leu Pro Gly Thr Phe Asn Pro Met	
445 450 455	
cct aaa ctt aaa gtc ctg tat tta aat aac aac ctc ctc caa gtt tta	1444
Pro Lys Leu Lys Val Leu Tyr Leu Asn Asn Asn Leu Leu Gln Val Leu	
460 465 470	
cca cca cat att ttt tca ggg gtt cct cta act aag gta aat ctt aaa	1492
Pro Pro His Ile Phe Ser Gly Val Pro Leu Thr Lys Val Asn Leu Lys	
475 480 485 490	
aca aac cag ttt acc cat cta cct gta agt aat att ttg gat gat ctt	1540
Thr Asn Gln Phe Thr His Leu Pro Val Ser Asn Ile Leu Asp Asp Leu	
495 500 505	
gat tta cta acc cag att gac ctt gag gat aac ccc tgg gac tgc tcc	1588
Asp Leu Leu Thr Gln Ile Asp Leu Glu Asp Asn Pro Trp Asp Cys Ser	
510 515 520	
tgt gac ctg gtt gga ctg cag caa tgg ata caa aag tta agc aag aac	1636
Cys Asp Leu Val Gly Leu Gln Gln Trp Ile Gln Lys Leu Ser Lys Asn	
525 530 535	
aca gtg aca gat gac atc ctc tgc act tcc ccc ggg cat ctc gac aaa	1684
Thr Val Thr Asp Asp Ile Leu Cys Thr Ser Pro Gly His Leu Asp Lys	
540 545 550	
aag gaa ttg aaa gcc cta aat agt gaa att ctc tgt cca ggt tta gta	1732
Lys Glu Leu Lys Ala Leu Asn Ser Glu Ile Leu Cys Pro Gly Leu Val	
555 560 565 570	
aat aac cca tcc atg cca aca cag act agt tac ctt atg gtc acc act	1780
Asn Asn Pro Ser Met Pro Thr Gln Thr Ser Tyr Leu Met Val Thr Thr	
575 580 585	
cct gca aca aca aca aat acg gct gat act att tta cga tct ctt acg	1828
Pro Ala Thr Thr Thr Asn Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr	
590 595 600	
gac gct gtg cca ctg tct gtt cta ata ttg gga ctt ctg att atg ttc	1876
Asp Ala Val Pro Leu Ser Val Leu Ile Leu Gly Leu Leu Ile Met Phe	
605 610 615	
atc act att gtt ttc tgt gct gca ggg ata gtg gtt ctt gtt ctt cac	1924
Ile Thr Ile Val Phe Cys Ala Ala Gly Ile Val Val Leu Val Leu His	
620 625 630	
cgc agg aga aga tac aaa aag aaa caa gta gat gag caa atg aga gac	1972
Arg Arg Arg Arg Tyr Lys Lys Lys Gln Val Asp Glu Gln Met Arg Asp	
635 640 645 650	
aac agt cct gtg cat ctt cag tac agc atg tat ggc cat aaa acc act	2020

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Asn	Ser	Pro	Val	His	Leu	Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	
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His	His	Thr	Thr	Glu	Arg	Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	
			670					675					680			
gga	gcc	cac	gaa	gag	ctg	aag	tta	atg	gaa	aca	tta	atg	tac	tca	cgt	2116
Gly	Ala	His	Glu	Glu	Leu	Lys	Leu	Met	Glu	Thr	Leu	Met	Tyr	Ser	Arg	
			685				690					695				
cca	agg	aag	gta	tta	gtg	gaa	cag	aca	aaa	aat	gag	tat	ttt	gaa	ctt	2164
Pro	Arg	Lys	Val	Leu	Val	Glu	Gln	Thr	Lys	Asn	Glu	Tyr	Phe	Glu	Leu	
			700				705				710					
aaa	gct	aat	tta	cat	gct	gaa	cct	gac	tat	tta	gaa	gtc	ctg	gag	cag	2212
Lys	Ala	Asn	Leu	His	Ala	Glu	Pro	Asp	Tyr	Leu	Glu	Val	Leu	Glu	Gln	
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Gln	Thr	*														

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<211> LENGTH: 732

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 7

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Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp	
			20					25					30			
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys	
		35					40					45				
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser	
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Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His	
		65			70					75					80	
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly	
			85						90					95		
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly	
			100					105					110			
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys	
		115					120					125				
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp	
		130				135					140					
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn	
		145			150					155					160	
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro	
			165					170						175		
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly	
			180					185					190			
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly	
		195					200					205				
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys	
		210				215					220					
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser	
		225			230				235						240	
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser	
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Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
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			275				280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
		290				295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315				320	
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
			325						330				335		
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
			340					345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355				360						365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370				375						380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395				400	
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
			405						410				415		
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
		420						425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys
		435					440					445			
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
	450					455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475				480	
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
			485						490					495	
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile
			500					505					510		
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu
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Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile
	530					535					540				
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu
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Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro
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Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn
			580					585					590		
Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp	Ala	Val	Pro	Leu	Ser
		595					600					605			
Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile	Thr	Ile	Val	Phe	Cys
	610					615					620				
Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg	Arg	Arg	Arg	Tyr	Lys
625					630					635				640	
Lys	Lys	Gln	Val	Asp	Glu	Gln	Met	Arg	Asp	Asn	Ser	Pro	Val	His	Leu
			645						650					655	
Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	His	His	Thr	Thr	Glu	Arg

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660					665					670				
Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Gly	Ala	His	Glu	Leu
675					680					685				
Lys	Leu	Met	Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro	Arg	Lys	Val	Leu
690					695					700				
Glu	Gln	Thr	Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys	Ala	Asn	Leu	His
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1 5 10														
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Ser Leu Leu Ala Cys Ile Ser Leu His Ser Gln Thr Pro Val Leu Ser														
15 20 25														
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Ser Arg Gly Ser Cys Asp Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly														
30 35 40														
aca atg cta ata aat tgt gaa gca aaa ggt atc aag atg gta tct gaa														196
Thr Met Leu Ile Asn Cys Glu Ala Lys Gly Ile Lys Met Val Ser Glu														
45 50 55														
ata agt gtg cca cca tca cga cct ttc caa cta agc tta tta aat aac														244
Ile Ser Val Pro Pro Ser Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn														
60 65 70														
ggc ttg acg atg ctt cac aca aat gac ttt tct ggg ctt acc aat gct														292
Gly Leu Thr Met Leu His Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala														
75 80 85 90														
att tca ata cac ctt gga ttt aac aat att gca gat att gag ata ggt														340
Ile Ser Ile His Leu Gly Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly														
95 100 105														
gca ttt aat ggc ctt ggc ctc ctg aaa caa ctt cat atc aat cac aat														388
Ala Phe Asn Gly Leu Gly Leu Leu Lys Gln Leu His Ile Asn His Asn														
110 115 120														
tct tta gaa att ctt aaa gag gat act ttc cat gga ctg gaa aac ctg														436
Ser Leu Glu Ile Leu Lys Glu Asp Thr Phe His Gly Leu Glu Asn Leu														
125 130 135														
gaa ttc ctg caa gca gat aac aat ttt atc aca gtg att gaa cca agt														484
Glu Phe Leu Gln Ala Asp Asn Asn Phe Ile Thr Val Ile Glu Pro Ser														
140 145 150														
gcc ttt agc aag ctc aac aga ctc aaa gtg tta att tta aat gac aat														532
Ala Phe Ser Lys Leu Asn Arg Leu Lys Val Leu Ile Leu Asn Asp Asn														
155 160 165 170														
gct att gag agt ctt cct cca aac atc ttc cga ttt gtt cct tta acc														580
Ala Ile Glu Ser Leu Pro Pro Asn Ile Phe Arg Phe Val Pro Leu Thr														
175 180 185														
cat cta gat ctt cgt gga aat caa tta caa aca ttg cct tat gtt ggt														628
His Leu Asp Leu Arg Gly Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly														
190 195 200														

-continued

ttt ctc gaa cac att ggc cga ata ttg gat ctt cag ttg gag gac aac Phe Leu Glu His Ile Gly Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn 205 210 215	676
aaa tgg gcc tgc aat tgt gac tta ttg cag tta aaa act tgg ttg gag Lys Trp Ala Cys Asn Cys Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu 220 225 230	724
aac atg cct cca cag tct ata att ggt gat gtt gtc tgc aac agc cct Asn Met Pro Pro Gln Ser Ile Ile Gly Asp Val Val Cys Asn Ser Pro 235 240 245 250	772
cca ttt ttt aaa gga agt ata ctc agt aga cta aag aag gaa tct att Pro Phe Phe Lys Gly Ser Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile 255 260 265	820
tgc cct act cca cca gtg tat gaa gaa cat gag gat cct tca gga tca Cys Pro Thr Pro Pro Val Tyr Glu Glu His Glu Asp Pro Ser Gly Ser 270 275 280	868
tta cat ctg gca gca aca tct tca ata aat gat agt cgc atg tca act Leu His Leu Ala Ala Thr Ser Ser Ile Asn Asp Ser Arg Met Ser Thr 285 290 295	916
aag acc acg tcc att cta aaa cta ccc acc aaa gca cca ggt ttg ata Lys Thr Thr Ser Ile Leu Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile 300 305 310	964
cct tat att aca aag cca tcc act caa ctt cca gga cct tac tgc cct Pro Tyr Ile Thr Lys Pro Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro 315 320 325 330	1012
att cct tgt aac tgc aaa gtc cta tcc cca tca gga ctt cta ata cat Ile Pro Cys Asn Cys Lys Val Leu Ser Pro Ser Gly Leu Leu Ile His 335 340 345	1060
tgt cag gag cgc aac att gaa agc tta tca gat ctg aga cct cct ccg Cys Gln Glu Arg Asn Ile Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro 350 355 360	1108
caa aat cct aga aag ctc att cta gcg gga aat att att cac agt tta Gln Asn Pro Arg Lys Leu Ile Leu Ala Gly Asn Ile Ile His Ser Leu 365 370 375	1156
atg aag tcc atc ctt tgg tcc aaa gca tct gga aga gga aga gag Met Lys Ser Ile Leu Trp Ser Lys Ala Ser Gly Arg Gly Arg Arg Glu 380 385 390	1204
gaa tga gaaagaagga agtgatgcaa aacatctcca aagaagtctt ttggaacagg Glu * 395	1260
aaaatcattc accactcaca ggggtcaaata tgaaatacaa aaccacgaac caatcaacag	1320
aattttttatc cttccaagat gccagctcat tgtacagaaa catttttagaa aaagaaaggg	1380
aacttcagca actgggaatc acagaataacc taaggaaaaa cattgctcag ctccagcctg	1440
atatggaggc acattatcct ggagcccacg aagagctgaa gttaatggaa acattaatgt	1500
actcacgtcc aaggaaggta ttagtggaac agacaaaaaa tgagtatttt gaacttaaaag	1560
ctaatttaca tgctgaacct gactattttag aagtcctgga gcagcaaaaca tagatggaga	1620

<210> SEQ ID NO 9

<211> LENGTH: 395

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 9

Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1 5 10 15

Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
20 25 30

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Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
  35              40              45

Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
  50              55              60

Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
  65              70              75              80

Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
      85              90              95

Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
      100              105              110

Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
      115              120              125

Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
      130              135              140

Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
      145              150              155              160

Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
      165              170              175

Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
      180              185              190

Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
      195              200              205

Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
      210              215              220

Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser
      225              230              235              240

Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser
      245              250              255

Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val
      260              265              270

Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr
      275              280              285

Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys Thr Thr Ser Ile Leu
      290              295              300

Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro
      305              310              315              320

Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys
      325              330              335

Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile
      340              345              350

Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro Gln Asn Pro Arg Lys Leu
      355              360              365

Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Lys Ser Ile Leu Trp
      370              375              380

Ser Lys Ala Ser Gly Arg Gly Arg Arg Glu Glu
      385              390              395

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<210> SEQ ID NO 10
<211> LENGTH: 3300
<212> TYPE: DNA
<213> ORGANISM: Homo sapiens
<220> FEATURE:
<221> NAME/KEY: CDS

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<222> LOCATION: (480) ... (3005)

<400> SEQUENCE: 10

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gcgtcgacaa caagaatac tagaaaagga ggaaggagaa cattgctgca gcttggatct      60
acaacctaag aaagcaagag tgatcaatct cagctctggt aaacatcttg tttacttact      120
gcattcagca gcttgcaa at ggtaactat atgcaaaaaa gtcagcatag ctgtgaagta      180
tgccgtgaat ttttaattgag ggaaaaagga caattgcttc aggatgctct agtatgcact      240
ctgcttgaaa tattttcaat gaaatgctca gtattctatc tttgaccaga gggttttaact      300
ttatgaagct atgggacttg acaaaaagtg atatttgaga agaaagtacg cagtgggttg      360
tgttttcttt tttttaataa aggaattgaa ttactttgaa cacctcttcc agctgtgcat      420
tacagataac gtcaggaaga gtctctgctt tacagaatcg gatttcacat catgacaac      479

atg aag ctg tgg att cat ctc ttt tat tca tct ctc ctt gcc tgt ata      527
Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1          5          10          15

tct tta cac tcc caa act cca gtg ctc tca tcc aga ggc tct tgt gat      575
Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
20          25          30

tct ctt tgc aat tgt gag gaa aaa gat ggc aca atg cta ata aat tgt      623
Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
35          40          45

gaa gca aaa ggt atc aag atg gta tct gaa ata agt gtg cca cca tca      671
Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
50          55          60

cga cct ttc caa cta agc tta tta aat aac ggc ttg acg atg ctt cac      719
Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
65          70          75          80

aca aat gac ttt tct ggg ctt acc aat gct att tca ata cac ctt gga      767
Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
85          90          95

ttt aac aat att gca gat att gag ata ggt gca ttt aat ggc ctt ggc      815
Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
100          105          110

ctc ctg aaa caa ctt cat atc aat cac aat tct tta gaa att ctt aaa      863
Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
115          120          125

gag gat act ttc cat gga ctg gaa aac ctg gaa ttc ctg caa gca gat      911
Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
130          135          140

aac aat ttt atc aca gtg att gaa cca agt gcc ttt agc aag ctc aac      959
Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
145          150          155          160

aga ctc aaa gtg tta att tta aat gac aat gct att gag agt ctt cct      1007
Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
165          170          175

cca aac atc ttc cga ttt gtt cct tta acc cat cta gat ctt cgt gga      1055
Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
180          185          190

aat caa tta caa aca ttg cct tat gtt ggt ttt ctc gaa cac att ggc      1103
Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
195          200          205

cga ata ttg gat ctt cag ttg gag gac aac aaa tgg gcc tgc aat tgt      1151
Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
210          215          220

gac tta ttg cag tta aaa act tgg ttg gag aac atg cct cca cag tct      1199

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Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser	
225					230					235					240	
ata	att	ggg	gat	gtt	gtc	tgc	aac	agc	cct	cca	ttt	ttt	aaa	gga	agt	1247
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser	
				245					250					255		
ata	ctc	agt	aga	cta	aag	aag	gaa	tct	att	tgc	cct	act	cca	cca	gtg	1295
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val	
				260					265					270		
tat	gaa	gaa	cat	gag	gat	cct	tca	gga	tca	tta	cat	ctg	gca	gca	aca	1343
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr	
				275					280					285		
tct	tca	ata	aat	gat	agt	cgc	atg	tca	act	aag	acc	acg	tcc	att	cta	1391
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu	
				290												
aaa	cta	ccc	acc	aaa	gca	cca	ggg	ttg	ata	cct	tat	att	aca	aag	cca	1439
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro	
305					310					315					320	
tcc	act	caa	ctt	cca	gga	cct	tac	tgc	cct	att	cct	tgt	aac	tgc	aaa	1487
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys	
				325						330				335		
gtc	cta	tcc	cca	tca	gga	ctt	cta	ata	cat	tgt	cag	gag	cgc	aac	att	1535
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile	
				340						345				350		
gaa	agc	tta	tca	gat	ctg	aga	cct	cct	ccg	caa	aat	cct	aga	aag	ctc	1583
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu	
				355						360				365		
att	cta	gcg	gga	aat	att	att	cac	agt	tta	atg	aag	tct	gat	cta	gtg	1631
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val	
				370												
gaa	tat	ttc	act	ttg	gaa	atg	ctt	cac	ttg	gga	aac	aat	cgt	att	gaa	1679
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu	
385					390					395					400	
gtt	ctt	gaa	gaa	gga	tcg	ttt	atg	aac	cta	acg	aga	tta	caa	aaa	ctc	1727
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu	
				405						410				415		
tat	cta	aat	ggg	aac	cac	ctg	acc	aaa	tta	agt	aaa	ggc	atg	ttc	ctt	1775
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu	
				420					425					430		
ggg	ctc	cat	aat	ctt	gaa	tac	tta	tat	ctt	gaa	tac	aat	gcc	att	aag	1823
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys	
				435					440					445		
gaa	ata	ctg	cca	gga	acc	ttt	aat	cca	atg	cct	aaa	ctt	aaa	gtc	ctg	1871
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu	
				450										460		
tat	tta	aat	aac	aac	ctc	caa	gtt	tta	cca	cca	cat	att	ttt	tca		1919
Tyr	Leu	Asn	Asn	Asn	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser		
465					470					475				480		
ggg	gtt	cct	cta	act	aag	gta	aat	ctt	aaa	aca	aac	cag	ttt	acc	cat	1967
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His	
				485					490					495		
cta	cct	gta	agt	aat	att	ttg	gat	gat	ctt	gat	tta	cta	acc	cag	att	2015
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile	
				500					505					510		
gac	ctt	gag	gat	aac	ccc	tggt	gac	tgc	tcc	tgt	gac	ctg	gtt	gga	ctg	2063
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu	
				515					520					525		
cag	caa	tggt	ata	caa	aag	tta	agc	aag	aac	aca	gtg	aca	gat	gac	atc	2111
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile	

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530	535	540	
ctc tgc act tcc ccc ggg cat ctc gac aaa aag gaa ttg aaa gcc cta			2159
Leu Cys Thr Ser Pro Gly His Leu Asp Lys Lys Glu Leu Lys Ala Leu			
545	550	555	560
aat agt gaa att ctc tgt cca ggt tta gta aat aac cca tcc atg cca			2207
Asn Ser Glu Ile Leu Cys Pro Gly Leu Val Asn Asn Pro Ser Met Pro			
565	570	575	
aca cag act agt tac ctt atg gtc acc act cct gca aca aca aca aat			2255
Thr Gln Thr Ser Tyr Leu Met Val Thr Thr Pro Ala Thr Thr Asn			
580	585	590	
acg gct gat act att tta cga tct ctt acg gac gct gtg cca ctg tct			2303
Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr Asp Ala Val Pro Leu Ser			
595	600	605	
gtt cta ata ttg gga ctt ctg att atg ttc atc act att gtt ttc tgt			2351
Val Leu Ile Leu Gly Leu Leu Ile Met Phe Ile Thr Ile Val Phe Cys			
610	615	620	
gct gca ggg ata gtg gtt ctt gtt ctt cac cgc agg aga aga tac aaa			2399
Ala Ala Gly Ile Val Val Leu Val Leu His Arg Arg Arg Tyr Lys			
625	630	635	640
aag aaa caa gta gat gag caa atg aga gac aac agt cct gtg cat ctt			2447
Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn Ser Pro Val His Leu			
645	650	655	
cag tac agc atg tat ggc cat aaa acc act cat cac act act gaa aga			2495
Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His His Thr Thr Glu Arg			
660	665	670	
ccc tct gcc tca ctc tat gaa cag cac atg gtg agc ccc atg gtt cat			2543
Pro Ser Ala Ser Leu Tyr Glu Gln His Met Val Ser Pro Met Val His			
675	680	685	
gtc tat aga agt cca tcc ttt ggt cca aag cat ctg gaa gag gaa gaa			2591
Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu			
690	695	700	
gag agg aat gag aaa gaa gga agt gat gca aaa cat ctc caa aga agt			2639
Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala Lys His Leu Gln Arg Ser			
705	710	715	720
ctt ttg gaa cag gaa aat cat tca cca ctc aca ggg tca aat atg aaa			2687
Leu Leu Glu Gln Glu Asn His Ser Pro Leu Thr Gly Ser Asn Met Lys			
725	730	735	
tac aaa acc acg aac caa tca aca gaa ttt tta tcc ttc caa gat gcc			2735
Tyr Lys Thr Thr Asn Gln Ser Thr Glu Phe Leu Ser Phe Gln Asp Ala			
740	745	750	
agc tca ttg tac aga aac att tta gaa aaa gaa agg gaa ctt cag caa			2783
Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys Glu Arg Glu Leu Gln Gln			
755	760	765	
ctg gga atc aca gaa tac cta agg aaa aac att gct cag ctc cag cct			2831
Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro			
770	775	780	
gat atg gag gca cat tat cct gga gcc cac gaa gag ctg aag tta atg			2879
Asp Met Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met			
785	790	795	800
gaa aca tta atg tac tca cgt cca agg aag gta tta gtg gaa cag aca			2927
Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr			
805	810	815	
aaa aat gag tat ttt gaa ctt aaa gct aat tta cat gct gaa cct gac			2975
Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp			
820	825	830	
tat tta gaa gtc ctg gag cag caa aca tag atggagagtt gagggctttc			3025
Tyr Leu Glu Val Leu Glu Gln Thr *			
835	840		

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gccagaaatg ctgtgattct gttattaagt ccataccttg taaataagtg ccttacgtga 3085
gtgtgtcatc aatcagaacc taagcacaga gtaaactatg gggaaaaaaaa aagaagacga 3145
aacagaaact cagggatcac tgggagaagc catggcataa tcttcaggca atttagtctg 3205
tcccaataaa acatacatcc ttggcatgta aatcatcaag ggtaatagta atattcatat 3265
acctgaaacg tgtctcatag gagtcctctc tgcac 3300

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<210> SEQ ID NO 11

<211> LENGTH: 841

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 11

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Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1           5           10           15

Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
20          25          30

Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
35          40          45

Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
50          55          60

Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
65          70          75          80

Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
85          90          95

Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
100         105         110

Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
115         120         125

Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
130         135         140

Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
145         150         155         160

Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
165         170         175

Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
180         185         190

Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
195         200         205

Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
210         215         220

Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser
225         230         235         240

Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser
245         250         255

Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val
260         265         270

Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr
275         280         285

Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys Thr Thr Ser Ile Leu
290         295         300

Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro

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305	310	315	320
Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys	325	330	335
Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile	340	345	350
Glu Ser Leu Ser Asp Leu Arg Pro Pro Gln Asn Pro Arg Lys Leu	355	360	365
Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Lys Ser Asp Leu Val	370	375	380
Glu Tyr Phe Thr Leu Glu Met Leu His Leu Gly Asn Asn Arg Ile Glu	385	390	395
Val Leu Glu Glu Gly Ser Phe Met Asn Leu Thr Arg Leu Gln Lys Leu	405	410	415
Tyr Leu Asn Gly Asn His Leu Thr Lys Leu Ser Lys Gly Met Phe Leu	420	425	430
Gly Leu His Asn Leu Glu Tyr Leu Tyr Leu Glu Tyr Asn Ala Ile Lys	435	440	445
Glu Ile Leu Pro Gly Thr Phe Asn Pro Met Pro Lys Leu Lys Val Leu	450	455	460
Tyr Leu Asn Asn Asn Leu Leu Gln Val Leu Pro Pro His Ile Phe Ser	465	470	475
Gly Val Pro Leu Thr Lys Val Asn Leu Lys Thr Asn Gln Phe Thr His	485	490	495
Leu Pro Val Ser Asn Ile Leu Asp Asp Leu Asp Leu Leu Thr Gln Ile	500	505	510
Asp Leu Glu Asp Asn Pro Trp Asp Cys Ser Cys Asp Leu Val Gly Leu	515	520	525
Gln Gln Trp Ile Gln Lys Leu Ser Lys Asn Thr Val Thr Asp Asp Ile	530	535	540
Leu Cys Thr Ser Pro Gly His Leu Asp Lys Lys Glu Leu Lys Ala Leu	545	550	555
Asn Ser Glu Ile Leu Cys Pro Gly Leu Val Asn Asn Pro Ser Met Pro	565	570	575
Thr Gln Thr Ser Tyr Leu Met Val Thr Thr Pro Ala Thr Thr Thr Asn	580	585	590
Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr Asp Ala Val Pro Leu Ser	595	600	605
Val Leu Ile Leu Gly Leu Leu Ile Met Phe Ile Thr Ile Val Phe Cys	610	615	620
Ala Ala Gly Ile Val Val Leu Val Leu His Arg Arg Arg Arg Tyr Lys	625	630	635
Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn Ser Pro Val His Leu	645	650	655
Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His His Thr Thr Glu Arg	660	665	670
Pro Ser Ala Ser Leu Tyr Glu Gln His Met Val Ser Pro Met Val His	675	680	685
Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu	690	695	700
Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala Lys His Leu Gln Arg Ser	705	710	715
			720

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<210> SEQ ID NO 12
<211> LENGTH: 1619
<212> TYPE: DNA
<213> ORGANISM: Homo sapiens
<220> FEATURE:
<221> NAME/KEY: CDS
<222> LOCATION: (23)...(1612)
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[illegible]

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155	160	165	170	
gct att gag agt ctt cct cca aac atc ttc cga ttt gtt cct tta acc				580
Ala Ile Glu Ser Leu Pro Pro Asn Ile Phe Arg Phe Val Pro Leu Thr				
	175	180	185	
cat cta gat ctt cgt gga aat caa tta caa aca ttg cct tat gtt ggt				628
His Leu Asp Leu Arg Gly Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly				
	190	195	200	
ttt ctc gaa cac att ggc cga ata ttg gat ctt cag ttg gag gac aac				676
Phe Leu Glu His Ile Gly Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn				
	205	210	215	
aaa tgg gcc tgc aat tgt gac tta ttg cag tta aaa act tgg ttg gag				724
Lys Trp Ala Cys Asn Cys Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu				
	220	225	230	
aac atg cct cca cag tct ata att ggt gat gtt gtc tgc aac agc cct				772
Asn Met Pro Pro Gln Ser Ile Ile Gly Asp Val Val Cys Asn Ser Pro				
	235	240	245	250
cca ttt ttt aaa gga agt ata ctc agt aga cta aag aag gaa tct att				820
Pro Phe Phe Lys Gly Ser Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile				
	255	260	265	
tgc cct act cca cca gtg tat gaa gaa cat gag gat cct tca gga tca				868
Cys Pro Thr Pro Pro Val Tyr Glu Glu His Glu Asp Pro Ser Gly Ser				
	270	275	280	
tta cat ctg gca gca aca tct tca ata aat gat agt cgc atg tca act				916
Leu His Leu Ala Ala Thr Ser Ser Ile Asn Asp Ser Arg Met Ser Thr				
	285	290	295	
aag acc acg tcc att cta aaa cta ccc acc aaa gca cca ggt ttg ata				964
Lys Thr Thr Ser Ile Leu Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile				
	300	305	310	
cct tat att aca aag cca tcc act caa ctt cca gga cct tac tgc cct				1012
Pro Tyr Ile Thr Lys Pro Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro				
	315	320	325	330
att cct tgt aac tgc aaa gtc cta tcc cca tca gga ctt cta ata cat				1060
Ile Pro Cys Asn Cys Lys Val Leu Ser Pro Ser Gly Leu Leu Ile His				
	335	340	345	
tgt cag gag cgc aac att gaa agc tta tca gat ctg aga cct cct ccg				1108
Cys Gln Glu Arg Asn Ile Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro				
	350	355	360	
caa aat cct aga aag ctc att cta gcg gga aat att att cac agt tta				1156
Gln Asn Pro Arg Lys Leu Ile Leu Ala Gly Asn Ile Ile His Ser Leu				
	365	370	375	
atg aat cca tcc ttt ggt cca aag cat ctg gaa gag gaa gaa gag agg				1204
Met Asn Pro Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu Arg				
	380	385	390	
aat gag aaa gaa gga agt gat gca aaa cat ctc caa aga agt ctt ttg				1252
Asn Glu Lys Glu Gly Ser Asp Ala Lys His Leu Gln Arg Ser Leu Leu				
	395	400	405	410
gaa cag gaa aat cat tca cca ctc aca ggg tca aat atg aaa tac aaa				1300
Glu Gln Glu Asn His Ser Pro Leu Thr Gly Ser Asn Met Lys Tyr Lys				
	415	420	425	
acc acg aac caa tca aca gaa ttt tta tcc ttc caa gat gcc agc tca				1348
Thr Thr Asn Gln Ser Thr Glu Phe Leu Ser Phe Gln Asp Ala Ser Ser				
	430	435	440	
ttg tac aga aac att tta gaa aaa gaa agg gaa ctt cag caa ctg gga				1396
Leu Tyr Arg Asn Ile Leu Glu Lys Glu Arg Glu Leu Gln Gln Leu Gly				
	445	450	455	
atc aca gaa tac cta agg aaa aac att gct cag ctc cag cct gat atg				1444
Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro Asp Met				
	460	465	470	

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gag gca cat tat cct gga gcc cac gaa gag ctg aag tta atg gaa aca 1492
Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met Glu Thr
475          480          485          490

tta atg tac tca cgt cca agg aag gta tta gtg gaa cag aca aaa aat 1540
Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr Lys Asn
          495          500          505

gag tat ttt gaa ctt aaa gct aat tta cat gct gaa cct gac tat tta 1588
Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp Tyr Leu
          510          515          520

gaa gtc ctg gag cag caa aca tag atggaga 1619
Glu Val Leu Glu Gln Gln Thr *
          525

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<210> SEQ ID NO 13
<211> LENGTH: 529
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

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<400> SEQUENCE: 13

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Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1          5          10          15

Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
          20          25          30

Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
          35          40          45

Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
          50          55          60

Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
          65          70          75          80

Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
          85          90          95

Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
          100          105          110

Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
          115          120          125

Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
          130          135          140

Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
          145          150          155          160

Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
          165          170          175

Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
          180          185          190

Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
          195          200          205

Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
          210          215          220

Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser
          225          230          235          240

Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser
          245          250          255

Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val
          260          265          270

Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr

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275				280				285							
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
290							295				300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
				325					330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
			340					345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355					360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Asn	Pro	Ser	Phe	Gly
	370					375					380				
Pro	Lys	His	Leu	Glu	Glu	Glu	Glu	Arg	Asn	Glu	Lys	Glu	Gly	Ser	
385					390				395					400	
Asp	Ala	Lys	His	Leu	Gln	Arg	Ser	Leu	Leu	Glu	Gln	Glu	Asn	His	Ser
			405					410						415	
Pro	Leu	Thr	Gly	Ser	Asn	Met	Lys	Tyr	Lys	Thr	Thr	Asn	Gln	Ser	Thr
			420					425					430		
Glu	Phe	Leu	Ser	Phe	Gln	Asp	Ala	Ser	Ser	Leu	Tyr	Arg	Asn	Ile	Leu
		435					440					445			
Glu	Lys	Glu	Arg	Glu	Leu	Gln	Gln	Leu	Gly	Ile	Thr	Glu	Tyr	Leu	Arg
	450					455					460				
Lys	Asn	Ile	Ala	Gln	Leu	Gln	Pro	Asp	Met	Glu	Ala	His	Tyr	Pro	Gly
465					470					475					480
Ala	His	Glu	Glu	Leu	Lys	Leu	Met	Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro
			485					490						495	
Arg	Lys	Val	Leu	Val	Glu	Gln	Thr	Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys
		500						505					510		
Ala	Asn	Leu	His	Ala	Glu	Pro	Asp	Tyr	Leu	Glu	Val	Leu	Glu	Gln	Gln
	515						520					525			

Thr

<210> SEQ ID NO 14

<211> LENGTH: 841

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 14

Met	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile
1				5					10					15	
Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp
		20						25					30		
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
		35					40					45			
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser
	50					55					60				
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His
65				70						75				80	
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
			85						90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
		100					105						110		

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Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115					120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130					135					140				
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145					150					155					160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165						170					175	
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
			180					185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
		195					200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225				230						235					240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
				245					250					255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
			260					265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
		275					280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
	290					295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
				325					330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
			340					345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355					360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370				375						380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
				405					410					415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
			420					425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys
		435					440					445			
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
	450					455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475					480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
				485					490					495	
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile
			500					505					510		
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu

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515					520					525					
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile
530					535						540				
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu
545					550					555					560
Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro
				565					570					575	
Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn
				580					585					590	
Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp	Ala	Val	Pro	Leu	Ser
				595				600				605			
Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile	Thr	Ile	Val	Phe	Cys
610					615					620					
Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg	Arg	Arg	Arg	Tyr	Lys
625					630					635					640
Lys	Lys	Gln	Val	Asp	Glu	Gln	Met	Arg	Asp	Asn	Ser	Pro	Val	His	Leu
				645					650					655	
Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	His	His	Thr	Thr	Glu	Arg
				660					665					670	
Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Val	Ser	Pro	Met	Val	His
				675					680				685		
Val	Tyr	Arg	Ser	Pro	Ser	Phe	Gly	Pro	Lys	His	Leu	Glu	Glu	Glu	Glu
690					695					700					
Glu	Arg	Asn	Glu	Lys	Glu	Gly	Ser	Asp	Ala	Lys	His	Leu	Gln	Arg	Ser
705					710					715					720
Leu	Leu	Glu	Gln	Glu	Asn	His	Ser	Pro	Leu	Thr	Gly	Ser	Asn	Met	Lys
				725					730					735	
Tyr	Lys	Thr	Thr	Asn	Gln	Ser	Thr	Glu	Phe	Leu	Ser	Phe	Gln	Asp	Ala
				740					745					750	
Ser	Ser	Leu	Tyr	Arg	Asn	Ile	Leu	Glu	Lys	Glu	Arg	Glu	Leu	Gln	Gln
				755					760					765	
Leu	Gly	Ile	Thr	Glu	Tyr	Leu	Arg	Lys	Asn	Ile	Ala	Gln	Leu	Gln	Pro
770					775					780					
Asp	Met	Glu	Ala	His	Tyr	Pro	Gly	Ala	His	Glu	Glu	Leu	Lys	Leu	Met
785					790					795					800
Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro	Arg	Lys	Val	Leu	Val	Glu	Gln	Thr
				805					810					815	
Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys	Ala	Asn	Leu	His	Ala	Glu	Pro	Asp
				820					825					830	
Tyr	Leu	Glu	Val	Leu	Glu	Gln	Gln	Thr							
835					840										

<210> SEQ ID NO 15

<211> LENGTH: 732

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 15

Met	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile
1				5					10					15	

Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp
			20					25					30		

Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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35					40					45				
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Ser
50					55					60				
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu
65				70					75					80
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu
				85					90					95
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu
			100				105					110		Gly
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Lys
		115				120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala
130					135					140				Asp
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu
145				150						155				160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu
			165						170					175
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg
		180						185					190	Gly
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile
		195				200					205			Gly
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn
210				215						220				Cys
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln
225				230					235					240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly
			245						250					255
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro
		260					265						270	Val
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Thr
	275					280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile
	290					295					300			Leu
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys
305				310						315				320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys
			325						330					335
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn
		340					345						350	Ile
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys
	355					360						365		Leu
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu
	370				375						380			Val
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile
385				390						395				400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys
			405						410					415
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe
		420					425						430	Leu
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile
	435						440							Lys

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Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
450						455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475					480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
				485					490					495	
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile
			500					505					510		
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu
		515					520					525			
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile
	530					535					540				
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu
545					550					555					560
Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro
				565					570					575	
Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn
			580					585					590		
Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp	Ala	Val	Pro	Leu	Ser
		595					600					605			
Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile	Thr	Ile	Val	Phe	Cys
	610					615					620				
Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg	Arg	Arg	Arg	Tyr	Lys
625					630					635					640
Lys	Lys	Gln	Val	Asp	Glu	Gln	Met	Arg	Asp	Asn	Ser	Pro	Val	His	Leu
				645					650					655	
Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	His	His	Thr	Thr	Glu	Arg
			660					665					670		
Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Gly	Ala	His	Glu	Glu	Leu
		675					680					685			
Lys	Leu	Met	Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro	Arg	Lys	Val	Leu	Val
	690					695				700					
Glu	Gln	Thr	Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys	Ala	Asn	Leu	His	Ala
705				710						715					720
Glu	Pro	Asp	Tyr	Leu	Glu	Val	Leu	Glu	Gln	Gln	Thr				
				725					730						

<210> SEQ ID NO 16

<211> LENGTH: 390

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 16

Met	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile
1				5					10					15	
Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp
			20					25				30			
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
		35					40				45				
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser
	50					55					60				
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His
65				70						75					80

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Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
				85					90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
			100					105					110		
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115					120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130					135					140				
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145					150					155					160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165						170						175
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
			180					185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
		195					200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225					230					235					240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
				245					250					255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
		260						265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
		275					280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
		290				295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
				325					330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
			340					345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355					360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Ile	Leu	Trp
		370				375					380				
Ser	Lys	Ala	Ser	Gly	Arg										
385					390										

<210> SEQ ID NO 17

<211> LENGTH: 529

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 17

Met	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile
1				5					10					15	
Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp
			20					25					30		
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
		35					40						45		

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Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser
50						55					60				
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His
65					70					75					80
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
				85					90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
			100					105					110		
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115					120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130					135					140				
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145					150					155					160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165						170						175
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
		180						185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
		195					200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225					230					235					240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
			245						250					255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
		260						265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
	275						280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
	290					295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
			325						330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
		340						345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
	355					360						365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Asn	Pro	Ser	Phe	Gly
	370				375						380				
Pro	Lys	His	Leu	Glu	Glu	Glu	Glu	Arg	Asn	Glu	Lys	Glu	Gly	Ser	
385					390				395					400	
Asp	Ala	Lys	His	Leu	Gln	Arg	Ser	Leu	Leu	Glu	Gln	Glu	Asn	His	Ser
			405						410					415	
Pro	Leu	Thr	Gly	Ser	Asn	Met	Lys	Tyr	Lys	Thr	Thr	Asn	Gln	Ser	Thr
		420						425					430		
Glu	Phe	Leu	Ser	Phe	Gln	Asp	Ala	Ser	Ser	Leu	Tyr	Arg	Asn	Ile	Leu
	435						440					445			
Glu	Lys	Glu	Arg	Glu	Leu	Gln	Gln	Leu	Gly	Ile	Thr	Glu	Tyr	Leu	Arg
	450					455					460				

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Lys Asn Ile Ala Gln Leu Gln Pro Asp Met Glu Ala His Tyr Pro Gly
 465 470 475 480

Ala His Glu Glu Leu Lys Leu Met Glu Thr Leu Met Tyr Ser Arg Pro
 485 490 495

Arg Lys Val Leu Val Glu Gln Thr Lys Asn Glu Tyr Phe Glu Leu Lys
 500 505 510

Ala Asn Leu His Ala Glu Pro Asp Tyr Leu Glu Val Leu Glu Gln Gln
 515 520 525

Thr

<210> SEQ ID NO 18
 <211> LENGTH: 798
 <212> TYPE: PRT
 <213> ORGANISM: Homo sapiens

<400> SEQUENCE: 18

Met Leu Ile Asn Cys Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile
 1 5 10 15

Ser Val Pro Pro Ser Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly
 20 25 30

Leu Thr Met Leu His Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile
 35 40 45

Ser Ile His Leu Gly Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala
 50 55 60

Phe Asn Gly Leu Gly Leu Leu Lys Gln Leu His Ile Asn His Asn Ser
 65 70 75 80

Leu Glu Ile Leu Lys Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu
 85 90 95

Phe Leu Gln Ala Asp Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala
 100 105 110

Phe Ser Lys Leu Asn Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala
 115 120 125

Ile Glu Ser Leu Pro Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His
 130 135 140

Leu Asp Leu Arg Gly Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe
 145 150 155 160

Leu Glu His Ile Gly Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys
 165 170 175

Trp Ala Cys Asn Cys Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn
 180 185 190

Met Pro Pro Gln Ser Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro
 195 200 205

Phe Phe Lys Gly Ser Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys
 210 215 220

Pro Thr Pro Pro Val Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu
 225 230 235 240

His Leu Ala Ala Thr Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys
 245 250 255

Thr Thr Ser Ile Leu Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro
 260 265 270

Tyr Ile Thr Lys Pro Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile
 275 280 285

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Pro	Cys	Asn	Cys	Lys	Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys
	290					295					300				
Gln	Glu	Arg	Asn	Ile	Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln
305					310					315					320
Asn	Pro	Arg	Lys	Leu	Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met
				325					330					335	
Lys	Ser	Asp	Leu	Val	Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly
			340					345					350		
Asn	Asn	Arg	Ile	Glu	Val	Leu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	
		355					360				365				
Arg	Leu	Gln	Lys	Leu	Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser
	370					375					380				
Lys	Gly	Met	Phe	Leu	Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu
385					390					395					400
Tyr	Asn	Ala	Ile	Lys	Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro
				405					410					415	
Lys	Leu	Lys	Val	Leu	Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro
			420					425					430		
Pro	His	Ile	Phe	Ser	Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr
		435					440					445			
Asn	Gln	Phe	Thr	His	Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp
	450					455					460				
Leu	Leu	Thr	Gln	Ile	Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys
465					470					475					480
Asp	Leu	Val	Gly	Leu	Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr
				485					490					495	
Val	Thr	Asp	Asp	Ile	Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys
			500					505					510		
Glu	Leu	Lys	Ala	Leu	Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn
		515					520					525			
Asn	Pro	Ser	Met	Pro	Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro
	530					535					540				
Ala	Thr	Thr	Thr	Asn	Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp
545					550					555					560
Ala	Val	Pro	Leu	Ser	Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile
				565					570					575	
Thr	Ile	Val	Phe	Cys	Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg
			580					585					590		
Arg	Arg	Arg	Tyr	Lys	Lys	Lys	Gln	Val	Asp	Glu	Gln	Met	Arg	Asp	Asn
			595				600					605			
Ser	Pro	Val	His	Leu	Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	His
	610					615					620				
His	Thr	Thr	Glu	Arg	Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Val
625					630					635					640
Ser	Pro	Met	Val	His	Val	Tyr	Arg	Ser	Pro	Ser	Phe	Gly	Pro	Lys	His
				645					650					655	
Leu	Glu	Glu	Glu	Glu	Glu	Arg	Asn	Glu	Lys	Glu	Gly	Ser	Asp	Ala	Lys
			660					665					670		
His	Leu	Gln	Arg	Ser	Leu	Leu	Glu	Gln	Glu	Asn	His	Ser	Pro	Leu	Thr
		675					680					685			
Gly	Ser	Asn	Met	Lys	Tyr	Lys	Thr	Thr	Asn	Gln	Ser	Thr	Glu	Phe	Leu
	690					695						700			

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Ser Phe Gln Asp Ala Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys Glu
705          710          715          720

Arg Glu Leu Gln Gln Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile
          725          730          735

Ala Gln Leu Gln Pro Asp Met Glu Ala His Tyr Pro Gly Ala His Glu
          740          745          750

Glu Leu Lys Leu Met Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val
          755          760          765

Leu Val Glu Gln Thr Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu
          770          775          780

His Ala Glu Pro Asp Tyr Leu Glu Val Leu Glu Gln Gln Thr
785          790          795

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<210> SEQ ID NO 19
<211> LENGTH: 798
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 19

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Met Leu Ile Asn Cys Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile
1          5          10          15

Ser Val Pro Pro Ser Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly
          20          25          30

Leu Thr Met Leu His Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile
          35          40          45

Ser Ile His Leu Gly Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala
          50          55          60

Phe Asn Gly Leu Gly Leu Leu Lys Gln Leu His Ile Asn His Asn Ser
65          70          75          80

Leu Glu Ile Leu Lys Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu
          85          90          95

Phe Leu Gln Ala Asp Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala
          100          105          110

Phe Ser Lys Leu Asn Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala
          115          120          125

Ile Glu Ser Leu Pro Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His
          130          135          140

Leu Asp Leu Arg Gly Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe
145          150          155          160

Leu Glu His Ile Gly Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys
          165          170          175

Trp Ala Cys Asn Cys Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn
          180          185          190

Met Pro Pro Gln Ser Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro
          195          200          205

Phe Phe Lys Gly Ser Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys
          210          215          220

Pro Thr Pro Pro Val Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu
225          230          235          240

His Leu Ala Ala Thr Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys
          245          250          255

Thr Thr Ser Ile Leu Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro
          260          265          270

