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(51) International Patent Classification:

C07K 14/80 (2006.01) C07K 16/40 (2006.01)

C12N 15/53 (2006.01) C12N 9/02 (2006.01)

C12N 15/63 (2006.01)

(21) International Application Number:

PCT/AU2016/050449

(22) International Filing Date:

2 June 2016 (02.06.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2015902345 2 June 2015 (02.06.2015) AU

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6, 175 Eagle Street, Brisbane, Queensland 4000 (AU).(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,
PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: IMPROVED OXIDOREDUCTASES FOR BIOCATALYSIS

RKCIGETIARWEVFLFLAILLQQIEFSVPPGVKVDMTPIYGLTMKHARCEHFQVKPR

>N128 (SEQ ID NO:22)

-----FSIPISATELLLASAIFCLVFWVRAWQPRVPGKLSKSP
 GPWGWPILLGHVLTIGKPHLALSLRSQRYGVQLQIRIGSTPVLVLSGLDTRQALVRQGD
 DFKGRPDLYSFTLISDQSMFTNPDSPGVWAARRRLAQNALKSFSAIDPSSSSCYLEE
 HVSKEAEYLISKFQELMAGVGHFDPYRVVSVANVICMCFGQRYDHDQELLSLVNLNLS
 NEFGEVAASGNPAOFIPILRYLPNP---ALDAFKDLNKKFYSFLQKMKVKEHYKTFEKGHI
 -ROITDSLIEHCQDKLDEN--ANIQLSDEKIVNVVLQLFAGGFVTTTASWSLMYLV
 NPSVQKKIQEELDVTIGRARRPRLSDRPQLPYMEAFILETFRASSFPVPTIPHSITTRDTS
 LNGFYIPKGRCVFNQWQINHDPKLWGPSEFRPERFLTPCG-TINKALSEKVIILFGLGK
 RKCIGETIARWEVFLFLAILLQQIEFSVPPGVKVDMTPIYGLTMKHARCEHFQVKPR

>N127 (SEQ ID NO:23)

-----ELLLASAIFCLVFWVRAWQPRVPGKLSKSP
 GPWGWPILLGHVLTIGKPHLALSLRSQRYGVQLQIRIGSTPVLVLSGLDTRQALVRQGD
 DFKGRPDLYSFTLISDQSMFTNPDSPGVWAARRRLAQNALKSFSAIDPSSSSCYLEE
 HVSKEAEYLISKFQELMAGVGHFDPYRVVSVANVICMCFGQRYDHSNQELLSLVNNS
 HEFVETASSGNPVQFFPILRYLPNP---ALQRFKDFNQRFRLFLQKTVEHYKTFCKNNI
 -QDITGALFKHSDKSLANN---SSLPEEKIVNVLDIFGAGGFVTTTASWSLMYLV
 NPEVQKKIQEELDVTIGRARRPRLSDRPQLPYMEAFILETFRASSFPVPTIPHSITTRDTS
 LNGFYIPKGRCVFNQWQINHDPKLWGPSEFRPERFLTPCG-TINKALSEKVIILFGLGK
 RKCIGETIARWEVFLFLAILLQQIEFSVPPGVKVDMTPIYGLTMKHARCEHFQVKPR

Figure 1

(57) Abstract: Engineered ancestral P450 enzymes are provided, including engineered ancestral CYP1, CYP2, CYP4, and CYP4F enzymes. Also provided are methods for the production of these engineered ancestral P450 enzymes. The engineered ancestral enzymes may have one or more improved or enhanced properties relative to one or more existing P450 enzymes. These enzymes can be used to perform chemical reactions, such as for structure-activity relationship analysis; pharmacological testing; bioremediation; or biosensor technology.



WO 2016/191824 A1

TITLE

IMPROVED OXIDOREDUCTASES FOR BIOCATALYSIS

TECHNICAL FIELD

THE present invention relates to the use of oxidoreductases for biocatalysis. More particularly, the invention relates to isolated, engineered oxidoreductase proteins with improved characteristics for use in biocatalysis, and a process for developing these proteins.

BACKGROUND

Biocatalysis, the use of enzymes to perform chemical transformations of industrial relevance, is emerging as an attractive means of addressing bottlenecks in the synthesis and modification of new chemicals. The basic principle underpinning this is that enzymes can catalyse reactions with greater chemo-, regio- and stereo-selectivity than can be accomplished by purely chemical means. Additionally, biocatalysts have substantial utility in biosensor technology and for bioremediation. Oxidoreductases comprise a major proportion of biocatalysts exploited industrially. The P450 oxidoreductases are amongst the most versatile enzymes known, a property which has made them a high-priority target for exploitation as biocatalysts. Furthermore, P450 oxidoreductases can be used in the preparation of small quantities of metabolites for use as experimental standards, and P450 oxidoreductase-based biocatalytic assays have substantial potential for screening drug candidates.

In microorganisms, P450s tend to be specialized to interact in a highly efficient manner with a relatively small set of structurally related substrates. However, efficiency is generally markedly diminished when microbial P450 forms act on unnatural substrates. In multicellular organisms, certain P450s perform key roles in xenobiotic metabolism, including the metabolism of drugs. These P450s show unusual characteristics compared to other more typical enzyme catalysts in that they act on an extraordinarily wide spectrum of substrates; such xenobiotic-metabolizing P450s may therefore be useful in a broader range of biocatalytic applications. However, known xenobiotic-metabolizing P450s possess relatively poor catalytic efficiency and inefficient coupling of product formation to cofactor consumption when acting on any one substrate, as well as sub-optimal interactions with their principal redox partner, NADPH-cytochrome P450 reductase (referred to variously as NPR or CPR).