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Tyr Ile Thr Lys Pro Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile
 275 280 285
 Pro Cys Asn Cys Lys Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys
 290 295 300
 Gln Glu Arg Asn Ile Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro Gln
 305 310 315 320
 Asn Pro Arg Lys Leu Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met
 325 330 335
 Lys Ser Asp Leu Val Glu Tyr Phe Thr Leu Glu Met Leu His Leu Gly
 340 345 350
 Asn Asn Arg Ile Glu Val Leu Glu Glu Gly Ser Phe Met Asn Leu Thr
 355 360 365
 Arg Leu Gln Lys Leu Tyr Leu Asn Gly Asn His Leu Thr Lys Leu Ser
 370 375 380
 Lys Gly Met Phe Leu Gly Leu His Asn Leu Glu Tyr Leu Tyr Leu Glu
 385 390 395 400
 Tyr Asn Ala Ile Lys Glu Ile Leu Pro Gly Thr Phe Asn Pro Met Pro
 405 410 415
 Lys Leu Lys Val Leu Tyr Leu Asn Asn Asn Leu Leu Gln Val Leu Pro
 420 425 430
 Pro His Ile Phe Ser Gly Val Pro Leu Thr Lys Val Asn Leu Lys Thr
 435 440 445
 Asn Gln Phe Thr His Leu Pro Val Ser Asn Ile Leu Asp Asp Leu Asp
 450 455 460
 Leu Leu Thr Gln Ile Asp Leu Glu Asp Asn Pro Trp Asp Cys Ser Cys
 465 470 475 480
 Asp Leu Val Gly Leu Gln Gln Trp Ile Gln Lys Leu Ser Lys Asn Thr
 485 490 495
 Val Thr Asp Asp Ile Leu Cys Thr Ser Pro Gly His Leu Asp Lys Lys
 500 505 510
 Glu Leu Lys Ala Leu Asn Ser Glu Ile Leu Cys Pro Gly Leu Val Asn
 515 520 525
 Asn Pro Ser Met Pro Thr Gln Thr Ser Tyr Leu Met Val Thr Thr Pro
 530 535 540
 Ala Thr Thr Thr Asn Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr Asp
 545 550 555 560
 Ala Val Pro Leu Ser Val Leu Ile Leu Gly Leu Leu Ile Met Phe Ile
 565 570 575
 Thr Ile Val Phe Cys Ala Ala Gly Ile Val Val Leu Val Leu His Arg
 580 585 590
 Arg Arg Arg Tyr Lys Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn
 595 600 605
 Ser Pro Val His Leu Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His
 610 615 620
 His Thr Thr Glu Arg Pro Ser Ala Ser Leu Tyr Glu Gln His Met Val
 625 630 635 640
 Ser Pro Met Val His Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys His
 645 650 655
 Leu Glu Glu Glu Glu Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala Lys
 660 665 670
 His Leu Gln Arg Ser Leu Leu Glu Gln Glu Asn His Ser Pro Leu Thr

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675					680					685					
Gly	Ser	Asn	Met	Lys	Tyr	Lys	Thr	Thr	Asn	Gln	Ser	Thr	Glu	Phe	Leu
690					695					700					
Ser	Phe	Gln	Asp	Ala	Ser	Ser	Leu	Tyr	Arg	Asn	Ile	Leu	Glu	Lys	Glu
705					710					715					720
Arg	Glu	Leu	Gln	Gln	Leu	Gly	Ile	Thr	Glu	Tyr	Leu	Arg	Lys	Asn	Ile
			725						730					735	
Ala	Gln	Leu	Gln	Pro	Asp	Met	Glu	Ala	His	Tyr	Pro	Gly	Ala	His	Glu
			740					745					750		
Glu	Leu	Lys	Leu	Met	Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro	Arg	Lys	Val
		755					760					765			
Leu	Val	Glu	Gln	Thr	Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys	Ala	Asn	Leu
	770					775					780				
His	Ala	Glu	Pro	Asp	Tyr	Leu	Glu	Val	Leu	Glu	Gln	Gln	Thr		
785					790					795					

<210> SEQ ID NO 20
 <211> LENGTH: 405
 <212> TYPE: PRT
 <213> ORGANISM: Homo sapiens
 <400> SEQUENCE: 20

Met	Leu	Ile	Asn	Cys	Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile
1			5						10					15	
Ser	Val	Pro	Pro	Ser	Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly
		20					25						30		
Leu	Thr	Met	Leu	His	Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile
	35					40						45			
Ser	Ile	His	Leu	Gly	Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala
	50					55					60				
Phe	Asn	Gly	Leu	Gly	Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser
65				70						75				80	
Leu	Glu	Ile	Leu	Lys	Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu
			85						90					95	
Phe	Leu	Gln	Ala	Asp	Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala
		100					105						110		
Phe	Ser	Lys	Leu	Asn	Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala
		115					120					125			
Ile	Glu	Ser	Leu	Pro	Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His
	130					135					140				
Leu	Asp	Leu	Arg	Gly	Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe
145				150						155				160	
Leu	Glu	His	Ile	Gly	Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys
			165					170						175	
Trp	Ala	Cys	Asn	Cys	Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn
		180						185					190		
Met	Pro	Pro	Gln	Ser	Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro
		195					200					205			
Phe	Phe	Lys	Gly	Ser	Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys
	210					215					220				
Pro	Thr	Pro	Pro	Val	Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu
225					230					235					240
His	Leu	Ala	Ala	Thr	Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys

-continued

245					250					255					
Thr	Thr	Ser	Ile	Leu	Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro
			260					265					270		
Tyr	Ile	Thr	Lys	Pro	Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile
			275				280					285			
Pro	Cys	Asn	Cys	Lys	Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys
			290				295					300			
Gln	Glu	Arg	Asn	Ile	Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln
			305				310					315			320
Asn	Pro	Arg	Lys	Leu	Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met
			325					330						335	
Lys	Ser	Asp	Leu	Val	Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly
			340					345					350		
Asn	Asn	Arg	Ile	Glu	Val	Leu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	
			355				360					365			
Arg	Leu	Gln	Lys	Leu	Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser
			370				375					380			
Lys	Gly	Met	Phe	Leu	Gly	Leu	His	Ala	Ile	Lys	Glu	Ile	Leu	Pro	Gly
			385				390					395			400
Thr	Phe	Asn	Pro	Met											
				405											

<210> SEQ ID NO 21

<211> LENGTH: 415

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 21

Met	Leu	Ile	Asn	Cys	Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile
1				5					10					15	
Ser	Val	Pro	Pro	Ser	Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly
		20						25					30		
Leu	Thr	Met	Leu	His	Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile
		35					40					45			
Ser	Ile	His	Leu	Gly	Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala
		50				55					60				
Phe	Asn	Gly	Leu	Gly	Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser
		65				70				75				80	
Leu	Glu	Ile	Leu	Lys	Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu
			85						90					95	
Phe	Leu	Gln	Ala	Asp	Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala
			100					105					110		
Phe	Ser	Lys	Leu	Asn	Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala
			115				120					125			
Ile	Glu	Ser	Leu	Pro	Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His
			130				135				140				
Leu	Asp	Leu	Arg	Gly	Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe
					150					155				160	
Leu	Glu	His	Ile	Gly	Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys
				165					170					175	
Trp	Ala	Cys	Asn	Cys	Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn
			180					185					190		
Met	Pro	Pro	Gln	Ser	Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro

-continued

195					200					205					
Phe	Phe	Lys	Gly	Ser	Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys
210					215					220					
Pro	Thr	Pro	Pro	Val	Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu
225					230					235					240
His	Leu	Ala	Ala	Thr	Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys
				245					250					255	
Thr	Thr	Ser	Ile	Leu	Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro
			260					265					270		
Tyr	Ile	Thr	Lys	Pro	Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile
	275					280					285				
Pro	Cys	Asn	Cys	Lys	Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys
	290					295					300				
Gln	Glu	Arg	Asn	Ile	Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln
305				310					315						320
Asn	Pro	Arg	Lys	Leu	Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met
			325						330					335	
Lys	Ser	Asp	Leu	Val	Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly
			340					345					350		
Asn	Asn	Arg	Ile	Glu	Val	Leu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	
		355				360					365				
Arg	Leu	Gln	Lys	Leu	Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser
	370					375					380				
Lys	Gly	Met	Phe	Leu	Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu
385				390					395					400	
Tyr	Asn	Ala	Ile	Lys	Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	
			405					410					415		

<210> SEQ ID NO 22

<211> LENGTH: 777

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 22

Met	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile
1				5					10					15	
Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp
		20					25					30			
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
		35				40					45				
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser
	50				55					60					
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His
65				70					75					80	
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
		85						90					95		
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
		100					105					110			
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115				120						125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130				135					140					
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn

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145	150	155	160
Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro	165	170	175
Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly	180	185	190
Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly	195	200	205
Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys	210	215	220
Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser	225	230	235
Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser	245	250	255
Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val	260	265	270
Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr	275	280	285
Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys Thr Thr Ser Ile Leu	290	295	300
Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro	305	310	315
Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys	325	330	335
Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile	340	345	350
Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro Gln Asn Pro Arg Lys Leu	355	360	365
Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Lys Ser Asp Leu Val	370	375	380
Glu Tyr Phe Thr Leu Glu Met Leu His Leu Gly Asn Asn Arg Ile Glu	385	390	395
Val Leu Glu Glu Gly Ser Phe Met Asn Leu Thr Arg Leu Gln Lys Leu	405	410	415
Tyr Leu Asn Gly Asn His Leu Thr Lys Leu Ser Lys Gly Met Phe Leu	420	425	430
Gly Leu His Ala Ile Lys Glu Ile Leu Pro Gly Thr Phe Asn Pro Met	435	440	445
His Ile Phe Ser Gly Val Pro Leu Thr Lys Val Asn Leu Lys Thr Asn	450	455	460
Gln Phe Thr His Leu Pro Val Ser Asn Ile Asn Pro Trp Asp Cys Ser	465	470	475
Cys Asp Leu Val Gly Leu Gln Gln Trp Ile Gln Lys Leu Ser Lys Asn	485	490	495
Thr Val Thr Asp Asp Ile Leu Cys Thr Ser Pro Gly His Leu Asp Lys	500	505	510
Lys Glu Leu Lys Ala Leu Asn Ser Glu Ile Leu Cys Pro Gly Leu Val	515	520	525
Asn Asn Pro Ser Met Pro Thr Gln Thr Ser Tyr Leu Met Val Ile Leu	530	535	540
Arg Ser Leu Thr Asp Ala Val Pro Leu Ser Val Leu Ile Leu Gly Leu	545	550	555
			560

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Leu Ile Met Phe Ile Thr Ile Val Phe Cys Ala Ala Gly Ile Val Val
      565                      570                      575

Leu Val Leu His Arg Arg Arg Arg Tyr Lys Lys Lys Gln Val Asp Glu
      580                      585                      590

Gln Met Arg Asp Asn Ser Pro Val His Leu Gln Tyr Ser Met Tyr Gly
      595                      600                      605

His Lys Thr Thr His His Thr Thr Glu Arg Pro Ser Ala Ser Leu Tyr
      610                      615                      620

Glu Gln His Met Val Ser Pro Met Val His Val Tyr Arg Ser Pro Ser
      625                      630                      635                      640

Phe Gly Pro Lys His Leu Gly Ser Asp Ala Lys His Leu Gln Arg Ser
      645                      650                      655

Leu Leu Glu Gln Glu Asn His Ser Pro Leu Thr Gly Ser Asn Met Lys
      660                      665                      670

Tyr Lys Thr Thr Asn Gln Ser Thr Glu Phe Leu Ser Phe Gln Asp Ala
      675                      680                      685

Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys Glu Arg Glu Leu Gln Gln
      690                      695                      700

Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro
      705                      710                      715                      720

Asp Met Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met
      725                      730                      735

Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr
      740                      745                      750

Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp
      755                      760                      765

Tyr Leu Glu Val Leu Glu Gln Gln Thr
      770                      775

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<210> SEQ ID NO 23

<211> LENGTH: 832

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 23

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Met Phe Leu Trp Leu Phe Leu Ile Leu Ser Ala Leu Ile Ser Ser Thr
  1      5      10      15

Asn Ala Asp Ser Asp Ile Ser Val Glu Ile Cys Asn Val Cys Ser Cys
  20      25      30

Val Ser Val Glu Asn Val Leu Tyr Val Asn Cys Glu Lys Val Ser Val
  35      40      45

Tyr Arg Pro Asn Gln Leu Lys Pro Pro Trp Ser Asn Phe Tyr His Leu
  50      55      60

Asn Phe Gln Asn Asn Phe Leu Asn Ile Leu Tyr Pro Asn Thr Phe Leu
  65      70      75      80

Asn Phe Ser His Ala Val Ser Leu His Leu Gly Asn Asn Lys Leu Gln
  85      90      95

Asn Ile Glu Gly Gly Ala Phe Leu Gly Leu Ser Ala Leu Lys Gln Leu
 100     105     110

His Leu Asn Asn Asn Glu Leu Lys Ile Leu Arg Ala Asp Thr Phe Leu
 115     120     125

Gly Ile Glu Asn Leu Glu Tyr Leu Gln Ala Asp Tyr Asn Leu Ile Lys
 130     135     140

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Tyr	Ile	Glu	Arg	Gly	Ala	Phe	Asn	Lys	Leu	His	Lys	Leu	Lys	Val	Leu	145	150	155	160
Ile	Leu	Asn	Asp	Asn	Leu	Ile	Ser	Phe	Leu	Pro	Asp	Asn	Ile	Phe	Arg	165	170	175	
Phe	Ala	Ser	Leu	Thr	His	Leu	Asp	Ile	Arg	Gly	Asn	Arg	Ile	Gln	Lys	180	185	190	
Leu	Pro	Tyr	Ile	Gly	Val	Leu	Glu	His	Ile	Gly	Arg	Val	Val	Glu	Leu	195	200	205	
Gln	Leu	Glu	Asp	Asn	Pro	Trp	Asn	Cys	Ser	Cys	Asp	Leu	Leu	Pro	Leu	210	215	220	
Lys	Ala	Trp	Leu	Glu	Asn	Met	Pro	Tyr	Asn	Ile	Tyr	Ile	Gly	Glu	Ala	225	230	235	240
Ile	Cys	Glu	Thr	Pro	Ser	Asp	Leu	Tyr	Gly	Arg	Leu	Leu	Lys	Glu	Thr	245	250	255	
Asn	Lys	Gln	Glu	Leu	Cys	Pro	Met	Gly	Thr	Gly	Ser	Asp	Phe	Asp	Val	260	265	270	
Arg	Ile	Leu	Pro	Pro	Ser	Gln	Leu	Glu	Asn	Gly	Tyr	Thr	Thr	Pro	Asn	275	280	285	
Gly	His	Thr	Thr	Gln	Thr	Ser	Leu	His	Arg	Leu	Val	Thr	Lys	Pro	Pro	290	295	300	
Lys	Thr	Thr	Asn	Pro	Ser	Lys	Ile	Ser	Gly	Ile	Val	Ala	Gly	Lys	Ala	305	310	315	320
Leu	Ser	Asn	Arg	Asn	Leu	Ser	Gln	Ile	Val	Ser	Tyr	Gln	Thr	Arg	Val	325	330	335	
Pro	Pro	Leu	Thr	Pro	Cys	Pro	Ala	Pro	Cys	Phe	Cys	Lys	Thr	His	Pro	340	345	350	
Ser	Asp	Leu	Gly	Leu	Ser	Val	Asn	Cys	Gln	Glu	Lys	Asn	Ile	Gln	Ser	355	360	365	
Met	Ser	Glu	Leu	Ile	Pro	Lys	Pro	Leu	Asn	Ala	Lys	Lys	Leu	His	Val	370	375	380	
Asn	Gly	Asn	Ser	Ile	Lys	Asp	Val	Asp	Val	Ser	Asp	Phe	Thr	Asp	Phe	385	390	395	400
Glu	Gly	Leu	Asp	Leu	Leu	His	Leu	Gly	Ser	Asn	Gln	Ile	Thr	Val	Ile	405	410	415	
Lys	Gly	Asp	Val	Phe	His	Asn	Leu	Thr	Asn	Leu	Arg	Arg	Leu	Tyr	Leu	420	425	430	
Asn	Gly	Asn	Gln	Ile	Glu	Arg	Leu	Tyr	Pro	Glu	Ile	Phe	Ser	Gly	Leu	435	440	445	
His	Asn	Leu	Gln	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Leu	Ile	Lys	Glu	Ile	450	455	460	
Ser	Ala	Gly	Thr	Phe	Asp	Ser	Met	Pro	Asn	Leu	Gln	Leu	Leu	Tyr	Leu	465	470	475	480
Asn	Asn	Asn	Leu	Leu	Lys	Ser	Leu	Pro	Val	Tyr	Ile	Phe	Ser	Gly	Ala	485	490	495	
Pro	Leu	Ala	Arg	Leu	Asn	Leu	Arg	Asn	Asn	Lys	Phe	Met	Tyr	Leu	Pro	500	505	510	
Val	Ser	Gly	Val	Leu	Asp	Gln	Leu	Gln	Ser	Leu	Thr	Gln	Ile	Asp	Leu	515	520	525	
Glu	Gly	Asn	Pro	Trp	Asp	Cys	Thr	Cys	Asp	Leu	Val	Ala	Leu	Lys	Leu	530	535	540	
Trp	Val	Glu	Lys	Leu	Ser	Asp	Gly	Ile	Val	Val	Lys	Glu	Leu	Lys	Cys	545	550	555	560

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Glu Thr Pro Val Gln Phe Ala Asn Ile Glu Leu Lys Ser Leu Lys Asn
 565 570 575
 Glu Ile Leu Cys Pro Lys Leu Leu Asn Lys Pro Ser Ala Pro Phe Thr
 580 585 590
 Ser Pro Ala Pro Ala Ile Thr Phe Thr Thr Pro Leu Gly Pro Ile Arg
 595 600 605
 Ser Pro Pro Gly Gly Pro Val Pro Leu Ser Ile Leu Ile Leu Ser Ile
 610 615 620
 Leu Val Val Leu Ile Leu Thr Val Phe Val Ala Phe Cys Leu Leu Val
 625 630 635 640
 Phe Val Leu Arg Arg Asn Lys Lys Pro Thr Val Lys His Glu Gly Leu
 645 650 655
 Gly Asn Pro Asp Cys Gly Ser Met Gln Leu Gln Leu Arg Lys His Asp
 660 665 670
 His Lys Thr Asn Lys Lys Asp Gly Leu Ser Thr Glu Ala Phe Ile Pro
 675 680 685
 Gln Thr Ile Glu Gln Met Ser Lys Ser His Thr Cys Gly Leu Lys Glu
 690 695 700
 Ser Glu Thr Gly Phe Met Phe Ser Asp Pro Pro Gly Gln Lys Val Val
 705 710 715 720
 Met Arg Asn Val Ala Asp Lys Glu Lys Asp Leu Leu His Val Asp Thr
 725 730 735
 Arg Lys Arg Leu Ser Thr Ile Asp Glu Leu Asp Glu Leu Phe Pro Ser
 740 745 750
 Arg Asp Ser Asn Val Phe Ile Gln Asn Phe Leu Glu Ser Lys Lys Glu
 755 760 765
 Tyr Asn Ser Ile Gly Val Ser Gly Phe Glu Ile Arg Tyr Pro Glu Lys
 770 775 780
 Gln Pro Asp Lys Lys Ser Lys Lys Ser Leu Ile Gly Gly Asn His Ser
 785 790 795 800
 Lys Ile Val Val Glu Gln Arg Lys Ser Glu Tyr Phe Glu Leu Lys Ala
 805 810 815
 Lys Leu Gln Ser Ser Pro Asp Tyr Leu Gln Val Leu Glu Glu Gln Thr
 820 825 830

<210> SEQ ID NO 24
 <211> LENGTH: 14
 <212> TYPE: PRT
 <213> ORGANISM: Tetanus toxoid

<400> SEQUENCE: 24

Gln Tyr Ile Lys Ala Asn Ser Lys Phe Ile Gly Ile Thr Glu
 1 5 10

<210> SEQ ID NO 25
 <211> LENGTH: 21
 <212> TYPE: PRT
 <213> ORGANISM: Plasmodium falciparum

<400> SEQUENCE: 25

Asp Ile Glu Lys Lys Ile Ala Lys Met Glu Lys Ala Ser Ser Val Phe
 1 5 10 15

Asn Val Val Asn Ser
 20

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<210> SEQ ID NO 26
<211> LENGTH: 16
<212> TYPE: PRT
<213> ORGANISM: Streptococcus

<400> SEQUENCE: 26

Gly Ala Val Asp Ser Ile Leu Gly Gly Val Ala Thr Tyr Gly Ala Ala
1 5 10 15

<210> SEQ ID NO 27
<211> LENGTH: 13
<212> TYPE: PRT
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: pan-DR binding epitope
<220> FEATURE:
<221> NAME/KEY: VARIANT
<222> LOCATION: 3
<223> OTHER INFORMATION: Xaa = cyclohexylalanine, phenylalanine, or
tyrosine
<220> FEATURE:
<221> NAME/KEY: VARIANT
<222> LOCATION: 1, 13
<223> OTHER INFORMATION: Xaa = D-alanine or L-alanine

<400> SEQUENCE: 27

Xaa Lys Xaa Val Ala Ala Trp Thr Leu Lys Ala Ala Xaa
1 5 10

<210> SEQ ID NO 28
<211> LENGTH: 14
<212> TYPE: DNA
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 28

ttttgatcaa gctt 14

<210> SEQ ID NO 29
<211> LENGTH: 42
<212> TYPE: DNA
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 29

ctaatacgac tcactatagg gctcgagcgg ccgcccgggc ag 42

<210> SEQ ID NO 30
<211> LENGTH: 12
<212> TYPE: DNA
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 30

gatacctgccc gg 12

<210> SEQ ID NO 31
<211> LENGTH: 40
<212> TYPE: DNA
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: Primer

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<400> SEQUENCE: 31

gtaatacgcac tcactatagg gcagcgtggt cgcggccgag

40

<210> SEQ ID NO 32

<211> LENGTH: 10

<212> TYPE: DNA

<213> ORGANISM: Artificial Sequence

<220> FEATURE:

<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 32

gatcctcggc

10

<210> SEQ ID NO 33

<211> LENGTH: 22

<212> TYPE: DNA

<213> ORGANISM: Artificial Sequence

<220> FEATURE:

<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 33

ctaatacgcac tcactatagg gc

22

<210> SEQ ID NO 34

<211> LENGTH: 22

<212> TYPE: DNA

<213> ORGANISM: Artificial Sequence

<220> FEATURE:

<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 34

tcgagcggcc gcccgggcag ga

22

<210> SEQ ID NO 35

<211> LENGTH: 20

<212> TYPE: DNA

<213> ORGANISM: Artificial Sequence

<220> FEATURE:

<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 35

agcgtgggtcg cggccgagga

20

<210> SEQ ID NO 36

<211> LENGTH: 25

<212> TYPE: DNA

<213> ORGANISM: Artificial Sequence

<220> FEATURE:

<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 36

atatcgccgc gctcgtcgtc gacaa

25

<210> SEQ ID NO 37

<211> LENGTH: 26

<212> TYPE: DNA

<213> ORGANISM: Artificial Sequence

<220> FEATURE:

<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 37

agccacacgc agtcattgt agaagg

26

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<210> SEQ ID NO 38
<211> LENGTH: 24
<212> TYPE: DNA
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 38

ataagctttc aatgttgccg tcct 24

<210> SEQ ID NO 39
<211> LENGTH: 24
<212> TYPE: DNA
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: Primer

<400> SEQUENCE: 39

tgtcaactaa gaccacgtcc attc 24

<210> SEQ ID NO 40
<211> LENGTH: 24
<212> TYPE: DNA
<213> ORGANISM: Artificial Sequence
<220> FEATURE:
<223> OTHER INFORMATION: Flag Tag

<400> SEQUENCE: 40

gattacaagg atgacgacga taag 24

<210> SEQ ID NO 41
<211> LENGTH: 12
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 41

Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu
1 5 10

<210> SEQ ID NO 42
<211> LENGTH: 21
<212> TYPE: DNA
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 42

aagctcattc tagcgggaaa t 21

<210> SEQ ID NO 43
<211> LENGTH: 24
<212> TYPE: DNA
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 43

aagggacgaa gacgaacacu uctt 24

<210> SEQ ID NO 44
<211> LENGTH: 23
<212> TYPE: DNA
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 44

aactgaagac ctgaagacaa taa 23

-continued

<210> SEQ ID NO 45
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 45

Asn Asp Ser Arg
1

<210> SEQ ID NO 46
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 46

Asn Leu Thr Arg
1

<210> SEQ ID NO 47
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 47

Asn Gln Ser Thr
1

<210> SEQ ID NO 48
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 48

Lys Lys Glu Ser
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<210> SEQ ID NO 49
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 49

Thr Val Ile Glu
1

<210> SEQ ID NO 50
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 50

Thr His Leu Asp
1

<210> SEQ ID NO 51
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 51

Thr Trp Leu Glu
1

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<210> SEQ ID NO 52
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 52

Ser Ile Asn Asp
1

<210> SEQ ID NO 53
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 53

Ser Leu Ser Asp
1

<210> SEQ ID NO 54
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 54

Thr Gln Ile Asp
1

<210> SEQ ID NO 55
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 55

Thr Val Thr Asp
1

<210> SEQ ID NO 56
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 56

Ser Leu Thr Asp
1

<210> SEQ ID NO 57
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 57

Ser Leu Tyr Glu
1

<210> SEQ ID NO 58
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 58

Ser Leu Leu Glu
1

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<210> SEQ ID NO 59
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 59

Ser Phe Gln Asp
1

<210> SEQ ID NO 60
<211> LENGTH: 4
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 60

Thr Lys Asn Glu
1

<210> SEQ ID NO 61
<211> LENGTH: 8
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 61

Lys Leu Met Glu Thr Leu Met Tyr
1 5

<210> SEQ ID NO 62
<211> LENGTH: 6
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 62

Gly Ser Cys Asp Ser Leu
1 5

<210> SEQ ID NO 63
<211> LENGTH: 6
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 63

Gly Leu Thr Asn Ala Ile
1 5

<210> SEQ ID NO 64
<211> LENGTH: 6
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 64

Gly Ala Phe Asn Gly Leu
1 5

<210> SEQ ID NO 65
<211> LENGTH: 6
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 65

Gly Ser Ile Leu Ser Arg
1 5

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<210> SEQ ID NO 66
<211> LENGTH: 6
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 66

Gly Ser Phe Met Asn Leu
1 5

<210> SEQ ID NO 67
<211> LENGTH: 6
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 67

Gly Asn His Leu Thr Lys
1 5

<210> SEQ ID NO 68
<211> LENGTH: 6
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 68

Gly Met Phe Leu Gly Leu
1 5

<210> SEQ ID NO 69
<211> LENGTH: 6
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 69

Gly Val Pro Leu Thr Lys
1 5

<210> SEQ ID NO 70
<211> LENGTH: 2228
<212> TYPE: DNA
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 70

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tctttgcaat tgtgaggaaa aagatggcac aatgctaata aattgtgaag caaaaggat	180
caagatggta tctgaaaata gtgtgccacc atcacgacct ttccaactaa gcttattaaa	240
taacggcttg acgatgcttc acacaaatga cttttctggg cttaccaatg ctatttcaat	300
acaccttgga tttaacaata ttgcagatat tgagataggt gcatttaaatg gccttggcct	360
cctgaaacaa cttcatatca atcacaattc tttagaaatt cttaaagagg ataccttcca	420
tggactggaa aacctggaat tcctgcaagc agataacaat tttatcacag tgattgaacc	480
aagtgccttt agcaagctca acagactcaa agtggttaatt ttaaatgaca atgctattga	540
gagttcttct ccaaactatc tccgatttgt tcctttaacc catctagatc ttcgtggaaa	600
tcaattacaa acattgcctt atgttggttt tctcgaacac attggccgaa tattggatct	660
tcagttggag gacaacaaat gggcctgcaa ttgtgactta ttgcagttaa aaacttggtt	720
ggagaacatg cctccacagt ctataattgg tgatgttgtc tgcaacagcc ctccattttt	780

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taaaggaagt atactcagta gactaaagaa ggaatctatt tgccctactc caccagtgtgta	840
tgaagaacat gaggatcctt caggatcatt acatctggca gcaacatctt caataaatga	900
tagtcgcatg tcaactaaga ccacgtccat tctaaaacta cccaccaaag caccagggtt	960
gataccttat attacaaagc catccactca acttcagga ccttactgcc ctattccttg	1020
taactgcaaa gtccatcccc catcaggact tctaatacat tgcaggagc gcaacattga	1080
aagcttatca gatctgagac ctccctcgca aaatcctaga aagctcattc tagcgggaaa	1140
tattattcac agtttaataga agtctgatct agtggaatat ttcactttgg aaatgcttca	1200
cttgggaaac aatcgtattg aagttcttga agaaggatcg tttatgaacc taacgagatt	1260
acaaaaactc tatctaaatg gtaaccacct gaccaaatta agtaaaggca tgttccttgg	1320
tcctcataat ctgaatact tatatcttga atacaatgcc attaaggaaa tactgccagg	1380
aacctttaat ccaatgccta aacttaaggt cctgtattta aataacaacc tectccaagt	1440
ttaccacca catatttttt caggggttcc tctaactaag gtaaatctta aaacaaacca	1500
gtttaccat ctacctgtaa gtaatatctt ggatgatctt gatttactaa cccagattga	1560
ccttgaggat aaccctggg actgctctg tgacctggtt ggactgcagc aatggataga	1620
aaagttaagc aagaacacag tgacagatga catcctctgc acttcccccg ggcactctga	1680
caaaaaggaa ttgaaagccc taaatagtga aattctctgt ccagggttag taaataaccc	1740
atccatgcca acacagacta gttaccttat ggtcaccact cctgcaacaa caacaaatac	1800
ggctgatact attttacgat ctcttacgga cgctgtgcca ctgtctgttc taatattggg	1860
acttctgatt atgttcatca ctattgtttt ctgtgctgca gggatagtgg ttctgttct	1920
tcaccgcagg agaagataga aaaagaaaca agtagatgag caaatgagag acaacagtcc	1980
tgtgcatctt cagtacagca tgtatggcca taaaaccact catcacacta ctgaaagacc	2040
ctctgcctca ctctatgaac agcacatggg agcccacgaa gagctgaagt taatggaaac	2100
attaatgtac tcacgtccaa ggaaggattt agtggaacag acaaaaaatg agtattttga	2160
acttaaagct aatttacatg ctgaacctga ctatttagaa gtcttgagc agcaaacata	2220
gatggaga	2228

<210> SEQ ID NO 71

<211> LENGTH: 2555

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 71

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tctttgcaat tgtgaggaaa aagatggcac aatgctaata aattgtgaag caaaaggat	180
caagatggta tctgaaataa gtgtgccacc atcacgacct ttccaactaa gcttattaaa	240
taacggcttg acgatgcttc acacaaatga cttttctggg cttaccaatg ctatttcaat	300
acaccttggg tttaacaata ttgcagatat tgagataggt gcatttaatg gccttggcct	360
cctgaaacaa cttcatatca atcacaatc tttagaaatt cttaaaggagg atactttcca	420
tgagctggaa aacctggaat tcctgcaagc agataacaat tttatcacag tgattgaacc	480
aagtgccttt agcaagctca acagactcaa agtgtaatt ttaaatgaca atgctattga	540
gagtcttctc ccaaactct tccgatttgt tcctttaacc catctagatc ttcgtggaaa	600

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tcaattacaa acattgcctt atgttggttt tctcgaacac attggccgaa tattggatct	660
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ggagaacatg cctccacagt ctataattgg tgatgttgtc tgcaacagcc ctccattttt	780
taaaggaagt atactcagta gactaaagaa ggaatctatt tgccctactc caccagtgtg	840
tgaagaacat gaggatcctt caggatcatt acatctggca gcaacatctt caataaatga	900
tagtcgcatg tcaactaaga ccacgtccat tctaaaacta cccaccaaag caccaggttt	960
gataccttat attacaaagc catccactca acttcaggga ccttactgcc ctattccttg	1020
taactgcaaa gtcctatccc catcaggact tctaatacat tgtcaggagc gcaacattga	1080
aagcttatca gatctgagac ctctctcgca aaatcctaga aagctcattc tagcgggaaa	1140
tattattcac agtttaataga agtctgatct agtggaatat ttacttttgg aaatgcttca	1200
cttgggaaac aatcgtattg aagttcttga agaaggatcg tttatgaacc taacgagatt	1260
acaaaaactc tatctaaatg gtaaccacct gaccaaatta agtaaaaggca tgttccttgg	1320
tctccataat ctgtaatact tatactctga atacaatgcc attaaggaaa tactgccagg	1380
aacctttaat ccaatgccta aacttaagt cctgtattta aataacaacc tctccaagt	1440
tttaccacca catatttttt caggggttcc tctaactaag gtaaatctta aaacaaacca	1500
gtttacccat ctacctgtaa gtaatatctt ggatgatctt gatttactaa cccagattga	1560
ccttgaggat aacccctggg actgctctg tgacctggtt ggactgcagc aatggataca	1620
aaagttaagc aagaacacag tgacagatga catcctctgc acttcccccg ggcatctcga	1680
caaaaaggaa ttgaaagccc taaatagtga aattctctgt ccagggttag taaataaccc	1740
atccatgcca acacagacta gttaccttat ggtcaccact cctgcaacaa caacaaatac	1800
ggctgatact attttacgat ctcttacgga cgctgtgcca ctgtctgttc taatattggg	1860
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tcaccgcagg agaagataca aaaagaaaca agtagatgag caaatgagag acaacagtcc	1980
tgtgcatctt cagtacagca tgtatggcca taaaaccact catcacacta ctgaaagacc	2040
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atcctttggt ccaaagcatc tggaagagga agaagagagg aatgagaaag aagggaagtga	2160
tgcaaaacat ctccaaagaa gtcttttggg acaggaaaat cattcaccac tcacagggtc	2220
aaatatgaaa tacaaaacca cgaaccaatc aacagaattt ttatccttcc aagatgccag	2280
ctcattgtac agaaacattt tagaaaaaga aagggaactt cagcaactgg gaatcacaga	2340
atacctaagg aaaaacattg ctacgctcca gctgatatg gaggcacatt atcctggagc	2400
ccacgaagag ctgaagttaa tggaacatt aatgtactca cgtccaagga aggtattagt	2460
ggaacagaca aaaaatgagt attttgaact taaagctaatt ttacatgctg aacctgacta	2520
tttagaagtc ctggagcagc aaacatagat ggaga	2555

<210> SEQ ID NO 72

<211> LENGTH: 2228

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 72

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tgccgtgata	tctttacact	cccaaaactcc	agtgcctctca	tccagaggct	cttgtgattc	120
tctttgcaat	tgtgaggaaa	aagatggcac	aatgctaata	aattgtgaag	caaaaggat	180
caagatggta	tctgaataa	gtgtgccacc	atcacgacct	ttccaactaa	gcttattaaa	240
taacggcttg	acgatgcttc	acacaaatga	cttttctggg	cttaccaatg	ctatttcaat	300
acaccttgga	tttaacaata	ttgcagatat	tgagataggt	gcatttaaatg	gccttggcct	360
cctgaaacaa	cttcatatca	atcacaaatc	tttagaaatt	cttaaagagg	atactttcca	420
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aagtgccttt	agcaagctca	acagactcaa	agtgtaatt	ttaaatgaca	atgctattga	540
gagtcttctc	ccaaacatct	tccgatttgt	tcctttaacc	catctagatc	ttcgtggaaa	600
tcaattacaa	acattgcctt	atgttggttt	tctcgaacac	attggccgaa	tattggatct	660
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ggagaacatg	cctccacagt	ctataattgg	tgatgttgtc	tgcaacagcc	ctccattttt	780
taaaggaagt	atactcagta	gactaaagaa	ggaatctatt	tgccctactc	caccagtgtg	840
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tagtcgcatg	tcaactaaga	ccacgtccat	tctaaaacta	cccaccaaag	caccagggtt	960
gataccttat	attacaaagc	catccactca	acttcagga	ccttactgcc	ctattccttg	1020
taactgcaaa	gtcctatccc	catcaggact	tctaatacat	tgtcaggagc	gcaacattga	1080
aagcttatca	gatctgagac	ctcctccgca	aaatcctaga	aagctcattc	tagcgggaaa	1140
tattattcac	agtttaata	agtctgatct	agtggaatat	ttcactttgg	aaatgcttca	1200
cttgggaaac	aatcgtattg	aagttcttga	agaaggatcg	tttatgaacc	taacgagatt	1260
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tctocataat	cttgaatact	tatatcttga	atacaatgcc	attaaggaaa	tactgccagg	1380
aacctttaat	ccaatgccta	aacttaaagt	cctgtattta	aataacaacc	tcctccaagt	1440
tttaccacca	catatttttt	caggggttcc	tctaactaag	gtaaatctta	aaacaaacca	1500
gtttaccat	ctacctgtaa	gtaatatctt	ggatgatctt	gatttactaa	cccagattga	1560
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aaagttaagc	aagaacacag	tgacagatga	catcctctgc	acttcccccg	ggcatctcga	1680
caaaaaggaa	ttgaaagccc	taaatagtga	aattctctgt	ccagggttag	taaataaccc	1740
atccatgcc	acacagacta	gttaccttat	ggtcaccact	cctgcaacaa	caacaaatac	1800
ggctgatact	atcttacgat	ctcttacgga	cgctgtgcca	ctgtctgttc	taatattggg	1860
acttctgatt	atgttcatca	ctattgtttt	ctgtgctgca	gggatagtgg	ttcttgttct	1920
tcaccgcagg	agaagataca	aaaagaaaca	agtagatgag	caaatgagag	acaacagtcc	1980
tgtgcatctt	cagtacagca	tgtatggcca	taaaaccact	catcacacta	ctgaaagacc	2040
ctctgcctca	ctctatgaac	agcacatggg	agccacagaa	gagctgaagt	taatggaaac	2100
attaatgtac	tcacgtccaa	ggaaggattt	agtggaacag	acaaaaaatg	agtattttga	2160
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gatggaga						2228

<210> SEQ ID NO 73

<211> LENGTH: 732

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<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 73

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Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
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Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
 20          25          30
Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
 35          40          45
Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
 50          55          60
Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
 65          70          75          80
Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
 85          90          95
Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
100         105         110
Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
115         120         125
Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
130         135         140
Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
145         150         155         160
Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
165         170         175
Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
180         185         190
Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
195         200         205
Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
210         215         220
Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser
225         230         235         240
Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser
245         250         255
Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val
260         265         270
Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr
275         280         285
Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys Thr Thr Ser Ile Leu
290         295         300
Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro
305         310         315         320
Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys
325         330         335
Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile
340         345         350
Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro Gln Asn Pro Arg Lys Leu
355         360         365
Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Lys Ser Asp Leu Val
370         375         380

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Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
				405					410					415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
			420					425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys
		435					440					445			
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
	450					455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475					480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
			485					490						495	
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile
			500				505						510		
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu
	515						520					525			
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile
	530					535					540				
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu
545					550					555					560
Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro
			565					570						575	
Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn
		580					585						590		
Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp	Ala	Val	Pro	Leu	Ser
		595				600					605				
Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile	Thr	Ile	Val	Phe	Cys
	610				615						620				
Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg	Arg	Arg	Arg	Tyr	Lys
625					630					635					640
Lys	Lys	Gln	Val	Asp	Glu	Gln	Met	Arg	Asp	Asn	Ser	Pro	Val	His	Leu
			645						650					655	
Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	His	His	Thr	Thr	Glu	Arg
		660						665					670		
Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Gly	Ala	His	Glu	Glu	Leu
		675					680					685			
Lys	Leu	Met	Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro	Arg	Lys	Val	Leu	Val
	690					695					700				
Glu	Gln	Thr	Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys	Ala	Asn	Leu	His	Ala
705					710					715					720
Glu	Pro	Asp	Tyr	Leu	Glu	Val	Leu	Glu	Gln	Gln	Thr				
				725					730						

<210> SEQ ID NO 74

<211> LENGTH: 841

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 74

Met	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile
1				5					10					15	

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Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp
			20					25					30		
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
		35					40					45			
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser
	50					55					60				
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His
65					70					75					80
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
				85					90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
			100					105					110		
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115					120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130					135					140				
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145					150					155					160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
				165					170					175	
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
			180					185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
		195					200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225					230					235					240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
				245					250					255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
			260					265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
	275						280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
	290					295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
				325					330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
			340					345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355				360						365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370					375					380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
				405					410					415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
			420					425					430		

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Gly Leu His Asn Leu Glu Tyr Leu Tyr Leu Glu Tyr Asn Ala Ile Lys
 435 440 445
 Glu Ile Leu Pro Gly Thr Phe Asn Pro Met Pro Lys Leu Lys Val Leu
 450 455 460
 Tyr Leu Asn Asn Asn Leu Leu Gln Val Leu Pro Pro His Ile Phe Ser
 465 470 475 480
 Gly Val Pro Leu Thr Lys Val Asn Leu Lys Thr Asn Gln Phe Thr His
 485 490 495
 Leu Pro Val Ser Asn Ile Leu Asp Asp Leu Asp Leu Leu Thr Gln Ile
 500 505 510
 Asp Leu Glu Asp Asn Pro Trp Asp Cys Ser Cys Asp Leu Val Gly Leu
 515 520 525
 Gln Gln Trp Ile Gln Lys Leu Ser Lys Asn Thr Val Thr Asp Asp Ile
 530 535 540
 Leu Cys Thr Ser Pro Gly His Leu Asp Lys Lys Glu Leu Lys Ala Leu
 545 550 555 560
 Asn Ser Glu Ile Leu Cys Pro Gly Leu Val Asn Asn Pro Ser Met Pro
 565 570 575
 Thr Gln Thr Ser Tyr Leu Met Val Thr Thr Pro Ala Thr Thr Thr Asn
 580 585 590
 Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr Asp Ala Val Pro Leu Ser
 595 600 605
 Val Leu Ile Leu Gly Leu Leu Ile Met Phe Ile Thr Ile Val Phe Cys
 610 615 620
 Ala Ala Gly Ile Val Val Leu Val Leu His Arg Arg Arg Arg Tyr Lys
 625 630 635 640
 Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn Ser Pro Val His Leu
 645 650 655
 Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His His Thr Thr Glu Arg
 660 665 670
 Pro Ser Ala Ser Leu Tyr Glu Gln His Met Val Ser Pro Met Val His
 675 680 685
 Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu
 690 695 700
 Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala Lys His Leu Gln Arg Ser
 705 710 715 720
 Leu Leu Glu Gln Glu Asn His Ser Pro Leu Thr Gly Ser Asn Met Lys
 725 730 735
 Tyr Lys Thr Thr Asn Gln Ser Thr Glu Phe Leu Ser Phe Gln Asp Ala
 740 745 750
 Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys Glu Arg Glu Leu Gln Gln
 755 760 765
 Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro
 770 775 780
 Asp Met Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met
 785 790 795 800
 Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr
 805 810 815
 Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp
 820 825 830
 Tyr Leu Glu Val Leu Glu Gln Gln Thr

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835	840
<210> SEQ ID NO 75	
<211> LENGTH: 732	
<212> TYPE: PRT	
<213> ORGANISM: Homo sapiens	
<400> SEQUENCE: 75	
Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile	
1 5 10 15	
Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp	
20 25 30	
Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys	
35 40 45	
Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser	
50 55 60	
Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His	
65 70 75 80	
Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly	
85 90 95	
Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly	
100 105 110	
Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys	
115 120 125	
Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp	
130 135 140	
Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn	
145 150 155 160	
Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro	
165 170 175	
Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly	
180 185 190	
Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly	
195 200 205	
Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys	
210 215 220	
Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser	
225 230 235 240	
Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser	
245 250 255	
Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val	
260 265 270	
Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr	
275 280 285	
Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys Thr Thr Ser Ile Leu	
290 295 300	
Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro	
305 310 315 320	
Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys	
325 330 335	
Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile	
340 345 350	
Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro Gln Asn Pro Arg Lys Leu	