Process efficiency considerations mean that it is usually desirable to add high concentrations of substrates and generate high concentrations of product in bioreactors. Achieving high substrate concentrations may necessitate the use of organic solvents at concentrations that are deleterious to the activity or stability of most P450s. Another inherent difficulty with using P450s in an industrial context is their thermal and mechanical instability; this is particularly a problem for the lipophilic, membrane-bound, mammalian P450s, which typically need to be processed and stored in a high concentration of glycerol or some other cryoprotectant. Conducting reactions under increased temperature may also improve efficiency, however at temperatures above which a P450 is stable the deactivation of enzyme will negate efficiency gains.

The identification and/or development of P450s with enhanced properties for industrial applications is clearly desirable. To date, screening libraries of existing P450s for desired properties has been seen as more expedient than engineering a new catalyst from a nonspecialized precursor. However, improvements in protein engineering offer new scope to rapidly customize enzymes. Certain well-

characterized and relatively efficient bacterial P450 forms have been engineered to redefine their substrate specificity, regio and enantio-selectivity, and catalytic efficiency. However, one potential limitation of substrate-specific microbial P450-derived mutant proteins, particularly for medicinal chemistry applications, is that they will be unlikely to produce many minor metabolites that may be of interest. Thus, the xenobiotic-metabolising P450s (e.g. mammalian enzymes), may be useful for engineering proteins that can produce a wider range of metabolites.

SUMMARY

The invention is broadly directed to the production of "engineered ancestral" P450 enzymes. It is a preferred object of the invention to provide "engineered ancestral" P450 enzymes that display or possess one or more desirable properties that are at least partly absent in extant P450 enzymes or are relatively enhanced compared to extant P450 enzymes.

The invention is broadly directed to an isolated protein comprising the amino acid sequence of a CYP1 protein, a CYP2 protein, a CYP4 protein and/or a CYP4F protein disclosed herein, or an amino acid sequence at least 80% similar to any one of these.

In a first aspect, the invention provides an isolated protein comprising the amino acid sequence set forth in any one of SEQ ID NOS:1-159, or an amino acid sequence at least 80% similar to said sequences, or a fragment or derivative thereof.

In a second aspect, the invention provides an isolated protein comprising the amino acid sequence set forth in any one of SEQ ID NOS:1-23, any one of SEQ ID NOS:64-94, any one of SEQ ID NOS:142-151, or any one of SEQ ID NOS:152-155, or an amino acid sequence 80% similar to any one of these or a fragment or derivative thereof, wherein each amino acid sequence comprises residues $X_1 - X_n$, as defined with reference to Tables 1-4.

In one preferred embodiment of the second aspect, one or more of the residues $X_1 - X_n$ is selected from the respective group of variable amino acids as set forth in:

Table 1 with respect to SEQ ID NOS:1-23;
Table 2 with respect to SEQ ID NOS:64-94;
Table 3 with respect to SEQ ID NOS:142-151; or
Table 4 with respect to SEQ ID NOS:152-155.

In another preferred embodiment of the second aspect, each of the residues $X_1 - X_n$ is selected from the respective group of variable amino acids as set forth in:

Table 1 with respect to SEQ ID NOS:1-23;
Table 2 with respect to SEQ ID NOS:64-94;
Table 3 with respect to SEQ ID NOS:142-151; or
Table 4 with respect to SEQ ID NOS:152-155.

In a third aspect, the invention provides an isolated protein comprising the amino acid sequence set forth in any one of SEQ ID NOS:24-63, SEQ ID NOS:95-125 or SEQ ID NOS:156-159, or an amino acid sequence 80% similar to any of these, wherein said sequences comprise variations at one or more residues corresponding to $X_1 - X_n$ of a respective sequence set forth in SEQ ID NOS:1-23, SEQ ID NOS:64-94, or SEQ ID NOS:152-155, respectively.

Also provide are fragments and derivatives of the isolated proteins of the second and third aspects.

Suitably, the isolated protein of the first to third aspects has P450 activity.

5 In a fourth aspect, the invention provides a method of producing or constructing an isolated protein, said method including the step of producing or constructing an engineered ancestral amino acid sequence of at least a fragment of a P450 protein from one or more P450 proteins comprising amino acid sequences that are different to the engineered ancestral amino acid sequence, wherein the engineered ancestral P450 protein is a CYP1, CYP2, CYP4 or CYP4F engineered ancestral protein.

10 Suitably, the engineered ancestral P450 protein displays or possesses one or more increased or enhanced properties compared to at least one of the one or more P450 proteins comprising amino acid sequences that are different to the engineered ancestral amino acid sequence.

This aspect also relates to an isolated P450 protein produced according to the method of this aspect.

15 In one embodiment, the isolated protein having P450 enzyme activity is the isolated protein of the first aspect. Preferably, the isolated protein comprises an amino acid sequences set forth in any one of SEQ ID NOS:1-159.

20 In a fifth aspect, the invention provides a method of producing or constructing a modified engineered ancestral P450 protein, said method including the step of introducing one or more amino acid substitutions in an amino acid sequence of the engineered ancestral P450 protein to thereby produce or construct the modified engineered ancestral P450 protein, wherein the engineered ancestral P450 protein is a CYP1, CYP2, CYP4 or CYP4F engineered ancestral protein.

25 In certain preferred embodiments, the amino acid sequence into which the one or more amino acid substitutions is introduced is selected from any one of SEQ ID NOS:1-23, any one of SEQ ID NOS:47-63, any one of SEQ ID NOS:142-151, or any one of SEQ ID NOS:152-155. In preferred embodiments relating to said sequences the amino acid substitutions are at one or more of the residues $X_1 - X_n$, with reference to Tables 1-4, respectively.

30 In an embodiment of the fifth aspect relating to SEQ ID NOS:24-63, SEQ ID NOS:95-125, and SEQ ID NOS:156-159, preferably the amino acid substitutions are at one or more residues corresponding to $X_1 - X_n$ of a respective sequence set forth in SEQ ID NOS:1-23, SEQ ID NOS:64-94, or SEQ ID NOS:152-155, respectively.

Suitably, the modified engineered ancestral P450 protein displays or possesses one or more increased or enhanced properties compared to the engineered ancestral P450 protein.

In certain preferred embodiments, said amino acid substitutions are non-conservative substitutions.

35 This aspect also relates to a modified engineered ancestral P450 protein.

In a sixth aspect, the invention provides an isolated nucleic acid encoding an isolated protein, fragment or derivative of the first to third aspects, or produced according to the fourth or fifth aspects.

In a seventh aspect, the invention provides a genetic construct comprising an isolated nucleic acid of the sixth aspect.

In an eighth aspect, the invention provides a host cell comprising the genetic construct of the seventh aspect.

In a ninth aspect, the invention provides an antibody or antibody fragment which binds and/or is raised against an isolated protein of the first to third aspects, or produced according to the fourth or fifth aspects..

A tenth aspect of the invention relates to a composition for performing a chemical reaction, said composition comprising one or more isolated proteins of the first to third aspects, or produced according to the fourth or fifth aspect, and one or more buffers, solvents and/or other reagents suitable for performing the chemical reaction.

An eleventh aspect of the invention relates to a method of performing a chemical reaction, said method including the step of exposing one or more substrate molecules to one or more isolated proteins according to the first to third aspects, or produced according to the fourth or fifth aspects, or a composition of the tenth aspect, to thereby perform the chemical reaction.

A twelfth aspect of the invention relates to a reaction product produced according to the method of the eleventh aspect.

A thirteenth aspect of the invention provides for use of the isolated protein of the first to third aspects, or produced according to the fourth or fifth aspects, or the composition of the tenth aspect, for biocatalysis, preferably for structure-activity relationship analysis; pharmacological testing; bioremediation; or biosensor technology.

It will be appreciated that the indefinite articles “a” and “an” are not to be read as singular indefinite articles or as otherwise excluding more than one or more than a single subject to which the indefinite article refers. For example, “a” protein includes one protein, one or more proteins or a plurality of proteins.

As used herein, unless the context requires otherwise, the words “comprise”, “comprises” and “comprising” will be understood to mean the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

BRIEF DESCRIPTION OF THE FIGURES

In order that the invention may be readily understood and put into practical effect, preferred embodiments will now be described by way of example with reference to the accompanying figures.

Figure 1 sets forth amino acid sequences (in FASTA format) of ‘A0’ engineered ancestral CYP1 enzymes N9_A0; N13_A0; N18_A0; N14_A0; N27_A0; N20_A0; N207_A0; N72_A0; N98_A0; N25_A0; N58_A0; N53_A0; N52_A0; N17_A0; N21_A0; N134_A0; N223_A0; N224_A0; N29_A0; N46_A0; N45_A0; N128_A0; N127_A0. ‘-’ represents a gap.

Figure 2 sets forth amino acid sequences (in FASTA format) of ‘A1’ engineered ancestral CYP1 enzymes N9_A1; N13_A1; N18_A1; N14_A1; N27_A1; N20_A1; N207_A1; N72_A1; N98_A1; N25_A1; N58_A1; N53_A1; N52_A1; N17_A1; N21_A1; N134_A1; N223_A1; N224_A1; N29_A1; N46_A1; N45_A1; N128_A1; N127_A1.

Figure 3 sets forth amino acid sequences (in FASTA format) of ‘A2’ engineered ancestral CYP1 enzymes 1A1_Mammalia; 1A2_Mammalia; 1B_Mammal; 1A4-Aves; 1A5-Aves_&_1A4-Aves; 1A;

1A5-Aves; 1A_Mamallia_&_1A_Reptile_&_1A_Amphibia; 1A-Actinopterygii; 1AD; 1D; 1ADBC; 1D_Mammalia; 1C_Actinopterygii; 1BC; 1B_Actinopterygii; 1B.

Figure 4 sets forth amino acid sequences (in FASTA format) of 'A0' engineered ancestral CYP2 enzymes N3_A0; N8_A0; N13_A0; N24_A0; N38_A0; N54_A0; N81_A0; N82_A0; N118_A0; 5 N159_A0; N200_A0; N312_A0; N117_A0; N157_A0; N196_A0; N37_A0; N77_A0; N112_A0; N23_A0; N35_A0; N47_A0; N69_A0; N70_A0; N140_A0; N98_A0; N218_A0; N133_A0; N134_A0; N169_A0; N170_A0; N97_A0. '-' represents a gap.

Figure 5 sets forth amino acid sequences (in FASTA format) of 'A1' engineered ancestral CYP2 enzymes N3_A1; N8_A1; N13_A1; N24_A1; N38_A1; N54_A1; N81_A1; N82_A1; N118_A1; 10 N159_A1; N200_A1; N312_A1; N117_A1; N157_A1; N196_A1; N37_A1; N77_A1; N112_A1; N23_A1; N35_A1; N47_A1; N69_A1; N70_A1; N140_A1; N98_A1; N218_A1; N133_A1; N134_A1; N169_A1; N170_A1; N97_A1.

Figure 6 sets forth amino acid sequences (in FASTA format) of 'A2' engineered ancestral CYP2 enzymes 2A_Mammal; 2AG; 2B_Mammal; 2BS; 2BSAG; 2C1_Mammal; 2C2_Mammal; 15 2CE_Mammal; 2CE_Mammal_&_2C_Reptile_&_2C_Aves; 2CEH; 2E_Mammal; 2F_Mammal; 2FT; 2H; 2S_Mammal; 2C_Aves.

Figure 7 sets forth amino acid sequences (in FASTA format) of 'A0' engineered ancestral CYP4F enzymes N0_A0; N4_A0; N9_A0; N10_A0; N105_A0; N129_A0; N151_A0; N195_A0; N261_A0; N337_A0.

20 Figure 8 sets forth amino acid sequences (in FASTA format) of 'A0' engineered ancestral CYP4ABXZ enzymes N2_A0; N4_A0; N122_A0; and N198_A0.

Figure 9 sets forth thermostability profiles of the CYP2 engineered ancestral enzyme and, where present, selected extant proteins, after heating for A) 10 minutes and B) 60 minutes. Data represent the mean +/- standard deviation (SD) of three biological replicates.