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355		360		365
Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Lys Ser Asp Leu Val				
370		375		380
Glu Tyr Phe Thr Leu Glu Met Leu His Leu Gly Asn Asn Arg Ile Glu				
385		390		395
Val Leu Glu Glu Gly Ser Phe Met Asn Leu Thr Arg Leu Gln Lys Leu				
	405		410	415
Tyr Leu Asn Gly Asn His Leu Thr Lys Leu Ser Lys Gly Met Phe Leu				
	420		425	430
Gly Leu His Asn Leu Glu Tyr Leu Tyr Leu Glu Tyr Asn Ala Ile Lys				
	435		440	445
Glu Ile Leu Pro Gly Thr Phe Asn Pro Met Pro Lys Leu Lys Val Leu				
	450		455	460
Tyr Leu Asn Asn Asn Leu Leu Gln Val Leu Pro Pro His Ile Phe Ser				
465		470		475
Gly Val Pro Leu Thr Lys Val Asn Leu Lys Thr Asn Gln Phe Thr His				
	485		490	495
Leu Pro Val Ser Asn Ile Leu Asp Asp Leu Asp Leu Leu Thr Gln Ile				
	500		505	510
Asp Leu Glu Asp Asn Pro Trp Asp Cys Ser Cys Asp Leu Val Gly Leu				
	515		520	525
Gln Gln Trp Ile Gln Lys Leu Ser Lys Asn Thr Val Thr Asp Asp Ile				
	530		535	540
Leu Cys Thr Ser Pro Gly His Leu Asp Lys Lys Glu Leu Lys Ala Leu				
545		550		555
Asn Ser Glu Ile Leu Cys Pro Gly Leu Val Asn Asn Pro Ser Met Pro				
	565		570	575
Thr Gln Thr Ser Tyr Leu Met Val Thr Thr Pro Ala Thr Thr Thr Asn				
	580		585	590
Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr Asp Ala Val Pro Leu Ser				
	595		600	605
Val Leu Ile Leu Gly Leu Leu Ile Met Phe Ile Thr Ile Val Phe Cys				
	610		615	620
Ala Ala Gly Ile Val Val Leu Val Leu His Arg Arg Arg Arg Tyr Lys				
625		630		635
Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn Ser Pro Val His Leu				
	645		650	655
Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His His Thr Thr Glu Arg				
	660		665	670
Pro Ser Ala Ser Leu Tyr Glu Gln His Met Gly Ala His Glu Glu Leu				
	675		680	685
Lys Leu Met Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val				
	690		695	700
Glu Gln Thr Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala				
705		710		715
Glu Pro Asp Tyr Leu Glu Val Leu Glu Gln Gln Thr				
	725		730	

<210> SEQ ID NO 76

<211> LENGTH: 1620

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

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<400> SEQUENCE: 76

tcggatttca	tcacatgaca	acatgaagct	gtggattcat	ctcttttatt	catctctcct	60
tgctgtata	tctttacact	cccaaactcc	agtgtctctca	tccagaggct	cttgtgattc	120
tctttgcaat	tgtgaggaaa	aagatggcac	aatgctaata	aattgtgaag	caaaaggat	180
caagatggta	tctgaaataa	gtgtgccacc	atcacgacct	ttccaactaa	gcttattaaa	240
taacggcttg	acgatgcttc	acacaaatga	cttttctggg	cttaccaatg	ctatttcaat	300
acaccttgga	tttaacaata	ttgcagatat	tgagataggt	gcatttaaatg	gccttggcct	360
cctgaaacaa	cttcatatca	atcacaaatc	tttagaaatt	cttaaagagg	atactttcca	420
tggaactggaa	aacctggaat	tcctgcaagc	agataacaat	tttatcacag	tgattgaacc	480
aagtgccttt	agcaagctca	acagactcaa	agtggttaatt	ttaaatgaca	atgctattga	540
gagtcttctc	ccaaacatct	tccgatttgt	tcctttaacc	catctagatc	ttcgtggaaa	600
tcaattacaa	acattgcctt	atgttggttt	tctcgaacac	attggccgaa	tattggatct	660
tcagttggag	gacaacaaat	gggcctgcaa	ttgtgactta	ttgcagttaa	aaacttggtt	720
ggagaacatg	cctccacagt	ctataattgg	tgatgttgtc	tgcaacagcc	ctccattttt	780
taaaggaagt	atactcagta	gactaaagaa	ggaatctatt	tgccctactc	caccagtgtg	840
tgaagaacat	gaggatcctt	caggatcatt	acatctggca	gcaacatctt	caataaatga	900
tagtcgcatg	tcaactaaga	ccaggtccat	tctaaaaacta	cccaccaaag	caccaggttt	960
gataccttat	attacaaagc	catccactca	acttcagga	ccttactgcc	ctattccttg	1020
taactgcaaa	gtcctatccc	catcaggact	tctaatacat	tgtcaggagc	gcaacattga	1080
aagcttatca	gatctgagac	ctcctccgca	aaatcctaga	aagctcattc	tagcgggaaa	1140
tattattcac	agtttaata	agtccatcct	ttggtccaaa	gcatctggaa	gaggaagaag	1200
agaggaatga	gaaagaagga	agtgtgcaa	aacatctcca	aagaagtctt	ttggaacagg	1260
aaaatcattc	accactcaca	gggtcaaata	tgaaatacaa	aaccacgaac	caatcaacag	1320
aatttttata	cttccaagat	gccagctcat	tgtacagaaa	catttttagaa	aaagaaaggg	1380
aacttcagca	actgggaatc	acagaatacc	taaggaaaaa	cattgctcag	ctccagcctg	1440
atatggaggc	acattatcct	ggagcccacg	aagagctgaa	gttaattggaa	acattaatgt	1500
actcagctcc	aaggaaggta	ttagtggaac	agacaaaaaa	tgagtatttt	gaacttaaa	1560
ctaatttaca	tgctgaacct	gactatttag	aagtcctgga	gcagcaaaaca	tagatggaga	1620

<210> SEQ ID NO 77

<211> LENGTH: 2555

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 77

tcggatttca	tcacatgaca	acatgaagct	gtggattcat	ctcttttatt	catctctcct	60
tgctgtata	tctttacact	cccaaactcc	agtgtctctca	tccagaggct	cttgtgattc	120
tctttgcaat	tgtgaggaaa	aagatggcac	aatgctaata	aattgtgaag	caaaaggat	180
caagatggta	tctgaaataa	gtgtgccacc	atcacgacct	ttccaactaa	gcttattaaa	240
taacggcttg	acgatgcttc	acacaaatga	cttttctggg	cttaccaatg	ctatttcaat	300
acaccttgga	tttaacaata	ttgcagatat	tgagataggt	gcatttaaatg	gccttggcct	360
cctgaaacaa	cttcatatca	atcacaaatc	tttagaaatt	cttaaagagg	atactttcca	420

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tggaactggaa aacctggaat tcctgcaagc agataacaat tttatcacag tgattgaacc	480
aagtgccttt agcaagctca acagactcaa agtggttaatt ttaaatgaca atgctattga	540
gagtcttcct ccaaactatct tccgatttgt tcctttaacc catctagatc ttcgtggaaa	600
tcaattacaa acattgcctt atgttggttt tctcgaacac attggccgaa tattggatct	660
tcagttggag gacaacaaat gggcctgcaa ttgtgactta ttgcagttaa aaacttggtt	720
ggagaacatg cctccacagt ctataattgg tgatgttgtc tgcaacagcc ctccattttt	780
taaaggaagt atactcagta gactaaagaa ggaatctatt tgcctactc caccagtgtg	840
tgaagaacat gaggatcctt caggatcatt acatctggca gcaacatctt caataaatga	900
tagtcgatg tcaactaaga ccacgtccat tctaaaacta cccaccaaag caccaggttt	960
gataccttat attacaaagc catccactca acttcagga ccttactgcc ctattccttg	1020
taactgcaaa gtcctatccc catcaggact tctaatacat tgtcaggagc gcaacattga	1080
aagcttatca gatctgagac ctctccgca aaatcctaga aagctcattc tagcgggaaa	1140
tattattcac agtttaataga agtctgatct agtggaatat ttcactttgg aaatgcttca	1200
cttgggaaac aatcgtattg aagttcttga agaaggatcg tttatgaacc taacgagatt	1260
acaaaaactc tatctaaatg gtaaccacct gaccaaatta agtaaaggca tgttccttgg	1320
tctccataat ctgtaatact tatatcttga atacaatgcc attaaggaaa tactgccagg	1380
aacctttaat ccaatgccta aacttaagat cctgtattta aataacaacc tcctccaagt	1440
tttaccacca catatttttt caggggttcc tctaactaag gtaaatctta aaacaaacca	1500
gtttacccat ctacctgtaa gtaatatctt ggatgatctt gatttactaa cccagattga	1560
ccttgaggat aaccctggg actgctctg tgacctggtt ggactgcagc aatggataca	1620
aaagttaagc aagaacacag tgacagatga catcctctgc acttcccccg ggcatctcga	1680
caaaaaggaa ttgaaagccc taaatagtga aattctctgt ccagggttag taaataaccc	1740
atccatgcca acacagacta gttaccttat ggtcaccact cctgcaacaa caacaaatac	1800
ggctgatact attttacgat ctcttacgga cgctgtgcca ctgtctgttc taatattggg	1860
acttctgatt atgttcatca ctattgtttt ctgtgctgca gggatagtgg ttcttgttct	1920
tcaccgcagg agaagataca aaaagaaaca agtagatgag caaatgagag acaacagtcc	1980
tgtgcatctt cagtacagca tgtatggcca taaaaccact catcacacta ctgaaagacc	2040
ctctgcctca ctctatgaac agcacatggt gagccccatg gttcatgtct atagaagtcc	2100
atcctttggt ccaaagcatc tggaagagga agaagagagg aatgagaaag aagggaagtga	2160
tgcaaaacat ctccaaagaa gtcttttggg acaggaaaat cattcaccac tcacagggtc	2220
aaatatgaaa tacaaaacca cgaaccaatc aacagaatct ttatccttcc aagatgccag	2280
ctcattgtac agaaacattt tagaaaaaga aagggaactt cagcaactgg gaatcacaga	2340
atacctaagg aaaaacattg ctacagctcca gctgatatg gaggcacatt atcctggagc	2400
ccacgaagag ctgaagttaa tggaacatt aatgtactca cgtccaagga aggtattagt	2460
ggaacagaca aaaaatgagt attttgaact taaagctaatt ttacatgctg aacctgacta	2520
tttagaagtc ctggagcagc aaacatagat ggaga	2555

<210> SEQ ID NO 78

<211> LENGTH: 1620

<212> TYPE: DNA

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<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 78

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tcggatttca tcacatgaca acatgaagct gtggattcat ctcttttatt catctctcct    60
tgccgtgata tctttacact cccaaactcc agtgctctca tccagaggct cttgtgattc    120
tctttgcaat tgtgaggaaa aagatggcac aatgctaata aattgtgaag caaaaggat    180
caagatggta tctgaaataa gtgtgccacc atcacgacct ttccaactaa gcttattaaa    240
taacggcttg acgatgcttc acacaaatga cttttctggg cttaccaatg ctatttcaat    300
acaccttgga tttacaataa ttgcagatat tgagataggt gcatttaaatg gccttggcct    360
cctgaaacaa cttcatatca atcacaattc tttagaaatt cttaaagagg atacctttcca    420
tggaactggaa aacctggaat tcctgcaagc agataacaat tttatcacag tgattgaacc    480
aagtgccttt agcaagctca acagactcaa agtgtaatt ttaaatgaca atgctattga    540
gagtcttctc ccaaactctc tccgatttgt tcctttaacc catctagatc ttcgtggaaa    600
tcaattacaa acattgcctt atgttggttt tctcgaacac attggccgaa tattgatctc    660
tcagttggag gacaacaaat gggcctgcaa ttgtgactta ttgcagttaa aaacttggtt    720
ggagaacatg cctccacagt ctataattgg tgatgttgtc tgcaacagcc ctccattttt    780
taaaggaagt atactcagta gactaaagaa ggaatctatt tgccctactc caccagtgtg    840
tgaagaacat gaggatcctt caggatcatt acatctggca gcaacatctt caataaatga    900
tagtcgcatg tcaactaaga ccacgtccat tctaaaacta cccaccaaag caccaggttt    960
gataccttat attacaaagc catccactca acttcagga ccttactgcc ctattccttg   1020
taactgcaaa gtccatcccc catcaggact tctaatacat tgtcaggagc gcaacattga   1080
aagcttatca gatctgagac ctccctcgca aaatcctaga aagctcattc tagcgggaaa   1140
tattattcac agtttaatga agtccatcct ttggtccaaa gcactctgga gaggaagaag   1200
agaggaatga gaaagaagga agtgatgcaa aacatctcca aagaagtctt ttggaacagg   1260
aaaatcattc accactcaca gggtaaaata tgaaatacaa aaccacgaac caatcaacag   1320
aatttttatc ctccaagat gccagctcat tgtacagaaa cattttagaa aaagaaaggg   1380
aacttcagca actgggaatc acagaatacc taaggaaaaa cattgctcag ctccagcctg   1440
atatggaggc acattatcct ggagcccacg aagagctgaa gttaatggaa acattaatgt   1500
actcacgtcc aaggaaggta ttagtggaac agacaaaaaa tgagtatttt gaacttaaag   1560
ctaatttaca tgctgaacct gactatttag aagtcctgga gcagcaaaaca tagatggaga   1620

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<210> SEQ ID NO 79

<211> LENGTH: 395

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 79

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Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
 1             5             10             15

Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
 20             25             30

Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
 35             40             45

Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
 50             55             60

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Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
65          70          75          80

Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
          85          90          95

Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
          100          105          110

Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
          115          120          125

Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
          130          135          140

Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
145          150          155          160

Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
          165          170          175

Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
          180          185          190

Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
          195          200          205

Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
          210          215          220

Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser
225          230          235          240

Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser
          245          250          255

Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val
          260          265          270

Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr
          275          280          285

Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys Thr Thr Ser Ile Leu
          290          295          300

Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro
305          310          315          320

Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys
          325          330          335

Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile
          340          345          350

Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro Gln Asn Pro Arg Lys Leu
          355          360          365

Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Lys Ser Ile Leu Trp
          370          375          380

Ser Lys Ala Ser Gly Arg Gly Arg Arg Glu Glu
385          390          395

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<210> SEQ ID NO 80

<211> LENGTH: 841

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 80

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Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1          5          10          15

Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
          20          25          30

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Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
	35						40					45			
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser
	50					55					60				
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His
65					70					75					80
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
				85					90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
			100						105				110		
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115					120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130					135					140				
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145					150					155					160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165						170						175
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
			180					185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
		195					200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225					230					235					240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
			245						250					255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
		260						265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
	275						280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
	290					295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
			325						330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
		340						345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
	355					360						365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370				375						380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
			405						410					415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
		420						425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys

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435						440						445					
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu		
450						455					460						
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser		
465					470					475					480		
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His		
				485					490					495			
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile		
			500					505					510				
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu		
		515					520					525					
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile		
530						535					540						
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu		
545					550					555					560		
Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro		
				565					570					575			
Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn		
			580					585					590				
Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp	Ala	Val	Pro	Leu	Ser		
		595					600					605					
Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile	Thr	Ile	Val	Phe	Cys		
610						615					620						
Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg	Arg	Arg	Arg	Tyr	Lys		
625					630					635					640		
Lys	Lys	Gln	Val	Asp	Glu	Gln	Met	Arg	Asp	Asn	Ser	Pro	Val	His	Leu		
			645						650					655			
Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	His	His	Thr	Thr	Glu	Arg		
		660						665					670				
Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Val	Ser	Pro	Met	Val	His		
		675					680					685					
Val	Tyr	Arg	Ser	Pro	Ser	Phe	Gly	Pro	Lys	His	Leu	Glu	Glu	Glu	Glu		
	690					695					700						
Glu	Arg	Asn	Glu	Lys	Glu	Gly	Ser	Asp	Ala	Lys	His	Leu	Gln	Arg	Ser		
705					710					715					720		
Leu	Leu	Glu	Gln	Glu	Asn	His	Ser	Pro	Leu	Thr	Gly	Ser	Asn	Met	Lys		
			725						730					735			
Tyr	Lys	Thr	Thr	Asn	Gln	Ser	Thr	Glu	Phe	Leu	Ser	Phe	Gln	Asp	Ala		
			740					745					750				
Ser	Ser	Leu	Tyr	Arg	Asn	Ile	Leu	Glu	Lys	Glu	Arg	Glu	Leu	Gln	Gln		
		755					760					765					
Leu	Gly	Ile	Thr	Glu	Tyr	Leu	Arg	Lys	Asn	Ile	Ala	Gln	Leu	Gln	Pro		
	770					775					780						
Asp	Met	Glu	Ala	His	Tyr	Pro	Gly	Ala	His	Glu	Glu	Leu	Lys	Leu	Met		
785					790					795					800		
Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro	Arg	Lys	Val	Leu	Val	Glu	Gln	Thr		
			805						810					815			
Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys	Ala	Asn	Leu	His	Ala	Glu	Pro	Asp		
		820						825					830				
Tyr	Leu	Glu	Val	Leu	Glu	Gln	Gln	Thr									
	835						840										

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<210> SEQ ID NO 81

<211> LENGTH: 395

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 81

Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1 5 10 15
Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
20 25 30
Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
35 40 45
Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
50 55 60
Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
65 70 75 80
Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
85 90 95
Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
100 105 110
Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
115 120 125
Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
130 135 140
Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
145 150 155 160
Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
165 170 175
Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
180 185 190
Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
195 200 205
Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
210 215 220
Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser
225 230 235 240
Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser
245 250 255
Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val
260 265 270
Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr
275 280 285
Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys Thr Thr Ser Ile Leu
290 295 300
Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro
305 310 315 320
Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys
325 330 335
Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile
340 345 350
Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro Gln Asn Pro Arg Lys Leu
355 360 365

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Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Lys Ser Ile Leu Trp
 370 375 380

Ser Lys Ala Ser Gly Arg Gly Arg Arg Glu Glu
 385 390 395

<210> SEQ ID NO 82

<211> LENGTH: 3300

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 82

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gcgtcgacaa caagaaatag tagaaaagga ggaaggagaa cattgctgca gcttggatct    60
acaacctaag aaagcaagag tgatcaatct cagctctgtt aaacatcttg tttacttact    120
gcattcagca gcttgcaaat ggtaaactat atgcaaaaaa gtcagcatag ctgtgaagta    180
tgccgtgaat ttaattgag ggaaaaagga caattgcttc aggatgctct agtatgcaact    240
ctgcttgaaa tattttcaat gaaatgctca gtattctatc ttgaccaga ggttttaact    300
ttatgaagct atgggacttg acaaaaagtg atatttgaga agaaagtacg cagtgggttg    360
tgttttcttt ttttaataa aggaattgaa ttactttgaa cacctcttcc agctgtgcat    420
tacagataac gtcaggaaga gtctctgctt tacagaatcg gatttcatca catgacaaca    480
tgaagctgtg gattcatctc ttttattcat ctctccttgc ctgtatatct ttacactccc    540
aaactccagt gctctcatcc agaggctctt gtgattctct ttgcaattgt gaggaaaaag    600
atggcacaat gctaataaat tgtgaagcaa aaggtatcaa gatggtatct gaaataagtg    660
tgccaccatc acgaccttcc caactaagct tattaataa cggtctgacg atgcttcaca    720
caaatgactt ttctgggctt accaatgcta tttcaatata ccttggattt aacaatattg    780
cagatattga gataggtgca ttaaatggcc ttggcctcct gaaacaactt catatcaatc    840
acaattcttt agaaattctt aaagaggata ctttccatgg actggaaaac ctggaattcc    900
tgcaagcaga taacaatttt atcacagtga ttgaaccaag tgccttttagc aagctcaaca    960
gactcaaagt gttaatttta aatgacaatg ctattgagag tcttctctca aacatcttcc   1020
gatttgttcc ttaaccctat ctagatcttc gtggaaatca attacaaaca ttgccttatg   1080
ttggttttct cgaacacatt ggccgaatat tggatcttca gttggaggac acaaatggg    1140
cctgcaattg tgacttattg cagttaaaaa cttggttgga gaacatgcct ccacagtcta   1200
taattgggtg tgttgtctgc aacagccctc cattttttaa aggaagtata ctcagtagac   1260
taaagaagga atctatttgc cctactccac cagtgtatga agaacatgag gatccttcag   1320
gatcattaca tctggcagca acatcttcaa taaatgatag tcgcatgtca actaagacca   1380
cgtccattct aaaactaccc accaaagcac caggtttgat acctatatt acaaagccat   1440
ccactcaact tccaggacct tactgcctta ttcttggtaa ctgcaaagtc ctatccccat   1500
caggacttct aatacattgt caggagcgca acattgaaag cttatcagat ctgagacctc   1560
ctccgcaaaa tcctagaaag ctcatcttag cgggaaatat tattcacagt ttaatgaagt   1620
ctgatctagt ggaatatctt actttggaaa tgcttcactt gggaaacaat cgtattgaag   1680
ttcttgaaga aggatcggtt atgaacctaa cgagattaca aaaactctat ctaaattggt   1740
accacctgac caaattaaat aaaggcatgt tccttgggtc ccataatctt gaatacttat   1800
atcttgaata caatgccatt aaggaaatag tgccaggaac ctttaatcca atgcctaaac   1860
ttaaagtcct gtatttaaat aacaacctcc tccaagtttt accaccacat attttttcag   1920

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gggttcctct aactaaggt aatcttaaaa caaaccagtt tacccatcta cctgtaagta 1980
atatatttga tgatcttgat ttactaacc agattgacct tgaggataac cctggggact 2040
gctcctgtga cctggttgga ctgcagcaat ggatacaaaa gttaagcaag aacacagtga 2100
cagatgacat cctctgcact tccccgggc atctcgacaa aaaggaattg aaagccctaa 2160
atagtgaat tctctgtcca ggtttagtaa ataaccatc catgccaaca cagactagtt 2220
accttatggt caccactcct gcaacaacaa caaatacggc tgatactatt ttacgatctc 2280
ttaaggacgc tgtgccactg tctgttctaa tattgggact tctgattatg ttcactacta 2340
ttgttttctg tgctgcaggg atagtgggtc ttgttcttca ccgcaggaga agatacaaaa 2400
agaaacaagt agatgagcaa atgagagaca acagtcctgt gcactctcag tacagcatgt 2460
atggccataa aaccactcat cacactactg aaagaccctc tgcctcactc tatgaacagc 2520
acatggtgag ccccatggtt catgtctata gaagtccatc ctttgggtcca aagcatctgg 2580
aagaggaaga agagaggaat gagaaagaag gaagtgatgc aaaacatctc caaagaagtc 2640
tttggaaca ggaaatcat tcaccactca cagggtcaaa tatgaaatac aaaaccacga 2700
accaatcaac agaattttta tccttccaag atgccagctc attgtacaga aacattttag 2760
aaaaagaaag ggaacttcag caactgggaa tcacagaata cctaaggaaa aacattgctc 2820
agctccagcc tgatatggag gcacattatc ctggagccca cgaagagctg aagttaatgg 2880
aaacattaat gtactcacgt ccaaggaagg tattagtga acagacaaaa aatgagtatt 2940
ttgaacttaa agctaattta catgctgaac ctgactattt agaagtcctg gagcagcaaa 3000
catagatgga gaggttgagg ctttcgccag aaatgctgtg attctgttat taagtccata 3060
ccttgtaaat aagtgcctta cgtgagtgtg tcataaatca gaacctaac acagagtaaa 3120
ctatggggaa aaaaaagaa gacgaaacag aaactcaggg atcactggga gaagccatgg 3180
cataatcttc aggcaattta gtctgtccca aataaacata catccttggc atgtaaatca 3240
tcaagggtaa tagtaatatt catatacctg aaacgtgtct cataggagtc ctctctgcac 3300