25 (I) CYP2_N312_A1 (labelled CYP2A) engineered ancestral enzyme compared to extant CYP2a5, CYP2A6 and CYP2A13;

(II) CYP2_N157_A1 (labelled CYP2B) engineered ancestral enzyme compared to extant CYP2B6 and CYP2B1;

30 (III) CYP2_N133_A1 (labelled CYP2C) engineered ancestral enzyme compared to extant proteins CYP2C8, CYP2C9, CYP2C11 and CYP2C19;

(IV) CYP2_N170_A1 (labelled CYP2E) engineered ancestral enzyme compared to extant protein CYP2E1;

(V) CYP2_N77_A1 (labelled CYP2F) engineered ancestral enzyme compared to and an extant protein CYP2F3;

35 (VI) CYP2_N196_A1 (labelled CYP2S) engineered ancestral enzyme compared to extant protein CYP2S1;

(VII) CYP2_N117_A1 (labelled CYP2ABGSFT), CYP2_N82_A1 (labelled CYP2ABGS), and CYP2_N24_A1 (labelled CYP2BS) engineered ancestral enzymes;

40 (VIII) CYP2_N69_A1 (labelled CYP2ABGSFTCEH), CYP2_N23_A1 (labelled CYP2CEH), and CYP2_N13_A1 (labelled CYP2CE) engineered ancestral enzymes.

Figure 10 sets forth ligand binding curves for engineered ancestral CYP2 enzymes for clopidogrel, ticlopidine and ritonavir, or in the case of (V), binding to clopidogrel and ritonavir. (I) CYP2_N157; (II) CYP2_N117; (III) CYP2_N82; (IV) CYP2_N24; (V) CYP2_N13.

Figure 11 sets forth an overview of the processes used to generate engineered ancestral sequences from a pool of extant sequence data, for CYP4ABXZ. It will be appreciated that a similar process was used for generation of CYP1, CYP2, and CYP4F ancestral sequences. The sequences were first obtained by text and BLAST searching the Uniprot and NCBI databases. The resulting sequences were narrowed down to one sequence per gene per organism, both manually and through the use of the clustering website CD-HIT. Remaining sequences were aligned using the Clustal or MAFFT methods, and anomalous sequences were removed (i.e. those with sequencing errors, incomplete ORFs, internal gaps >10 residues, or <55% local or global identity to other forms). Insertions that were present in only a minority of sequences were removed. Sequences were then realigned with a closely related outgroup sequence from outside the clade of interest, and a phylogenetic tree was generated using ML with bootstrapping. The MSA and tree were sent to FastML for reconstruction using the Joint method, and the ancestral sequence for the node of interest was downloaded.

Figure 12 sets forth thermostability profiles of the CYP4ABXZ engineered ancestral enzyme and selected extant proteins.

Figure 13 sets forth a phylogenetic tree containing the sequences used to reconstruct the CYP4ABXZ ancestors.

Figure 14 sets forth an expanded view of the CYP4B clade (N4) from the previous the tree depicted in Figure 13. Although some sequences appear to be phylogenetically misplaced (labelled as unusual CYP4As), BLAST searching revealed that these sequences are actually highly homologous to CYP4B1 enzymes, and as such they are probably mis-annotated CYP4B1 enzymes.

Figure 15 sets forth amino acid sequences of engineered ancestral CYP4 proteins CYP4ABXZ (CYP4BXZ_N2_A1); CYP4B (CYP4ABXZ_N4_A1); CYP4A (CYP4ABXZ_N122_A1); CYP4XZ (CYP4ABXZ_N198_A1).

BRIEF DESCRIPTION OF THE SEQUENCE LISTING

30	SEQ ID NOS:1-23:	Amino acid sequences of A0 engineered ancestral CYP1 enzymes N9_A0; N13_A0; N18_A0; N14_A0; N27_A0; N20_A0; N207_A0; N72_A0; N98_A0; N25_A0; N58_A0; N53_A0; N52_A0; N17_A0; N21_A0; N134_A0; N223_A0; N224_A0; N29_A0; N46_A0; N45_A0; N128_A0; and N127_A0
35	SEQ ID NOS:24-46:	Amino acid sequences of A1 engineered ancestral CYP1 enzymes N9_A1; N13_A1; N18_A1; N14_A1; N27_A1; N20_A1; N207_A1; N72_A1; N98_A1; N25_A1; N58_A1; N53_A1; N52_A1; N17_A1; N21_A1; N134_A1; N223_A1; N224_A1; N29_A1; N46_A1; N45_A1; N128_A1; and N127_A1.
40	SEQ ID NOS:47-63:	Amino acid sequences of A2 engineered ancestral CYP1 enzymes 1A1_Mammalia; 1A2_Mammalia; 1B_Mammal; 1A4-Aves; 1A5-Aves_&_1A4-Aves; 1A; 1A5-Aves;

- 1A_Mamallia_&_1A_Reptile_&_1A_Amphibia; 1A-Actinopterygii; 1AD; 1D; 1ADBC; 1D_Mammalia; 1C_Actinopterygii; 1BC; 1B_Actinopterygii; and 1B.
- 5 SEQ ID NOS:64-94: Amino acid sequences of A0 engineered ancestral CYP2 enzymes N3_0; N8_A0; N13_A0; N24_A0; N38_A0; N54_A0; N81_A0; N82_A0; N118_A0; N159_A0; N200_A0; N312_A0; N117_A0; N157_A0; N196_A0; N37_A0; N77_A0; N112_A0; N23_A0; N35_A0; N47_A0; N69_A0; N70_A0; N140_A0; N98_A0; N218_A0; N133_A0; N134_A0; N169_A0; N170_A0; and N97_A0.
- 10 SEQ ID NOS:95-125: Amino acid sequences of A1 engineered ancestral CYP2 enzymes N3_1; N8_A1; N13_A1; N24_A1; N38_A1; N54_A1; N81_A1; N82_A1; N118_A1; N159_A1; N200_A1; N312_A1; N117_A1; N157_A1; N196_A1; N37_A1; N77_A1; N112_A1; N23_A1; N35_A1; N47_A1; N69_A1; N70_A1; N140_A1; N98_A1; N218_A1; N133_A1; N134_A1; N169_A1; N170_A1; and N97_A1.
- 15 SEQ ID NOS:126-141: Amino acid sequences of A2 engineered ancestral CYP2 enzymes 2A_Mammal; 2AG; 2B_Mammal; 2BS; 2BSAG; 2C1_Mammal; 2C2_Mammal; 2CE_Mammal; 2CE_Mammal_&_2C_Reptile_&_2C_Aves; 2CEH; 2E_Mammal; 2F_Mammal; 2FT; 2H; 2S_Mammal; and 2C_Aves.
- 20 SEQ ID NOS:142-151: Amino acid sequences of A0 engineered ancestral CYP4F enzymes N0_A0; N4_A0; N9_A0; N10_A0; N105_A0; N129_A0; N151_A0; N195_A0; N261_A0; and N337_A0.
- SEQ ID NOS:152-155: Amino acid sequences of A0 engineered ancestral CYP4ABXZ enzymes N2_A0; N4_A0; N122_A0; and N198_A0.
- 25 SEQ ID NOS:156-159:: Amino acid sequences of A1 engineered ancestral CYP4ABXZ enzymes CYP4ABXZ (CYP4BXZ_N2_A1); CYP4B (CYP4ABXZ_N4_A1); CYP4A (CYP4ABXZ_N122_A1); CYP4XZ (CYP4ABXZ_N198_A1).
- SEQ ID NOS:160-162: Amino acid sequences N-terminal modifications.

DETAILED DESCRIPTION

30 This invention relates to the design and production of engineered P450 enzymes that represent enzymes ancestral to extant P450 enzymes. The invention is at least partly predicated on the surprising discovery that said engineered ancestral enzymes P450 enzymes may have one or more increased or enhanced properties relative to one or more extant P450 enzymes.

35 For example, in certain embodiments an engineered ancestral enzyme of the invention has substantially increased thermal stability. This is a highly surprising discovery because the temperature conditions to which the hypothetical engineered ancestral enzyme may have been exposed are likely to be substantially similar to the temperature conditions to which one or more corresponding extant enzymes are exposed.

40 In other particular embodiments, “engineered ancestral” CYP1 enzymes have been created which are putative or hypothetical ancestors of extant P450 enzymes. In other particular embodiments,

“engineered ancestral” CYP2 enzymes have been created which are putative or hypothetical ancestors of extant P450 enzymes. In other particular embodiments, “engineered ancestral” CYP4 enzymes have been created which are putative or hypothetical ancestors of extant P450 enzymes. In other particular embodiments, “engineered ancestral” CYP4F enzymes have been created which are putative or hypothetical ancestors of extant P450 enzymes.

Furthermore, amino acid residues in the engineered ancestral CYP1, CYP2, CYP4, and CYP4F P450 enzymes have been identified that may be modified to confer, modify or remove one or more properties of the P450 enzymes. These include substrate specificity or promiscuity, thermal stability, pH stability and kinetic properties, although without limitation thereto.

For the purposes of this invention, by “*isolated*” is meant material that has been removed from its natural state or otherwise been subjected to human manipulation. Isolated material may be substantially or essentially free from components that normally accompany it in its natural state, or may be manipulated so as to be in an artificial state together with components that normally accompany it in its natural state. Isolated material may be in native, chemical synthetic or recombinant form.

By “*protein*” is meant an amino acid polymer. The amino acids may be natural or non-natural amino acids, D- or L- amino acids as are well understood in the art.

A “*peptide*” is a protein having no more than fifty (50) amino acids.

A “*polypeptide*” is a protein having more than fifty (50) amino acids.

As used herein terms such as “*oxidizing*” and “*oxidation*” refer to increasing the oxidation state of an atom, molecule or ion through a loss or transfer of one or more electrons from the atom, molecule or ion. Typically, oxidation is accompanied by an associated reduction in oxidation state of another atom, molecule or ion through a gain or transfer of one or more electrons by or to the atom, molecule or ion. These associated or linked changes in oxidation state are referred to as “*redox*” reactions.

As used herein a “*P450 enzyme*” or a “*protein having P450 enzyme activity*” is a protein having one or more activities of a P450 enzyme. A preferred activity is monooxygenase activity according to the reaction: $\text{RH} + \text{O}_2 + \text{NAD(P)H} + \text{H}^+ \rightarrow \text{ROH} + \text{H}_2\text{O} + \text{NAD(P)}^+$ where R is a carbon-containing heteroatom. Particular, non-limiting examples of such reactions include hydroxylation at aromatic and aliphatic centres, epoxidation, N-, O-, S-dealkylation and N-, and S-oxidation, acyl migration, oxidative dehalogenation, ring expansion, contraction and cleavage, C-C bond cleavage, denitrosation of N-nitrosamines, oxidative ester cleavage, aldehyde scissions (*e.g.* to alkenes and HCOOH), ipso attack on aromatic ring substituents and N- or O-dearylation. One or more other activities may include NO synthase-like activity, reductase activity (*e.g.* reductions of alkyl halides, N-oxides, nitro compounds, inorganic molecules such as SO₂, Cr(VI) or NO, desaturations (*e.g.* dehydrogenations), one electron oxidations, isomerizations and/or phospholipase D activity (*e.g.* phosphate ester hydrolysis). As used herein, “*CYP1 protein*” or “*CYP1 enzyme*” refers to another particular class or family of proteins having P450 enzyme activity. As used herein, “*CYP2 protein*” or “*CYP2 enzyme*” refers to another particular class or family of proteins having P450 enzyme activity. As used herein, “*CYP4 protein*” or “*CYP4 enzyme*” refers to a particular class or family of proteins having P450 enzyme activity. As used herein, “*CYP4ABXZ protein*” or “*CYP4ABXZ enzyme*” refers to a particular class or family of proteins having

P450 enzyme activity. As used herein, “*CYP4F protein*” or “*CYP4F enzyme*” refers to a particular class or family of proteins having P450 enzyme activity.