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<210> SEQ ID NO 83

<211> LENGTH: 2555

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 83

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tcggatttca tcacatgaca acatgaagct gtggattcat ctcttttatt catctctcct 60
tgctgtata tctttacact cccaaactcc agtgctctca tccagaggct cttgtgattc 120
tctttgcaat tgtgaggaaa aagatggcac aatgctaata aattgtgaag caaaaggat 180
caagatggta tctgaaataa gtgtgccacc atcagcacct ttccaactaa gcttattaaa 240
taacggcttg acgatgcttc acacaaatga cttttctggg cttaccaatg ctatttcaat 300
acaccttgga tttacaataa ttgcagatat tgagataggt gcatttaatg gccttggcct 360
cctgaaacaa cttcatatca atcacaatc tttagaaatt cttaaagagg atactttcca 420
tggactggaa aacctggaat tcctgcaagc agataacaat tttatcacag tgattgaacc 480
aagtgccttt agcaagctca acagactcaa agtgtaatt ttaaatgaca atgctattga 540
gagtcttctt ccaaactct tccgatttgt tcctttaacc catctagatc ttcgtggaaa 600
tcaattacaa acattgcctt atgttggttt tctcgaacac attggccgaa tattggatct 660

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tcagttggag gacaacaaat gggcctgcaa ttgtgactta ttgcagttaa aaacttggtt	720
ggagaacatg cctccacagt ctataattgg tgatgttgtc tgcaacagcc ctccattttt	780
taaaggaagt atactcagta gactaaagaa ggaatctatt tgccctactc caccagtgtg	840
tgaagaacat gaggatcctt caggatcatt acatctggca gcaacatctt caataaatga	900
tagtcgcatg tcaactaaga ccacgtccat tctaaaacta cccaccaaag caccaggttt	960
gataccttat attacaaagc catccactca acttcaggga ccttactgcc ctattccttg	1020
taactgcaaa gtcctatccc catcaggact tctaatacat tgtcaggagc gcaacattga	1080
aagcttatca gatctgagac ctccctcgca aaatcctaga aagctcattc tagcgggaaa	1140
tattattcac agtttaataga agtctgatct agtggaatat ttacttttgg aaatgcttca	1200
cttgggaaac aatcgtattg aagttcttga agaaggatcg tttatgaacc taacgagatt	1260
acaaaaactc tatctaaatg gtaaccacct gaccaaatta agtaaaggca tgttccttgg	1320
tctccataat ctggaatact tatactctga atacaatgcc attaaggaaa tactgccagg	1380
aacctttaat ccaatgccta aacttaagt cctgtattta aataacaacc tctccaagt	1440
tttaccacca catatttttt caggggttcc tctaactaag gtaaatctta aaacaaacca	1500
gtttacccat ctacctgtaa gtaatatctt ggatgatctt gatttactaa cccagattga	1560
ccttgaggat aaccctggg actgctctg tgacctgggt ggactgcagc aatggataca	1620
aaagttaagc aagaacacag tgacagatga catcctctgc acttcccccg ggcatctcga	1680
caaaaaggaa ttgaaagccc taaatagtga aattctctgt ccaggtttag taaataaccc	1740
atccatgcca acacagacta gttaccttat ggtcaccact cctgcaacaa caacaaatac	1800
ggctgatact attttacgat ctcttacgga cgctgtgcca ctgtctgttc taatattggg	1860
acttctgatt atgttcacga ctattgtttt ctgtgctgca gggatagtgg ttcttgttct	1920
tcaccgcagg agaagataca aaaagaaaca agtagatgag caaatgagag acaacagtcc	1980
tgtgcatctt cagtacagca tgtatggcca taaaaccact catcacacta ctgaaagacc	2040
ctctgcctca ctctatgaac agcacatggt gagccccatg gttcatgtct atagaagtcc	2100
atcctttggt ccaaagcatc tggaagagga agaagagagg aatgagaaag aaggaagtga	2160
tgcaaaacat ctccaaagaa gtcttttggg acaggaaaat cattcaccac tcacagggtc	2220
aaatatgaaa tacaaaacca cgaaccaatc aacagaattt ttatccttcc aagatgccag	2280
ctcattgtac agaaacattt tagaaaaaga aagggaactt cagcaactgg gaatcacaga	2340
atacctaagg aaaaacattg ctacagctcca gctgatatg gaggcacatt atcctggagc	2400
ccacgaagag ctgaaagtaa tggaacatt aatgtactca cgtccaagga aggtattagt	2460
ggaacagaca aaaaatgagt attttgaact taaagctaatt ttacatgctg aacctgacta	2520
tttagaagtc ctggagcagc aaacatagat ggaga	2555

<210> SEQ ID NO 84

<211> LENGTH: 3300

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 84

gcgtcgacaa caagaaatag tagaaaagga ggaaggagaa cattgctgca gcttgatct	60
acaacctaaag aaagcaagag tgatcaatct cagctctgtt aaacatcttg ttacttact	120
gcattcagca gcttgcaaat ggttaactat atgcaaaaaa gtcagcatag ctgtgaagta	180

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tgccgtgaat	tttaattgag	ggaaaaagga	caattgcttc	aggatgctct	agtatgcact	240
ctgcttgaaa	tattttcaat	gaaatgctca	gtattctatc	tttgaccaga	ggttttaact	300
ttatgaagct	atgggacttg	acaaaaagtg	atatttgaga	agaaagtacg	cagtgggttg	360
tgttttcttt	tttttaataa	aggaattgaa	ttactttgaa	cacctcttcc	agctgtgcat	420
tacagataac	gtcaggaaga	gtctctgctt	tacagaatcg	gatttcatca	catgacaaca	480
tgaagctgtg	gattcatctc	ttttattcat	ctctccttgc	ctgtatatct	ttactctccc	540
aaactccagt	gctctcatcc	agaggtcttt	gtgattctct	ttgcaattgt	gaggaaaaag	600
atggcacaat	gctaataaat	tgtgaagcaa	aaggatatca	gatggtatct	gaaataagtg	660
tgccaccatc	acgacctttc	caactaagct	tattaaataa	cgcttgacg	atgcttcaca	720
caaatgactt	ttctgggctt	accaatgcta	tttcaataca	ccttgatttt	aacaatattg	780
cagatattga	gataggtgca	tttaattggc	ttggcctcct	gaaacaactt	catatcaatc	840
acaattcttt	agaaattctt	aaagaggata	ctttccatgg	actggaaaac	ctggaattcc	900
tgaagcaga	taacaatttt	atcacagtga	ttgaaccaag	tgcttttagc	aagctcaaca	960
gactcaaagt	gttaatttta	aatgacaatg	ctattgagag	tcttcctcca	aacatcttcc	1020
gatttgttcc	tttaacccat	ctagatcttc	gtggaaatca	attacaaaca	ttgccttatg	1080
ttggttttct	cgaacacatt	ggccgaatat	tggatcttca	gttggaggac	aacaaatggg	1140
cctgcaattg	tgacttattg	cagttaaaaa	cttggttgga	gaacatgcct	ccacagtcta	1200
taattgggtga	tgttgtctgc	aacagccctc	cattttttta	aggaagtata	ctcagtagac	1260
taaaagaagga	atctattttg	cctactccac	cagtgtatga	agaacatgag	gacccctcag	1320
gatcattaca	tctggcagca	acatcttcaa	taaatgatag	tcgcatgtca	actaagacca	1380
cgccattctc	aaaactaccc	accaaagcac	caggtttgat	accttatatt	acaaagccat	1440
ccactcaact	tccaggacct	tactgcccta	ttccttgtaa	ctgcaaagtc	ctatccccat	1500
caggacttct	aatacattgt	caggagcgca	acattgaaag	cttatcagat	ctgagacctc	1560
ctccgcaaaa	tcctagaaa	ctcattctag	cgggaaatat	tattcacagt	ttaatgaagt	1620
ctgatctagt	ggaatatctc	actttggaaa	tgcttcactt	gggaaacaat	cgtattgaag	1680
ttcttgaa	aggatcggtt	atgaacctaa	cgagattaca	aaaactctat	ctaaatggta	1740
accacctgac	caaattaagt	aaaggcatgt	tccttggctc	ccataatctt	gaatacttat	1800
atcttgaata	caatgccatt	aaggaaatc	tgccaggaac	ctttaatcca	atgcctaaac	1860
ttaaagtcct	gtattttaa	aacaacctcc	tccaagtttt	accaccacat	attttttcag	1920
gggttcctct	aactaaggta	aatcttaaaa	caaaccagtt	tacctatcta	cctgtaagta	1980
atattttgga	tgatcttgat	ttactaaccc	agattgacct	tgaggataac	cctggggact	2040
gctcctgtga	cctgggtgga	ctgcagcaat	ggatacaaaa	gttaagcaag	aacacagtga	2100
cagatgacat	cctctgcact	ttccccgggc	atctcgacaa	aaaggaattg	aaagccctaa	2160
atagtgaat	tctctgtcca	ggtttagtta	ataaccatc	catgccaaca	cagactagtt	2220
accttatggt	caccactcct	gcaacaacaa	caaatacggc	tgatactatt	ttacgatctc	2280
ttacggacgc	tgtgccactg	tctgtttctaa	tattggggact	tctgattatg	ttcatcacta	2340
ttgttttctg	tgtctgacgg	atagtgggtc	ttgttcttca	ccgcaggaga	agatacaaaa	2400
agaaacaagt	agatgagcaa	atgagagaca	acagtctctg	gcactctcag	tacagcatgt	2460

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atggccataa aaccactcat cacactactg aaagaccctc tgcctcactc tatgaacagc	2520
acatggtgag ccccatggtt catgtctata gaagtccatc ctttgggtcca aagcatctgg	2580
aagaggaaga agagaggaat gagaagaag gaagtgatgc aaaacatctc caaagaagtc	2640
ttttggaaca ggaaaatcat tcaccactca caggggtcaaa tatgaaatac aaaaccacga	2700
accaatcaac agaattttta tccttccaag atgccagctc attgtacaga aacattttag	2760
aaaaagaaag ggaacttcag caactgggaa tcacagaata cctaaggaaa aacattgctc	2820
agctccagcc tgatatggag gcacattatc ctggagccca cgaagagctg aagttaatgg	2880
aaacattaat gtactcacgt ccaaggaagg tattagtgga acagacaaaa aatgagtatt	2940
ttgaacttaa agctaattta catgctgaac ctgactatctt agaagtcctg gacgagcaaa	3000
catagatgga gagttagggg ctttcgccag aaatgctgtg attctgttat taagtccata	3060
ccttgtaaat aagtgcctta cgtgagtgtg tcatcaatca gaacctaacg acagagtaaa	3120
ctatggggaa aaaaaagaa gacgaaacag aaactcaggg atcactggga gaagccatgg	3180
cataatcttc aggcaattta gtctgtccca aataaacata catccttggc atgtaaatca	3240
tcaagggtaa tagtaatatt catatacctg aaacgtgtct cataggagtc ctctctgcac	3300

<210> SEQ ID NO 85

<211> LENGTH: 841

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 85

Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile	
1 5 10 15	
Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp	
20 25 30	
Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys	
35 40 45	
Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser	
50 55 60	
Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His	
65 70 75 80	
Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly	
85 90 95	
Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly	
100 105 110	
Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys	
115 120 125	
Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp	
130 135 140	
Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn	
145 150 155 160	
Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro	
165 170 175	
Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly	
180 185 190	
Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly	
195 200 205	
Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys	
210 215 220	

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Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser	225	230	235	240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser	245	250	255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val	260	265	270	
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr	275	280	285	
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu	290	295	300	
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro	305	310	315	320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys	325	330	335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile	340	345	350	
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu	355	360	365	
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val	370	375	380	
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu	385	390	395	400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu	405	410	415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu	420	425	430	
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys	435	440	445	
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu	450	455	460	
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser	465	470	475	480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His	485	490	495	
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile	500	505	510	
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu	515	520	525	
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile	530	535	540	
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu	545	550	555	560
Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro	565	570	575	
Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn	580	585	590	
Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp	Ala	Val	Pro	Leu	Ser	595	600	605	
Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile	Thr	Ile	Val	Phe	Cys	610	615	620	
Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg	Arg	Arg	Arg	Tyr	Lys				

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625		630		635		640
Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn Ser Pro Val His Leu						
	645			650		655
Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His His Thr Thr Glu Arg						
	660		665			670
Pro Ser Ala Ser Leu Tyr Glu Gln His Met Val Ser Pro Met Val His						
	675		680			685
Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu						
	690		695			700
Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala Lys His Leu Gln Arg Ser						
	705		710			715
Leu Leu Glu Gln Glu Asn His Ser Pro Leu Thr Gly Ser Asn Met Lys						
	725		730			735
Tyr Lys Thr Thr Asn Gln Ser Thr Glu Phe Leu Ser Phe Gln Asp Ala						
	740		745			750
Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys Glu Arg Glu Leu Gln Gln						
	755		760			765
Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro						
	770		775			780
Asp Met Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met						
	785		790			795
Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr						
	805		810			815
Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp						
	820		825			830
Tyr Leu Glu Val Leu Glu Gln Gln Thr						
	835		840			

<210> SEQ ID NO 86
 <211> LENGTH: 841
 <212> TYPE: PRT
 <213> ORGANISM: Homo sapiens

<400> SEQUENCE: 86

Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile			
1	5	10	15
Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp			
	20	25	30
Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys			
	35	40	45
Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser			
	50	55	60
Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His			
	65	70	75
Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly			
	85	90	95
Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly			
	100	105	110
Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys			
	115	120	125
Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp			
	130	135	140
Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn			

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145	150	155	160
Arg Leu Lys Val	Leu Ile Leu Asn Asp	Asn Ala Ile Glu Ser	Leu Pro
	165	170	175
Pro Asn Ile Phe	Arg Phe Val Pro Leu Thr	His Leu Asp Leu Arg	Gly
	180	185	190
Asn Gln Leu Gln	Thr Leu Pro Tyr Val	Gly Phe Leu Glu His	Ile Gly
	195	200	205
Arg Ile Leu Asp	Leu Gln Leu Glu Asp	Asn Lys Trp Ala Cys	Asn Cys
	210	215	220
Asp Leu Leu Gln	Leu Lys Thr Trp Leu Glu	Asn Met Pro Pro	Gln Ser
	225	230	235
Ile Ile Gly Asp	Val Val Cys Asn Ser	Pro Pro Phe Phe	Lys Gly Ser
	245	250	255
Ile Leu Ser Arg	Leu Lys Lys Glu Ser	Ile Cys Pro Thr	Pro Pro Val
	260	265	270
Tyr Glu Glu His	Glu Asp Pro Ser Gly	Ser Leu His Leu Ala	Thr
	275	280	285
Ser Ser Ile Asn	Asp Ser Arg Met Ser Thr	Lys Thr Thr Ser	Ile Leu
	290	295	300
Lys Leu Pro Thr	Lys Ala Pro Gly Leu Ile	Pro Tyr Ile Thr	Lys Pro
	305	310	315
Ser Thr Gln Leu	Pro Gly Pro Tyr Cys	Pro Ile Pro Cys	Asn Cys Lys
	325	330	335
Val Leu Ser Pro	Ser Gly Leu Leu Ile His	Cys Gln Glu Arg	Asn Ile
	340	345	350
Glu Ser Leu Ser	Asp Leu Arg Pro Pro	Gln Asn Pro Arg	Lys Leu
	355	360	365
Ile Leu Ala Gly	Asn Ile Ile His Ser Leu	Met Lys Ser Asp	Leu Val
	370	375	380
Glu Tyr Phe Thr	Leu Glu Met Leu His Leu	Gly Asn Asn Arg	Ile Glu
	385	390	395
Val Leu Glu Glu	Gly Ser Phe Met Asn Leu	Thr Arg Leu Gln	Lys Leu
	405	410	415
Tyr Leu Asn Gly	Asn His Leu Thr Lys Leu	Ser Lys Gly Met	Phe Leu
	420	425	430
Gly Leu His Asn	Leu Glu Tyr Leu Tyr Leu	Glu Tyr Asn Ala	Ile Lys
	435	440	445
Glu Ile Leu Pro	Gly Thr Phe Asn Pro Met	Pro Lys Leu Lys	Val Leu
	450	455	460
Tyr Leu Asn Asn	Asn Leu Leu Gln Val Leu	Pro Pro His Ile	Phe Ser
	465	470	475
Gly Val Pro Leu	Thr Lys Val Asn Leu Lys	Thr Asn Gln Phe	Thr His
	485	490	495
Leu Pro Val Ser	Asn Ile Leu Asp Asp	Leu Asp Leu Leu	Thr Gln Ile
	500	505	510
Asp Leu Glu Asp	Asn Pro Trp Asp Cys	Ser Cys Asp Leu	Val Gly Leu
	515	520	525
Gln Gln Trp Ile	Gln Lys Leu Ser Lys	Asn Thr Val Thr	Asp Asp Ile
	530	535	540
Leu Cys Thr Ser	Pro Gly His Leu Asp	Lys Lys Glu Leu	Lys Ala Leu
	545	550	555

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<210> SEQ ID NO 87
<211> LENGTH: 841
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 87

Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1          5          10          15

Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
          20          25          30

Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
          35          40          45

Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
50          55          60

Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
65          70          75          80

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Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
			85						90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
			100					105					110		
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115					120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130					135					140				
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145					150					155					160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165						170					175	
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
		180						185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
		195					200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225					230					235				240	
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
			245						250					255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
		260						265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
	275						280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
	290					295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
			325						330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
		340						345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355					360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370					375					380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
			405						410					415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
		420						425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys
		435					440					445			
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
	450					455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475					480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
			485						490					495	

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Leu Pro Val Ser Asn Ile Leu Asp Asp Leu Asp Leu Leu Thr Gln Ile
 500 505 510
 Asp Leu Glu Asp Asn Pro Trp Asp Cys Ser Cys Asp Leu Val Gly Leu
 515 520 525
 Gln Gln Trp Ile Gln Lys Leu Ser Lys Asn Thr Val Thr Asp Asp Ile
 530 535 540
 Leu Cys Thr Ser Pro Gly His Leu Asp Lys Lys Glu Leu Lys Ala Leu
 545 550 555 560
 Asn Ser Glu Ile Leu Cys Pro Gly Leu Val Asn Asn Pro Ser Met Pro
 565 570 575
 Thr Gln Thr Ser Tyr Leu Met Val Thr Thr Pro Ala Thr Thr Thr Asn
 580 585 590
 Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr Asp Ala Val Pro Leu Ser
 595 600 605
 Val Leu Ile Leu Gly Leu Leu Ile Met Phe Ile Thr Ile Val Phe Cys
 610 615 620
 Ala Ala Gly Ile Val Val Leu Val Leu His Arg Arg Arg Arg Tyr Lys
 625 630 635 640
 Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn Ser Pro Val His Leu
 645 650 655
 Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His His Thr Thr Glu Arg
 660 665 670
 Pro Ser Ala Ser Leu Tyr Glu Gln His Met Val Ser Pro Met Val His
 675 680 685
 Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu
 690 695 700
 Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala Lys His Leu Gln Arg Ser
 705 710 715 720
 Leu Leu Glu Gln Glu Asn His Ser Pro Leu Thr Gly Ser Asn Met Lys
 725 730 735
 Tyr Lys Thr Thr Asn Gln Ser Thr Glu Phe Leu Ser Phe Gln Asp Ala
 740 745 750
 Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys Glu Arg Glu Leu Gln Gln
 755 760 765
 Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro
 770 775 780
 Asp Met Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met
 785 790 795 800
 Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr
 805 810 815
 Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp
 820 825 830
 Tyr Leu Glu Val Leu Glu Gln Gln Thr
 835 840

<210> SEQ ID NO 88

<211> LENGTH: 1619

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 88

tcggatttca tcacatgaca acatgaagct gtggattcat ctcttttatt catctctcct 60

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tgccgtgata	tctttacact	cccaaaactcc	agtgcctctca	tccagaggct	cttgtgattc	120
tctttgcaat	tgtgaggaaa	aagatggcac	aatgctaata	aattgtgaag	caaaaggat	180
caagatggta	tctgaaataa	gtgtgccacc	atcacgacct	ttccaactaa	gcttattaaa	240
taacggcttg	acgatgcttc	acacaaatga	cttttctggg	cttaccaatg	ctatttcaat	300
acaccttgga	tttaacaata	ttgcagatat	tgagataggt	gcattttaatg	gccttggcct	360
cctgaaacaa	cttcatatca	atcacaaatc	tttagaaatt	cttaaagagg	atactttcca	420
tggaactggaa	aacctggaat	tcctgcaagc	agataacaat	tttatcacag	tgattgaacc	480
aagtgccttt	agcaagctca	acagactcaa	agtgttaatt	ttaaatgaca	atgctattga	540
gagtcttctc	ccaaacatct	tccgatttgt	tcctttaacc	catctagatc	ttcgtggaaa	600
tcaattacaa	acattgcctt	atgttggttt	tctcgaacac	attggccgaa	tattggatct	660
tcagttggag	gacaacaaat	gggcctgcaa	ttgtgactta	ttgcagttaa	aaacttggtt	720
ggagaacatg	cctccacagt	ctataattgg	tgatgttgtc	tgcaacagcc	ctccattttt	780
taaaggaagt	atactcagta	gactaaagaa	ggaatctatt	tgccctactc	caccagtgtg	840
tgaagaacat	gaggatcctt	caggatcatt	acatctggca	gcaacatctt	caataaatga	900
tagtcgcatg	tcaactaaga	ccacgtccat	tctaaaacta	cccaccaaag	caccagggtt	960
gataccttat	attacaaagc	catccactca	acttccagga	ccttactgcc	ctattccttg	1020
taactgcaaa	gtcctatccc	catcaggact	tctaatacat	tgtcaggagc	gcaacattga	1080
aagcttatca	gatctgagac	ctcctccgca	aaatcctaga	aagctcattc	tagcgggaaa	1140
tattattcac	agtttaata	atccatcctt	tggtccaaag	catctggaag	aggaagaaga	1200
gaggaatgag	aaagaaggaa	gtgatgcaaa	acatctccaa	agaagtcttt	tggaacagga	1260
aaatcattca	ccactcacag	ggtcaaatat	gaaatacaaa	accacgaacc	aatcaacaga	1320
atttttatcc	ttccaagatg	ccagctcatt	gtacagaaac	attttagaaa	aagaaaggga	1380
acttcagcaa	ctgggaatca	cagaatacct	aaggaaaaac	attgctcagc	tccagcctga	1440
tatggaggca	cattatcctg	gagcccacga	agagctgaag	ttaatggaaa	cattaatgta	1500
ctcacgtcca	aggaaggat	tagtggaaca	gacaaaaaat	gagtattttg	aacttaaagc	1560
taatttcat	gctgaacctg	actattttaga	agtcctggag	cagcaaacat	agatggaga	1619