Typically, a redox partner is required for redox activity of a P450 enzyme. As used herein, a “*redox partner*” is a protein that facilitates the transfer of electrons from an electron donor molecule to a P450 enzyme. Generally, the redox partner of a P450 enzyme is a P450 reductase, although without limitation thereto.

As used herein, a “*P450 reductase*” or a “*protein having P450 reductase activity*” is a protein having one or more activities of a P450 reductase enzyme. A preferred activity is the transfer of electrons from an electron donor molecule to a P450 enzyme. As used herein, “*CPR protein*” or “*CPR enzyme*” refers to the “cytochrome P450 reductase” class or family of proteins having P450 reductase activity. Generally, a CPR enzyme comprises a “flavin adenine dinucleotide” (“FAD”) –binding domain and a “flavin mononucleotide” (“FMN”) –binding domain. The general scheme of electron flow during redox reactions involving CPR and P450 enzymes is: $\text{NADPH} \rightarrow \text{FAD} \rightarrow \text{FMN} \rightarrow \text{P450} \rightarrow \text{O}_2$, although without limitation thereto.

It will be appreciated that a P450 enzyme may have a diverse array of substrates including testosterone, progesterone, midozalam, nifedipine, tamoxifen, 9pharmacodyna A, erythromycin, cyclophosphamide, paracetamol, lignocaine, ethosuximide, codeine, lovastatin, 7-benzyloxy-4-(trifluoromethyl)-coumarin, 7-benzyloxyresorufin, terfenadine, S-omeprazole and benzyloxyluciferin; pesticides such as organochlorine pesticide, an organophosphate pesticide, or a pyrethroid pesticide; solvents such as perchloroethylene (PCE) or trichloroethylene (TCE); and food contaminants such as carbamate or organophosphate pesticide residues, although without limitation thereto.

Isolated proteins

In some embodiments, the isolated proteins comprising the amino acid sequence set forth in SEQ ID NOS:1-63, and variants thereof, may be referred to as proteins having P450 activity that is “ancestral” to one or more extant CYP1 proteins.

In some embodiments, the isolated proteins comprising the amino acid sequence set forth in SEQ ID NOS:64-141, and variants thereof, may be referred to as proteins having P450 activity that is “ancestral” to one or more extant CYP2 proteins.

In some embodiments, the isolated proteins comprising the amino acid sequence set forth in SEQ ID NOS:152-159, and variants thereof, may be referred to as proteins having P450 activity that is “ancestral” to one or more of extant CYP4 proteins, e.g. the proteins set out in Figures 13 and 14. The amino acid sequences (incorporated herein by reference to respective UniProt or NCBI accessions) used to generate the phylogenetic tree set forth in Figure 13, are the amino acid sequences of certain extant CYP4 (CYP4A, CYP4X, and CYP4Z) proteins of animals. The amino acid sequences (incorporated herein by reference to respective UniProt or NCBI accessions) used to generate the phylogenetic tree set forth in Figure 14, are the amino acid sequences of certain extant CYP4 (CYP4B) proteins of animals.

In some embodiments, the isolated proteins comprising the amino acid sequence set forth in SEQ ID NOS:142-151, and variants thereof, may be referred to as proteins having P450 activity that is “ancestral” to one or more extant CYP4F proteins.

Suitably, the isolated engineered ancestral CYP1 enzymes comprising any one of the sequences set forth in SEQ ID NOS:1-63, and variants thereof, have one or more improved or enhanced properties, as hereinbelow described, compared to one or more isolated extant CYP1 proteins.

5 Suitably, the isolated engineered ancestral CYP2 enzymes comprising any one of the sequences set forth in SEQ ID NOS:64-141, and variants thereof, have one or more improved or enhanced properties, as hereinbelow described, compared to one or more isolated extant CYP2 proteins.

Suitably, the isolated engineered ancestral CYP4 enzymes comprising any one of the sequences set forth in SEQ ID NOS:152-159, and variants thereof, have one or more improved or enhanced properties, as hereinbelow described, compared to one or more isolated extant CYP4 proteins.

10 Suitably, the isolated ancestral CYP4F enzymes comprising any one of the sequences set forth in SEQ ID NOS:142-151, and variants thereof, have one or more improved or enhanced properties, as hereinbelow described, compared to one or more isolated extant CYP4F proteins.

Non-limiting examples of the one or more improved properties of an engineered ancestral CYP1, CYP2, CYP4, or CYP4F enzyme as herein described include: thermal stability, stability in solvents (e.g. organic solvents), metabolite production, catalytic versatility, catalytic efficiency (e.g. the efficiency of coupling of product formation to cofactor consumption), substrate specificity (e.g. increased specificity or increased genericity, as desired) and enzyme kinetic properties (e.g. increased V_{max} , lower K_m), although without limitation thereto.

Certain embodiments also relate to fragments of the isolated proteins disclosed herein.

20 In one embodiment, a protein “*fragment*” includes an amino acid sequence that constitutes less than 100%, but at least 20%, 30%, 40%, 50%, 60%, 70%, 80% or 90-99% of said isolated protein.

In another embodiment, a protein fragment comprises no more than 6, 10, 12, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100, 120, 150, 200, 250, 300, 350 or 400 contiguous amino acids of the isolated protein.

25 In a preferred embodiment, the protein fragment has one or more activities of a P450 enzyme or P450 reductase enzyme as hereinbefore described.

In certain embodiments, the protein fragment does not comprise an N-terminal “membrane anchor” region, or comprise a partial N-terminal membrane anchor region.

30 In some embodiments, an isolated ancestral protein of the invention may comprise the N-terminal amino acid sequence MALLAVFL (SEQ ID NO:160), which may assist with protein expression, in place of a native N-terminal amino acid sequence.