<210> SEQ ID NO 89

<211> LENGTH: 1619

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 89

tcggatttca	tcacatgaca	acatgaagct	gtggattcat	ctcttttatt	catctctcct	60
tgccgtgata	tctttacact	cccaaaactcc	agtgcctctca	tccagaggct	cttgtgattc	120
tctttgcaat	tgtgaggaaa	aagatggcac	aatgctaata	aattgtgaag	caaaaggat	180
caagatggta	tctgaaataa	gtgtgccacc	atcacgacct	ttccaactaa	gcttattaaa	240
taacggcttg	acgatgcttc	acacaaatga	cttttctggg	cttaccaatg	ctatttcaat	300
acaccttgga	tttaacaata	ttgcagatat	tgagataggt	gcattttaatg	gccttggcct	360
cctgaaacaa	cttcatatca	atcacaaatc	tttagaaatt	cttaaagagg	atactttcca	420
tggaactggaa	aacctggaat	tcctgcaagc	agataacaat	tttatcacag	tgattgaacc	480
aagtgccttt	agcaagctca	acagactcaa	agtgttaatt	ttaaatgaca	atgctattga	540

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gagtccttcc	ccaaacatct	tccgatttgt	tcctttaacc	catctagatc	ttcgtggaaa	600
tcaattacaa	acattgcctt	atgttggttt	tctcgaacac	attggccgaa	tattggatct	660
tcagttggag	gacaacaaat	gggcctgcaa	ttgtgactta	ttgcagttaa	aaacttggtt	720
ggagaacatg	cctccacagt	ctataattgg	tgatgttgtc	tgcaacagcc	ctccattttt	780
taaaggaagt	atactcagta	gactaaagaa	ggaatctatt	tgccctactc	caccagtgtg	840
tgaagaacat	gaggatcctt	caggatcatt	acatctggca	gcaacatctt	caataaatga	900
tagtcgcatg	tcaactaaga	ccacgtccat	tctaaaacta	cccaccaaag	caccagggtt	960
gataccttat	attacaaagc	catccactca	acttccagga	ccttactgcc	ctattccttg	1020
taactgcaaa	gtcctatccc	catcaggact	tctaatacat	tgtcaggagc	gcaacattga	1080
aagcttatca	gatctgagac	ctcctccgca	aaatcctaga	aagctcattc	tagcgggaaa	1140
tattattcac	agtttaatga	atccatcctt	tggtccaaag	catctggaag	aggaagaaga	1200
gaggaatgag	aaagaaggaa	gtgatgcaaa	acatctccaa	agaagtcttt	tggaacagga	1260
aaatcattca	ccactcacag	ggtcaaatat	gaaatacaaa	accacgaacc	aatcaacaga	1320
atttttatcc	ttccaagatg	ccagctcatt	gtacagaaac	attttagaaa	aagaaaggga	1380
acttcagcaa	ctgggaatca	cagaatacct	aaggaaaaac	attgctcagc	tccagcctga	1440
tatggaggca	cattatcctg	gagcccacga	agagctgaag	ttaatggaaa	cattaatgta	1500
ctcacgtcca	aggaagggtat	tagtggaaca	gacaaaaaat	gagtattttg	aacttaaagc	1560
taatttacat	gctgaacctg	actattttaga	agtcctggag	cagcaaacat	agatggaga	1619

<210> SEQ ID NO 90

<211> LENGTH: 1619

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 90

tcggatttca	tcacatgaca	acatgaagct	gtggattcat	ctcttttatt	catctctcct	60
tgctgtata	tctttacact	cccaaaactc	agtgtctctc	tccagaggct	cttgtgatcc	120
tctttgcaat	tgtgaggaaa	aagatggcac	aatgctaata	aattgtgaag	caaaagggtat	180
caagatggta	tctgaaataa	gtgtgccacc	atcacgacct	ttccaactaa	gcttattaaa	240
taacggcttg	acgatgcttc	acacaaatga	cttttctggg	cttaccaatg	ctatttcaat	300
acaccttgga	tttaacaata	ttgcagatat	tgagataggt	gcatttaaatg	gccttggcct	360
cctgaaacaa	cttcatatca	atcacaaatc	tttagaaaatt	cttaagagg	atactttcca	420
tggaactggaa	aacctggaat	tcctgcaagc	agataacaat	tttatcacag	tgattgaacc	480
aagtgccttt	agcaagctca	acagactcaa	agtggttaatt	ttaaatgaca	atgctattga	540
gagtccttcc	ccaaacatct	tccgatttgt	tcctttaacc	catctagatc	ttcgtggaaa	600
tcaattacaa	acattgcctt	atgttggttt	tctcgaacac	attggccgaa	tattggatct	660
tcagttggag	gacaacaaat	gggcctgcaa	ttgtgactta	ttgcagttaa	aaacttggtt	720
ggagaacatg	cctccacagt	ctataattgg	tgatgttgtc	tgcaacagcc	ctccattttt	780
taaaggaagt	atactcagta	gactaaagaa	ggaatctatt	tgccctactc	caccagtgtg	840
tgaagaacat	gaggatcctt	caggatcatt	acatctggca	gcaacatctt	caataaatga	900
tagtcgcatg	tcaactaaga	ccacgtccat	tctaaaacta	cccaccaaag	caccagggtt	960

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gataccttat attacaagc catccactca acttcacagga ccttactgcc ctattccttg 1020
taactgcaaa gtccatcccc catcaggact tctaatacat tgtcaggagc gcaacattga 1080
aagcttatca gatctgagac ctccctcgca aaatcctaga aagctcattc tagcgggaaa 1140
tattattcac agtttaataga atccatcctt tgggtccaaag catctggaag aggaagaaga 1200
gaggaatgag aaagaaggaa gtgatgcaaa acatctccaa agaagtcttt tggaacagga 1260
aaatcattca ccactcacag ggtcaaatat gaaatacaaa accacgaacc aatcaacaga 1320
atttttatcc ttccaagatg ccagctcatt gtacagaaac attttagaaa aagaaaggga 1380
acttcagcaa ctgggaatca cagaatacct aaggaaaaac attgctcagc tccagcctga 1440
tatggaggca cattatcctg gagcccacga agagctgaag ttaatggaaa cattaatgta 1500
ctcacgtcca aggaaggat tagtggaaca gacaaaaaat gagtatTTTg aacttaaagc 1560
taatttacat gctgaacctg actattttaga agtcctggag cagcaaacat agatggaga 1619

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<210> SEQ ID NO 91

<211> LENGTH: 529

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 91

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Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1           5           10           15
Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
          20           25           30
Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
          35           40           45
Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
          50           55           60
Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
65           70           75           80
Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
          85           90           95
Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
          100          105          110
Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
          115          120          125
Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
          130          135          140
Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
145          150          155          160
Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
          165          170          175
Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
          180          185          190
Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
          195          200          205
Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
          210          215          220
Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser
225          230          235          240
Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser
          245          250          255

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Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val
      260                      265                      270

Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr
      275                      280                      285

Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys Thr Thr Ser Ile Leu
      290                      295                      300

Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro
      305                      310                      315                      320

Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys
      325                      330                      335

Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile
      340                      345                      350

Glu Ser Leu Ser Asp Leu Arg Pro Pro Pro Gln Asn Pro Arg Lys Leu
      355                      360                      365

Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Asn Pro Ser Phe Gly
      370                      375                      380

Pro Lys His Leu Glu Glu Glu Glu Arg Asn Glu Lys Glu Gly Ser
      385                      390                      395                      400

Asp Ala Lys His Leu Gln Arg Ser Leu Leu Glu Gln Glu Asn His Ser
      405                      410                      415

Pro Leu Thr Gly Ser Asn Met Lys Tyr Lys Thr Thr Asn Gln Ser Thr
      420                      425                      430

Glu Phe Leu Ser Phe Gln Asp Ala Ser Ser Leu Tyr Arg Asn Ile Leu
      435                      440                      445

Glu Lys Glu Arg Glu Leu Gln Gln Leu Gly Ile Thr Glu Tyr Leu Arg
      450                      455                      460

Lys Asn Ile Ala Gln Leu Gln Pro Asp Met Glu Ala His Tyr Pro Gly
      465                      470                      475                      480

Ala His Glu Glu Leu Lys Leu Met Glu Thr Leu Met Tyr Ser Arg Pro
      485                      490                      495

Arg Lys Val Leu Val Glu Gln Thr Lys Asn Glu Tyr Phe Glu Leu Lys
      500                      505                      510

Ala Asn Leu His Ala Glu Pro Asp Tyr Leu Glu Val Leu Glu Gln Gln
      515                      520                      525

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Thr

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<210> SEQ ID NO 92
<211> LENGTH: 841
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

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<400> SEQUENCE: 92

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Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
 1          5          10          15

Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
 20          25          30

Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
 35          40          45

Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
 50          55          60

Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
 65          70          75          80

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Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
				85					90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
			100					105					110		
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115					120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130					135					140				
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145					150					155					160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165						170					175	
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
		180						185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
		195					200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225					230					235					240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
			245						250					255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
		260						265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
	275						280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
	290					295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
			325						330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
		340						345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355					360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370					375					380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
			405						410					415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
		420						425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys
		435					440					445			
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
	450					455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475					480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
			485						490					495	

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Leu Pro Val Ser Asn Ile Leu Asp Asp Leu Asp Leu Leu Thr Gln Ile
      500                      505                      510

Asp Leu Glu Asp Asn Pro Trp Asp Cys Ser Cys Asp Leu Val Gly Leu
      515                      520                      525

Gln Gln Trp Ile Gln Lys Leu Ser Lys Asn Thr Val Thr Asp Asp Ile
      530                      535                      540

Leu Cys Thr Ser Pro Gly His Leu Asp Lys Lys Glu Leu Lys Ala Leu
545                      550                      555                      560

Asn Ser Glu Ile Leu Cys Pro Gly Leu Val Asn Asn Pro Ser Met Pro
      565                      570                      575

Thr Gln Thr Ser Tyr Leu Met Val Thr Thr Pro Ala Thr Thr Thr Asn
      580                      585                      590

Thr Ala Asp Thr Ile Leu Arg Ser Leu Thr Asp Ala Val Pro Leu Ser
      595                      600                      605

Val Leu Ile Leu Gly Leu Leu Ile Met Phe Ile Thr Ile Val Phe Cys
      610                      615                      620

Ala Ala Gly Ile Val Val Leu Val Leu His Arg Arg Arg Arg Tyr Lys
625                      630                      635                      640

Lys Lys Gln Val Asp Glu Gln Met Arg Asp Asn Ser Pro Val His Leu
      645                      650                      655

Gln Tyr Ser Met Tyr Gly His Lys Thr Thr His His Thr Thr Glu Arg
      660                      665                      670

Pro Ser Ala Ser Leu Tyr Glu Gln His Met Val Ser Pro Met Val His
      675                      680                      685

Val Tyr Arg Ser Pro Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu
      690                      695                      700

Glu Arg Asn Glu Lys Glu Gly Ser Asp Ala Lys His Leu Gln Arg Ser
705                      710                      715                      720

Leu Leu Glu Gln Glu Asn His Ser Pro Leu Thr Gly Ser Asn Met Lys
      725                      730                      735

Tyr Lys Thr Thr Asn Gln Ser Thr Glu Phe Leu Ser Phe Gln Asp Ala
      740                      745                      750

Ser Ser Leu Tyr Arg Asn Ile Leu Glu Lys Glu Arg Glu Leu Gln Gln
      755                      760                      765

Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro
      770                      775                      780

Asp Met Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met
785                      790                      795                      800

Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr
      805                      810                      815

Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp
      820                      825                      830

Tyr Leu Glu Val Leu Glu Gln Gln Thr
      835                      840

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<210> SEQ ID NO 93

<211> LENGTH: 529

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 93

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Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1           5           10           15

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Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp	20	25	30	
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys	35	40	45	
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser	50	55	60	
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His	65	70	75	80
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly	85	90	95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly	100	105	110	
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys	115	120	125	
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp	130	135	140	
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn	145	150	155	160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro	165	170	175	
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly	180	185	190	
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly	195	200	205	
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys	210	215	220	
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser	225	230	235	240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser	245	250	255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val	260	265	270	
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr	275	280	285	
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu	290	295	300	
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro	305	310	315	320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys	325	330	335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile	340	345	350	
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu	355	360	365	
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Asn	Pro	Ser	Phe	Gly	370	375	380	
Pro	Lys	His	Leu	Glu	Glu	Glu	Glu	Arg	Asn	Glu	Lys	Glu	Gly	Ser		385	390	395	400
Asp	Ala	Lys	His	Leu	Gln	Arg	Ser	Leu	Leu	Glu	Gln	Glu	Asn	His	Ser	405	410	415	
Pro	Leu	Thr	Gly	Ser	Asn	Met	Lys	Tyr	Lys	Thr	Thr	Asn	Gln	Ser	Thr				

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420					425					430						
Glu	Phe	Leu	Ser	Phe	Gln	Asp	Ala	Ser	Ser	Leu	Tyr	Arg	Asn	Ile	Leu	
435					440					445						
Glu	Lys	Glu	Arg	Glu	Leu	Gln	Gln	Leu	Gly	Ile	Thr	Glu	Tyr	Leu	Arg	
450					455					460						
Lys	Asn	Ile	Ala	Gln	Leu	Gln	Pro	Asp	Met	Glu	Ala	His	Tyr	Pro	Gly	
465					470					475					480	
Ala	His	Glu	Glu	Leu	Lys	Leu	Met	Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro	
485					490					495						
Arg	Lys	Val	Leu	Val	Glu	Gln	Thr	Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys	
500					505					510						
Ala	Asn	Leu	His	Ala	Glu	Pro	Asp	Tyr	Leu	Glu	Val	Leu	Glu	Gln	Gln	
515					520					525						

Thr

<210> SEQ ID NO 94
 <211> LENGTH: 841
 <212> TYPE: PRT
 <213> ORGANISM: Homo sapiens

<400> SEQUENCE: 94

Met	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile
1				5					10					15	
Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp
		20						25					30		
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
		35					40					45			
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser
	50					55					60				
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His
65				70					75						80
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
			85						90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
			100				105						110		
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115					120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130					135					140				
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145				150					155						160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165					170						175	
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
		180					185						190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
		195				200						205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225				230					235						240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
			245					250						255	

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Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
			260					265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
			275				280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
		290				295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
				325					330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
			340					345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355					360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370					375					380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
				405					410					415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
			420					425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys
		435					440					445			
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
	450					455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475					480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
				485					490					495	
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile
			500					505					510		
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu
		515					520					525			
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile
	530					535					540				
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu
545					550					555					560
Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro
				565					570					575	
Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn
			580					585					590		
Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp	Ala	Val	Pro	Leu	Ser
		595					600					605			
Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile	Thr	Ile	Val	Phe	Cys
	610					615					620				
Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg	Arg	Arg	Arg	Tyr	Lys
625					630					635					640
Lys	Lys	Gln	Val	Asp	Glu	Gln	Met	Arg	Asp	Asn	Ser	Pro	Val	His	Leu
				645					650					655	
Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	His	His	Thr	Thr	Glu	Arg

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660					665					670					
Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Val	Ser	Pro	Met	Val	His
675					680					685					
Val	Tyr	Arg	Ser	Pro	Ser	Phe	Gly	Pro	Lys	His	Leu	Glu	Glu	Glu	Glu
690					695					700					
Glu	Arg	Asn	Glu	Lys	Glu	Gly	Ser	Asp	Ala	Lys	His	Leu	Gln	Arg	Ser
705					710					715					
Leu	Leu	Glu	Gln	Glu	Asn	His	Ser	Pro	Leu	Thr	Gly	Ser	Asn	Met	Lys
725					730					735					
Tyr	Lys	Thr	Thr	Asn	Gln	Ser	Thr	Glu	Phe	Leu	Ser	Phe	Gln	Asp	Ala
740					745					750					
Ser	Ser	Leu	Tyr	Arg	Asn	Ile	Leu	Glu	Lys	Glu	Arg	Glu	Leu	Gln	Gln
755					760					765					
Leu	Gly	Ile	Thr	Glu	Tyr	Leu	Arg	Lys	Asn	Ile	Ala	Gln	Leu	Gln	Pro
770					775					780					
Asp	Met	Glu	Ala	His	Tyr	Pro	Gly	Ala	His	Glu	Glu	Leu	Lys	Leu	Met
785					790					795					
Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro	Arg	Lys	Val	Leu	Val	Glu	Gln	Thr
805					810					815					
Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys	Ala	Asn	Leu	His	Ala	Glu	Pro	Asp
820					825					830					
Tyr	Leu	Glu	Val	Leu	Glu	Gln	Gln	Thr							
835					840										

<210> SEQ ID NO 95
 <211> LENGTH: 16
 <212> TYPE: PRT
 <213> ORGANISM: Homo sapiens

<400> SEQUENCE: 95

Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Gly	Ala	His	Glu	Glu	Leu	Lys	Leu
1				5				10					15		

<210> SEQ ID NO 96
 <211> LENGTH: 18
 <212> TYPE: PRT
 <213> ORGANISM: Homo sapiens

<400> SEQUENCE: 96

Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Gly	Ala	His	Glu	Glu	Leu	Lys
1				5					10					15	

Leu Met

<210> SEQ ID NO 97
 <211> LENGTH: 28
 <212> TYPE: PRT
 <213> ORGANISM: Homo sapiens

<400> SEQUENCE: 97

Thr	Thr	Glu	Arg	Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Gly	Ala
1				5					10					15	

His	Glu	Glu	Leu	Lys	Leu	Met	Glu	Thr	Leu	Met	Tyr
			20						25		

<210> SEQ ID NO 98
 <211> LENGTH: 22
 <212> TYPE: PRT

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<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 98

Ile Ile His Ser Leu Met Lys Ser Ile Leu Trp Ser Lys Ala Ser Gly
1 5 10 15Arg Gly Arg Arg Glu Glu
20

<210> SEQ ID NO 99

<211> LENGTH: 23

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 99

Asn Ile Ile His Ser Leu Met Lys Ser Ile Leu Trp Ser Lys Ala Ser
1 5 10 15Gly Arg Gly Arg Arg Glu Glu
20

<210> SEQ ID NO 100

<211> LENGTH: 28

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 100

Leu Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Lys Ser Ile Leu
1 5 10 15Trp Ser Lys Ala Ser Gly Arg Gly Arg Arg Glu Glu
20 25

<210> SEQ ID NO 101

<211> LENGTH: 23

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 101

Gly Asn Ile Ile His Ser Leu Met Asn Pro Ser Phe Gly Pro Lys His
1 5 10 15Leu Glu Glu Glu Glu Glu Arg
20

<210> SEQ ID NO 102

<211> LENGTH: 24

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 102

Ala Gly Asn Ile Ile His Ser Leu Met Asn Pro Ser Phe Gly Pro Lys
1 5 10 15His Leu Glu Glu Glu Glu Arg
20

<210> SEQ ID NO 103

<211> LENGTH: 29

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 103

Arg Lys Leu Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Asn Pro
1 5 10 15

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Ser Phe Gly Pro Lys His Leu Glu Glu Glu Glu Arg
20 25

<210> SEQ ID NO 104

<211> LENGTH: 841

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 104

Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
1 5 10 15

Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
20 25 30

Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
35 40 45

Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
50 55 60

Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
65 70 75 80

Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
85 90 95

Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
100 105 110

Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
115 120 125

Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
130 135 140

Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
145 150 155 160

Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
165 170 175

Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
180 185 190

Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
195 200 205

Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
210 215 220

Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser
225 230 235 240

Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser
245 250 255

Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val
260 265 270

Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr
275 280 285

Ser Ser Ile Asn Asp Ser Arg Met Ser Thr Lys Thr Thr Ser Ile Leu
290 295 300

Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro
305 310 315 320

Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys
325 330 335

Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile
340 345 350

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Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355					360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370					375					380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
				405					410					415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
		420						425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys
		435					440					445			
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
	450					455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475					480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
				485					490					495	
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile
			500					505					510		
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu
	515						520					525			
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile
	530					535					540				
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu
545					550					555					560
Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro
				565					570					575	
Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn
		580						585					590		
Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp	Ala	Val	Pro	Leu	Ser
		595					600					605			
Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile	Thr	Ile	Val	Phe	Cys
	610					615					620				
Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg	Arg	Arg	Arg	Tyr	Lys
625					630					635					640
Lys	Lys	Gln	Val	Asp	Glu	Gln	Met	Arg	Asp	Asn	Ser	Pro	Val	His	Leu
				645					650					655	
Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	His	His	Thr	Thr	Glu	Arg
		660						665					670		
Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Val	Ser	Pro	Met	Val	His
		675					680					685			
Val	Tyr	Arg	Ser	Pro	Ser	Phe	Gly	Pro	Lys	His	Leu	Glu	Glu	Glu	Glu
	690					695					700				
Glu	Arg	Asn	Glu	Lys	Glu	Gly	Ser	Asp	Ala	Lys	His	Leu	Gln	Arg	Ser
705					710					715					720
Leu	Leu	Glu	Gln	Glu	Asn	His	Ser	Pro	Leu	Thr	Gly	Ser	Asn	Met	Lys
				725					730					735	
Tyr	Lys	Thr	Thr	Asn	Gln	Ser	Thr	Glu	Phe	Leu	Ser	Phe	Gln	Asp	Ala
		740						745					750		
Ser	Ser	Leu	Tyr	Arg	Asn	Ile	Leu	Glu	Lys	Glu	Arg	Glu	Leu	Gln	Gln
		755					760					765			