In some embodiments, an isolated ancestral protein of the invention may comprise the N-terminal amino acid sequence: MALLAVFLGPVAASPWLLL
LLVGGSWLLARVLAWTYTFYDNCRRRLQCF (SEQ ID NO:161), which may assist with protein expression, in place of a native N-terminal amino acid sequence.

35 In some embodiments, an isolated ancestral protein of the invention may comprise the N-terminal amino acid sequence MAKKTSS (SEQ ID NO:162), which may assist with protein expression, in place of a native N-terminal amino acid sequence.

40 In some preferred embodiments, the invention relates to the engineered ancestral CYP1 sequences set forth in SEQ ID NOS:1-23, which are herein referred to as CYP1 ‘A0’ sequences, or fragments or variants thereof. It will be appreciated that these sequences were produced using the ‘whole

tree' approach as described in the examples, and feature gaps which relate to the alignment of the precursor sequences used to generate said sequences, and which gaps assist in defining preferred variation within the sequences, with reference to Table 1. It will be understood that an isolated CYP1 sequences with the sequence set forth in any one of SEQ ID NOS:1-23 possess the sequence of the amino acid residues, in consecutive order, without the gaps.

In some preferred embodiments, the invention relates to the engineered ancestral CYP1 sequences set forth in SEQ ID NOS:24-46, which are herein referred to as 'A1' sequences, or fragments or variants thereof. It will be appreciated that these sequences were produced using the 'whole tree' approach as described in the examples, and correspond to the A0 sequences with the same 'N' identifier (i.e. N9_A1 corresponds to N9_A0). However, the A1 sequences set forth in SEQ ID NOS:24-46 differ from the A0 sequences set forth in SEQ ID NOS:1-23, in that gap sequences are excluded, and the native N-terminal regions has been replaced with MAKKTSS, as hereinabove described.

In some preferred embodiments, the invention relates to the engineered ancestral CYP1 sequences set forth in SEQ ID NOS:47-63, which are herein referred to as CYP1 'A2' sequences, or fragments or variants thereof. It will be appreciated that these sequences were produced using the 'subfamily' approach and are related to particular A1 and A0 sequences, as described in the examples. The relationship of CYP1 A2 sequences to CYP1 A1 and A0 sequences is set forth in Table 12.

In some preferred embodiments, the invention relates to the engineered ancestral CYP2 sequences set forth in SEQ ID NOS:64-94, which are herein referred to as CYP1 'A0' sequences, or fragments or variants thereof. It will be appreciated that these sequences were produced using the 'whole tree' approach as described in the examples, and feature gaps which relate to the alignment of the precursor sequences used to generate said sequences, which gaps assist in defining preferred variation within the sequences, with reference to Table 2. It will be understood that isolated CYP2 sequences with the sequence set forth in any one of SEQ ID NOS:64-94 possess the sequence of the amino acid residues, in consecutive order, without the gaps.

In some preferred embodiments, the invention relates to the engineered ancestral CYP2 sequences set forth in SEQ ID NOS:95-125. It will be appreciated that these sequences were produced using the 'whole tree' approach as described in the examples, and correspond to the A0 sequences with the same 'N' identifier (i.e. N13_A1 corresponds to N13_A0). However, the A1 sequences set forth in SEQ ID NOS:95-125 differ from the A0 sequences set forth in SEQ ID NOS:64-94, in that gap sequences are excluded, and the native N-terminal regions has been replaced with MAKKTSS, as hereinabove described.

In some preferred embodiments, the invention relates to the engineered ancestral CYP2 sequences set forth in SEQ ID NOS:126-141. It will be appreciated that these sequences were produced using the 'subfamily' approach as described in the examples, and are related to particular A1 and A0 sequences. The relationship of CYP2 A2 sequences to CYP2 A1 and A0 sequences is set forth in Table 13.

In some preferred embodiments, the invention relates to the engineered ancestral CYP4F sequences set forth in SEQ ID NOS:142-151, which are herein referred to as CYP4F 'A0' sequences, or fragments or variants thereof. It will be appreciated that these sequences were produced using the 'whole

tree' approach as described in the examples, and feature gaps which relate to the alignment of the precursor sequences used to generate said sequences, and which gaps assist in defining preferred variation within the sequences, with reference to Table 3. It will be understood that isolated CYP4F sequences with the amino acid sequence set forth in any one of SEQ ID NOS:142-151 possess the sequence of the amino acid residues, in consecutive order, without the gaps.

In some preferred embodiments, the invention relates to the engineered ancestral CYP4ABXZ sequences set forth in SEQ ID NOS:152-155, which are herein referred to as CYP4ABXZ 'A0' sequences, or fragments or variants thereof. It will be appreciated that these sequences were produced using the 'whole tree' approach as described in the examples, and feature gaps which relate to the alignment of the precursor sequences used to generate said sequences, and which gaps assist in defining preferred variation within the sequences, with reference to Table 4. It will be understood that an isolated CYP4ABXZ sequence with the amino acid sequence set forth in any one of SEQ ID NOS:152-155 possess the sequence of the amino acid residues, in consecutive order, without the gaps.

In some preferred embodiments, the invention relates to the engineered ancestral CYP4ABXZ sequences set forth in SEQ ID NOS:156-159. It will be appreciated that these sequences were produced using the 'whole tree' approach as described in the examples, and correspond to the A0 sequences with the same 'N' identifier (e.g. CYP4ABXZ_N2_A0 corresponds to CYP4ABXZ_N2_A1). However, the A1 sequences set forth in SEQ ID NOS:156-159 differ from the A0 sequences set forth in SEQ ID NOS:152-155, in that gap sequences are excluded, and the native N-terminal regions has been replaced, as hereinabove described.

Variants

Certain embodiments of invention also relate to variants of an isolated protein of the invention. In a preferred embodiment, the protein variant has one or more activities of a P450 enzyme as hereinbefore described.