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Leu Gly Ile Thr Glu Tyr Leu Arg Lys Asn Ile Ala Gln Leu Gln Pro
 770 775 780

Asp Met Glu Ala His Tyr Pro Gly Ala His Glu Glu Leu Lys Leu Met
 785 790 795 800

Glu Thr Leu Met Tyr Ser Arg Pro Arg Lys Val Leu Val Glu Gln Thr
 805 810 815

Lys Asn Glu Tyr Phe Glu Leu Lys Ala Asn Leu His Ala Glu Pro Asp
 820 825 830

Tyr Leu Glu Val Leu Glu Gln Gln Thr
 835 840

<210> SEQ ID NO 105

<211> LENGTH: 732

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 105

Met Lys Leu Trp Ile His Leu Phe Tyr Ser Ser Leu Leu Ala Cys Ile
 1 5 10 15

Ser Leu His Ser Gln Thr Pro Val Leu Ser Ser Arg Gly Ser Cys Asp
 20 25 30

Ser Leu Cys Asn Cys Glu Glu Lys Asp Gly Thr Met Leu Ile Asn Cys
 35 40 45

Glu Ala Lys Gly Ile Lys Met Val Ser Glu Ile Ser Val Pro Pro Ser
 50 55 60

Arg Pro Phe Gln Leu Ser Leu Leu Asn Asn Gly Leu Thr Met Leu His
 65 70 75 80

Thr Asn Asp Phe Ser Gly Leu Thr Asn Ala Ile Ser Ile His Leu Gly
 85 90 95

Phe Asn Asn Ile Ala Asp Ile Glu Ile Gly Ala Phe Asn Gly Leu Gly
 100 105 110

Leu Leu Lys Gln Leu His Ile Asn His Asn Ser Leu Glu Ile Leu Lys
 115 120 125

Glu Asp Thr Phe His Gly Leu Glu Asn Leu Glu Phe Leu Gln Ala Asp
 130 135 140

Asn Asn Phe Ile Thr Val Ile Glu Pro Ser Ala Phe Ser Lys Leu Asn
 145 150 155 160

Arg Leu Lys Val Leu Ile Leu Asn Asp Asn Ala Ile Glu Ser Leu Pro
 165 170 175

Pro Asn Ile Phe Arg Phe Val Pro Leu Thr His Leu Asp Leu Arg Gly
 180 185 190

Asn Gln Leu Gln Thr Leu Pro Tyr Val Gly Phe Leu Glu His Ile Gly
 195 200 205

Arg Ile Leu Asp Leu Gln Leu Glu Asp Asn Lys Trp Ala Cys Asn Cys
 210 215 220

Asp Leu Leu Gln Leu Lys Thr Trp Leu Glu Asn Met Pro Pro Gln Ser
 225 230 235 240

Ile Ile Gly Asp Val Val Cys Asn Ser Pro Pro Phe Phe Lys Gly Ser
 245 250 255

Ile Leu Ser Arg Leu Lys Lys Glu Ser Ile Cys Pro Thr Pro Pro Val
 260 265 270

Tyr Glu Glu His Glu Asp Pro Ser Gly Ser Leu His Leu Ala Ala Thr
 275 280 285

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Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
290					295					300					
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys
				325					330					335	
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
			340					345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu
		355					360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Asp	Leu	Val
	370				375						380				
Glu	Tyr	Phe	Thr	Leu	Glu	Met	Leu	His	Leu	Gly	Asn	Asn	Arg	Ile	Glu
385					390					395					400
Val	Leu	Glu	Glu	Gly	Ser	Phe	Met	Asn	Leu	Thr	Arg	Leu	Gln	Lys	Leu
				405					410					415	
Tyr	Leu	Asn	Gly	Asn	His	Leu	Thr	Lys	Leu	Ser	Lys	Gly	Met	Phe	Leu
			420					425					430		
Gly	Leu	His	Asn	Leu	Glu	Tyr	Leu	Tyr	Leu	Glu	Tyr	Asn	Ala	Ile	Lys
		435					440					445			
Glu	Ile	Leu	Pro	Gly	Thr	Phe	Asn	Pro	Met	Pro	Lys	Leu	Lys	Val	Leu
	450					455					460				
Tyr	Leu	Asn	Asn	Asn	Leu	Leu	Gln	Val	Leu	Pro	Pro	His	Ile	Phe	Ser
465					470					475					480
Gly	Val	Pro	Leu	Thr	Lys	Val	Asn	Leu	Lys	Thr	Asn	Gln	Phe	Thr	His
				485					490					495	
Leu	Pro	Val	Ser	Asn	Ile	Leu	Asp	Asp	Leu	Asp	Leu	Leu	Thr	Gln	Ile
			500					505					510		
Asp	Leu	Glu	Asp	Asn	Pro	Trp	Asp	Cys	Ser	Cys	Asp	Leu	Val	Gly	Leu
		515					520					525			
Gln	Gln	Trp	Ile	Gln	Lys	Leu	Ser	Lys	Asn	Thr	Val	Thr	Asp	Asp	Ile
	530					535					540				
Leu	Cys	Thr	Ser	Pro	Gly	His	Leu	Asp	Lys	Lys	Glu	Leu	Lys	Ala	Leu
545					550					555					560
Asn	Ser	Glu	Ile	Leu	Cys	Pro	Gly	Leu	Val	Asn	Asn	Pro	Ser	Met	Pro
				565					570					575	
Thr	Gln	Thr	Ser	Tyr	Leu	Met	Val	Thr	Thr	Pro	Ala	Thr	Thr	Thr	Asn
			580					585					590		
Thr	Ala	Asp	Thr	Ile	Leu	Arg	Ser	Leu	Thr	Asp	Ala	Val	Pro	Leu	Ser
		595					600					605			
Val	Leu	Ile	Leu	Gly	Leu	Leu	Ile	Met	Phe	Ile	Thr	Ile	Val	Phe	Cys
	610					615					620				
Ala	Ala	Gly	Ile	Val	Val	Leu	Val	Leu	His	Arg	Arg	Arg	Arg	Tyr	Lys
625					630					635					640
Lys	Lys	Gln	Val	Asp	Glu	Gln	Met	Arg	Asp	Asn	Ser	Pro	Val	His	Leu
				645					650					655	
Gln	Tyr	Ser	Met	Tyr	Gly	His	Lys	Thr	Thr	His	His	Thr	Thr	Glu	Arg
			660					665					670		
Pro	Ser	Ala	Ser	Leu	Tyr	Glu	Gln	His	Met	Gly	Ala	His	Glu	Glu	Leu
		675					680					685			
Lys	Leu	Met	Glu	Thr	Leu	Met	Tyr	Ser	Arg	Pro	Arg	Lys	Val	Leu	Val

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690					695					700					
Glu	Gln	Thr	Lys	Asn	Glu	Tyr	Phe	Glu	Leu	Lys	Ala	Asn	Leu	His	Ala
705					710					715					720
Glu	Pro	Asp	Tyr	Leu	Glu	Val	Leu	Glu	Gln	Gln	Thr				
				725					730						
<210> SEQ ID NO 106															
<211> LENGTH: 395															
<212> TYPE: PRT															
<213> ORGANISM: Homo sapiens															
<400> SEQUENCE: 106															
Met	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile
1				5					10					15	
Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp
			20					25					30		
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
		35					40					45			
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser
	50					55					60				
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His
65				70						75					80
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
			85						90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
			100						105				110		
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
		115					120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
	130					135					140				
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
145					150					155					160
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165						170					175	
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
			180					185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
		195					200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
	210					215					220				
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
225					230					235					240
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
			245						250					255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
		260						265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
	275						280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu
	290					295					300				
Lys	Leu	Pro	Thr	Lys	Ala	Pro	Gly	Leu	Ile	Pro	Tyr	Ile	Thr	Lys	Pro
305					310					315					320
Ser	Thr	Gln	Leu	Pro	Gly	Pro	Tyr	Cys	Pro	Ile	Pro	Cys	Asn	Cys	Lys

-continued

325					330					335					
Val	Leu	Ser	Pro	Ser	Gly	Leu	Leu	Ile	His	Cys	Gln	Glu	Arg	Asn	Ile
			340					345					350		
Glu	Ser	Leu	Ser	Asp	Leu	Arg	Pro	Pro	Gln	Asn	Pro	Arg	Lys	Leu	
			355				360					365			
Ile	Leu	Ala	Gly	Asn	Ile	Ile	His	Ser	Leu	Met	Lys	Ser	Ile	Leu	Trp
			370				375					380			
Ser	Lys	Ala	Ser	Gly	Arg	Gly	Arg	Arg	Glu	Glu					
			385				390					395			
<210> SEQ ID NO 107															
<211> LENGTH: 529															
<212> TYPE: PRT															
<213> ORGANISM: Homo sapiens															
<400> SEQUENCE: 107															
Met	Lys	Leu	Trp	Ile	His	Leu	Phe	Tyr	Ser	Ser	Leu	Leu	Ala	Cys	Ile
1				5					10					15	
Ser	Leu	His	Ser	Gln	Thr	Pro	Val	Leu	Ser	Ser	Arg	Gly	Ser	Cys	Asp
			20					25					30		
Ser	Leu	Cys	Asn	Cys	Glu	Glu	Lys	Asp	Gly	Thr	Met	Leu	Ile	Asn	Cys
			35				40					45			
Glu	Ala	Lys	Gly	Ile	Lys	Met	Val	Ser	Glu	Ile	Ser	Val	Pro	Pro	Ser
			50				55					60			
Arg	Pro	Phe	Gln	Leu	Ser	Leu	Leu	Asn	Asn	Gly	Leu	Thr	Met	Leu	His
				70					75					80	
Thr	Asn	Asp	Phe	Ser	Gly	Leu	Thr	Asn	Ala	Ile	Ser	Ile	His	Leu	Gly
				85					90					95	
Phe	Asn	Asn	Ile	Ala	Asp	Ile	Glu	Ile	Gly	Ala	Phe	Asn	Gly	Leu	Gly
			100					105					110		
Leu	Leu	Lys	Gln	Leu	His	Ile	Asn	His	Asn	Ser	Leu	Glu	Ile	Leu	Lys
			115				120					125			
Glu	Asp	Thr	Phe	His	Gly	Leu	Glu	Asn	Leu	Glu	Phe	Leu	Gln	Ala	Asp
			130				135					140			
Asn	Asn	Phe	Ile	Thr	Val	Ile	Glu	Pro	Ser	Ala	Phe	Ser	Lys	Leu	Asn
				150					155					160	
Arg	Leu	Lys	Val	Leu	Ile	Leu	Asn	Asp	Asn	Ala	Ile	Glu	Ser	Leu	Pro
			165					170						175	
Pro	Asn	Ile	Phe	Arg	Phe	Val	Pro	Leu	Thr	His	Leu	Asp	Leu	Arg	Gly
			180					185					190		
Asn	Gln	Leu	Gln	Thr	Leu	Pro	Tyr	Val	Gly	Phe	Leu	Glu	His	Ile	Gly
			195				200					205			
Arg	Ile	Leu	Asp	Leu	Gln	Leu	Glu	Asp	Asn	Lys	Trp	Ala	Cys	Asn	Cys
			210				215					220			
Asp	Leu	Leu	Gln	Leu	Lys	Thr	Trp	Leu	Glu	Asn	Met	Pro	Pro	Gln	Ser
				230					235					240	
Ile	Ile	Gly	Asp	Val	Val	Cys	Asn	Ser	Pro	Pro	Phe	Phe	Lys	Gly	Ser
				245				250						255	
Ile	Leu	Ser	Arg	Leu	Lys	Lys	Glu	Ser	Ile	Cys	Pro	Thr	Pro	Pro	Val
			260					265					270		
Tyr	Glu	Glu	His	Glu	Asp	Pro	Ser	Gly	Ser	Leu	His	Leu	Ala	Ala	Thr
			275				280					285			
Ser	Ser	Ile	Asn	Asp	Ser	Arg	Met	Ser	Thr	Lys	Thr	Thr	Ser	Ile	Leu

-continued

290	295	300
Lys Leu Pro Thr Lys Ala Pro Gly Leu Ile Pro Tyr Ile Thr Lys Pro 305 310 315 320		
Ser Thr Gln Leu Pro Gly Pro Tyr Cys Pro Ile Pro Cys Asn Cys Lys 325 330 335		
Val Leu Ser Pro Ser Gly Leu Leu Ile His Cys Gln Glu Arg Asn Ile 340 345 350		
Glu Ser Leu Ser Asp Leu Arg Pro Pro Gln Asn Pro Arg Lys Leu 355 360 365		
Ile Leu Ala Gly Asn Ile Ile His Ser Leu Met Asn Pro Ser Phe Gly 370 375 380		
Pro Lys His Leu Glu Glu Glu Glu Arg Asn Glu Lys Glu Gly Ser 385 390 395 400		
Asp Ala Lys His Leu Gln Arg Ser Leu Leu Glu Gln Glu Asn His Ser 405 410 415		
Pro Leu Thr Gly Ser Asn Met Lys Tyr Lys Thr Thr Asn Gln Ser Thr 420 425 430		
Glu Phe Leu Ser Phe Gln Asp Ala Ser Ser Leu Tyr Arg Asn Ile Leu 435 440 445		
Glu Lys Glu Arg Glu Leu Gln Gln Leu Gly Ile Thr Glu Tyr Leu Arg 450 455 460		
Lys Asn Ile Ala Gln Leu Gln Pro Asp Met Glu Ala His Tyr Pro Gly 465 470 475 480		
Ala His Glu Glu Leu Lys Leu Met Glu Thr Leu Met Tyr Ser Arg Pro 485 490 495		
Arg Lys Val Leu Val Glu Gln Thr Lys Asn Glu Tyr Phe Glu Leu Lys 500 505 510		
Ala Asn Leu His Ala Glu Pro Asp Tyr Leu Glu Val Leu Glu Gln Gln 515 520 525		

Thr

<210> SEQ ID NO 108

<211> LENGTH: 347

<212> TYPE: DNA

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 108

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caaaactgcag gagtcaggag ttggcctggg ggcgccctca cagagcctgt ccatcacatg      60
caccgtctca ggattctcat tgaccggcta tgggtgtaaac tgggttcgcc agcctccagg      120
aaagggctctg ggggtggctgg gaatgatttg gggcgatgga agcacagatt atacttcagc      180
tctccaatcc agactgagca tcaggaagga caattcaaga gccaaacttt cttaaaaaat      240
aacagtctgc aaactgatga cacagccagg tattactgtg ccagagatga agggagggga      300
ctctgtttga ttgctggggc caagggaacca cggtcaccgt ctctctca      347

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<210> SEQ ID NO 109

<211> LENGTH: 115

<212> TYPE: PRT

<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 109

Gln Thr Ala Gly Val Arg Ser Trp Pro Gly Gly Ala Leu Thr Glu Pro
1 5 10 15

-continued

Val	His	His	Met	His	Arg	Leu	Arg	Ile	Leu	Ile	Asp	Arg	Leu	Trp	Cys
			20					25					30		
Lys	Leu	Gly	Ser	Pro	Ala	Ser	Arg	Lys	Gly	Ser	Gly	Val	Ala	Gly	Asn
	35						40				45				
Asp	Leu	Gly	Arg	Trp	Lys	His	Arg	Leu	Tyr	Phe	Ser	Ser	Pro	Ile	Gln
	50				55					60					
Thr	Glu	His	Gln	Glu	Gly	Gln	Phe	Lys	Ser	Gln	Thr	Phe	Leu	Lys	Asn
65					70					75				80	
Asn	Ser	Leu	Gln	Thr	Asp	Asp	Thr	Ala	Arg	Tyr	Tyr	Cys	Ala	Arg	Asp
			85					90						95	
Glu	Gly	Arg	Gly	Leu	Cys	Leu	Ile	Ala	Gly	Ala	Lys	Gly	Pro	Arg	Ser
		100					105						110		
Pro	Ser	Pro													
		115													

<210> SEQ ID NO 110
 <211> LENGTH: 330
 <212> TYPE: DNA
 <213> ORGANISM: Homo sapiens

<400> SEQUENCE: 110

gacattcagc tgaccagtc tctgtcttc ttagctgtat ctctggggca gagggccacc	60
atctcataca gggccagcaa aagtgtcagt acatctggct atagttatat gcactggaac	120
caacagaaac caggacagcc acccagactc ctcattctatc ttgtatccaa cctagaatct	180
ggggtccttg ccaggttcag tggcagtggtg tctgggacag acttcaccct caacatccat	240
cctgtggagg aggaggatgc tgcaacctat tactgtcagc acattaggga gcttacacgt	300
tcggaggggg gaccaagctg gagatctaac	330

<210> SEQ ID NO 111
 <211> LENGTH: 110
 <212> TYPE: PRT
 <213> ORGANISM: Homo sapiens

<400> SEQUENCE: 111

Asp	Ile	Gln	Leu	Thr	Gln	Ser	Pro	Ala	Ser	Leu	Ala	Val	Ser	Leu	Gly
1				5				10					15		
Gln	Arg	Ala	Thr	Ile	Ser	Tyr	Arg	Ala	Ser	Lys	Ser	Val	Ser	Thr	Ser
	20						25					30			
Gly	Tyr	Ser	Tyr	Met	His	Trp	Asn	Gln	Gln	Lys	Pro	Gly	Gln	Pro	Pro
	35					40					45				
Arg	Leu	Leu	Ile	Tyr	Leu	Val	Ser	Asn	Leu	Glu	Ser	Gly	Val	Pro	Ala
	50				55					60					
Arg	Phe	Ser	Gly	Ser	Gly	Ser	Gly	Thr	Asp	Phe	Thr	Leu	Asn	Ile	His
65				70					75					80	
Pro	Val	Glu	Glu	Glu	Asp	Ala	Ala	Thr	Tyr	Tyr	Cys	Gln	His	Ile	Arg
		85						90					95		
Glu	Leu	Thr	Arg	Ser	Glu	Gly	Gly	Pro	Ser	Trp	Arg	Ser	Asn		
	100						105						110		

<210> SEQ ID NO 112
 <211> LENGTH: 115
 <212> TYPE: PRT
 <213> ORGANISM: Homo sapiens

<400> SEQUENCE: 112

-continued

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Gln Thr Ala Gly Val Arg Ser Trp Pro Gly Gly Ala Leu Thr Glu Pro
1           5           10           15
Val His His Met His Arg Leu Arg Ile Leu Ile Asp Arg Leu Trp Cys
                20           25           30
Lys Leu Gly Ser Pro Ala Ser Arg Lys Gly Ser Gly Val Ala Gly Asn
                35           40           45
Asp Leu Gly Arg Trp Lys His Arg Leu Tyr Phe Ser Ser Pro Ile Gln
                50           55           60
Thr Glu His Gln Glu Gly Gln Phe Lys Ser Gln Thr Phe Leu Lys Asn
65           70           75           80
Asn Ser Leu Gln Thr Asp Asp Thr Ala Arg Tyr Tyr Cys Ala Arg Asp
                85           90           95
Glu Gly Arg Gly Leu Cys Leu Ile Ala Gly Ala Lys Gly Pro Arg Ser
                100           105           110
Pro Ser Pro
                115

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<210> SEQ ID NO 113
<211> LENGTH: 110
<212> TYPE: PRT
<213> ORGANISM: Homo sapiens

<400> SEQUENCE: 113

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Asp Ile Gln Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1           5           10           15
Gln Arg Ala Thr Ile Ser Tyr Arg Ala Ser Lys Ser Val Ser Thr Ser
                20           25           30
Gly Tyr Ser Tyr Met His Trp Asn Gln Gln Lys Pro Gly Gln Pro Pro
                35           40           45
Arg Leu Leu Ile Tyr Leu Val Ser Asn Leu Glu Ser Gly Val Pro Ala
                50           55           60
Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Asn Ile His
65           70           75           80
Pro Val Glu Glu Glu Asp Ala Ala Thr Tyr Tyr Cys Gln His Ile Arg
                85           90           95
Glu Leu Thr Arg Ser Glu Gly Gly Pro Ser Trp Arg Ser Asn
                100           105           110

```

1. A method for detection, the method comprising:
 providing a test sample, and
 determining an expression level of a protein in the test sample, wherein the determining is achieved by measuring specific binding of a binding partner to the protein in the test sample,
 wherein the binding partner is a substance that specifically binds to a protein comprising the amino acid sequence of SEQ ID NO: 3.

2. The method of claim 1, which further comprises:
 providing a normal sample;
 determining an expression level of the protein in the normal sample, wherein the determining is achieved by measuring specific binding of the binding partner to the protein in the normal sample; and
 comparing the expression levels of the protein detected in the test sample and the normal sample.

3. The method of claim 1, wherein the binding partner is an antibody or antigen binding fragment thereof that specifically binds to a protein comprising the amino acid sequence of SEQ ID NO: 3.

4. The method of claim 3, wherein the antibody or fragment is monoclonal.

5. The method of claim 1, wherein the test sample is a bladder test sample.

6. The method of claim 2, wherein the normal sample is a normal bladder sample.

7. A method to detect the presence of malignancy in a tissue, which method comprises:

contacting said tissue with an antibody or antigen binding fragment thereof that binds specifically to a protein comprising amino acid sequence of SEQ ID NO: 3 under conditions wherein a complex is formed of said antibody or antigen binding fragment thereof with a protein present in said tissue, and,

detecting the presence of said complex,
wherein the presence of said complex indicates the presence of malignancy in said tissue.

8. The method of claim 7, wherein said antibody or fragment is monoclonal.

9. The method of claim 7, wherein the tissue is a bladder tissue.

10. The method of claim 7, wherein said detecting step comprises immunohistochemical analysis.

11. The method of claim 7, wherein said contacting is in situ.

12. The method of claim 7, wherein said contacting is on a Western blot.

13. The method of claim 7, wherein said contacting is on a tissue array.

* * * * *