As used herein "*variant*" proteins of the invention have one or more amino acids deleted or substituted by different amino acids. It is well understood in the art that some amino acids may be substituted or deleted without changing the activity of the protein ("*conservative*" substitutions). More substantial changes to activity may be made by introducing substitutions or deletions that are less conservative ("*non-conservative*" substitutions).

Preferably, protein variants share at least 70% or 75%, preferably at least 80% or 85% or more preferably at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% sequence identity with an amino acid sequence of the isolated protein.

In other preferred embodiments, protein variants share at least 80% or 85% or more preferably at least 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% sequence identity with an amino acid sequence of the isolated protein, excluding the N-terminal membrane anchor region of said protein.

In certain embodiments, the protein fragment does not comprise an N-terminal "membrane anchor" region.

As will be understood by one skilled in the art, the N-terminal membrane anchor region of a P450 enzyme or P450 reductase enzyme of the invention may be substantially modified without substantially affecting the function of said protein.

Terms used generally herein to describe sequence relationships between respective proteins and nucleic acids include “comparison window”, “sequence identity”, “percentage of sequence identity” and “substantial identity”. Because respective nucleic acids/proteins may each comprise (1) only one or more portions of a complete nucleic acid/protein sequence that are shared by the nucleic acids/proteins, and (2) one or more portions which are divergent between the nucleic acids/proteins, sequence comparisons are typically performed by comparing sequences over a “comparison window” to identify and compare local regions of sequence similarity. A “*comparison window*” refers to a conceptual segment of typically 6, 9 or 12 contiguous residues that is compared to a reference sequence. The comparison window may comprise additions or deletions (*i.e.*, gaps) of about 20% or less as compared to the reference sequence for optimal alignment of the respective sequences. Optimal alignment of sequences for aligning a comparison window may be conducted by computerised implementations of algorithms (Geneworks program by Intelligenetics; GAP, BESTFIT, FASTA, and TFASTA in the Wisconsin Genetics Software Package Release 7.0, Genetics Computer Group, 575 Science Drive Madison, WI, USA, incorporated herein by reference) or by inspection and the best alignment (*i.e.*, resulting in the highest percentage homology over the comparison window) generated by any of the various methods selected. Reference also may be made to the BLAST family of programs as for example disclosed by Altschul *et al.*, 1997, Nucl. Acids Res. **25** 3389, which is incorporated herein by reference. A detailed discussion of sequence analysis can be found in Unit 19.3 of CURRENT PROTOCOLS IN MOLECULAR BIOLOGY Eds. Ausubel *et al.* (John Wiley & Sons Inc NY, 1995-1999).

The term “*sequence identity*” is used herein in its broadest sense to include the number of exact nucleotide or amino acid matches having regard to an appropriate alignment using a standard algorithm, having regard to the extent that sequences are identical over a window of comparison. Thus, a “*percentage of sequence identity*” is calculated by comparing two optimally aligned sequences over the window of comparison, determining the number of positions at which the identical nucleic acid base (*e.g.*, A, T, C, G, U) occurs in both sequences to yield the number of matched positions, dividing the number of matched positions by the total number of positions in the window of comparison (*i.e.*, the window size), and multiplying the result by 100 to yield the percentage of sequence identity. For example, “*sequence identity*” may be understood to mean the “match percentage” calculated by the DNASIS computer program (Version 2.5 for windows; available from Hitachi Software engineering Co., Ltd., South San Francisco, California, USA).

Certain preferred embodiments of the invention relate to variants of the A0 CYP1 ancestral sequences set forth in SEQ ID NOS:1-23.

Preferably, variants of the CYP1 ancestral sequences set forth in SEQ ID NOS:1-23, comprise amino acid variation at one or more of the amino acid residues $X_1 - X_n$, as set forth under the respective heading in Table 1. Detail regarding interpretation of the Table 1 data is provided in the table description below. By way of example, preferred variants of the CYP1 A0 ancestral sequence CYP1_N9_A0

comprise amino acid variation at one or more of the amino acid residues $X_1 - X_{476}$ set forth in Table 1 under the heading '(i) N9'.

Preferably, the amino acid at one or more of the amino acid residues $X_1 - X_n$ is selected from the group of consisting of the respective preferred amino acid variants given in Table 1. By way of example, at residue X_5 , preferred variants of CYP1_N9_A0 comprise an amino acid selected from the group consisting of: a deletion; L; M; A; P; and T.

Certain other preferred embodiments of the invention relate to variants of the A1 and A2 CYP1 ancestral sequences. Preferably, variation in the A1 and A2 CYP1 sequences corresponds to that for the A0 CYP1 sequences, with reference to Table 1. It will be understood that variation corresponding to that set forth in Table 1 in relation to the A0 CYP1 sequences set forth in SEQ ID NOS:1-23 can be readily determined for the A1 CYP1 sequences set forth in SEQ ID NOS:24-46, and the A2 CYP1 sequences set forth in SEQ ID NOS:47-63 in view of the relationship of the A0, A1, and A2 sequences, as herein described, for example using bioinformatic tools known to those skilled in the art.

Certain preferred embodiments of the invention relate to variants of the A0 CYP2 ancestral sequences set forth in SEQ ID NOS:64-94.

Preferably, variants of the CYP2 ancestral sequences set forth in SEQ ID NOS:64-94, comprise amino acid variation at one or more of the amino acid residues $X_1 - X_n$, as set forth under the respective heading in Table 2. Detail regarding interpretation of the Table 2 data is provided in the table description below. By way of example, preferred variants of the CYP2 ancestral sequence CYP2_N13_A0 comprise amino acid variation at one or more of the amino acid residues $X_1 - X_{444}$ set forth in Table 2 under the heading '(iii) N13'.

Preferably, the amino acid at one or more of the amino acid residues $X_1 - X_n$ is selected from the group of consisting of the respective preferred amino acid variants given in Table 2. By way of example, at residue X_5 , preferred variants of N13_A0 comprise an amino acid selected from the group consisting of: a deletion; G; S; and E.

Certain other preferred embodiments of the invention relate to variants of the A1 and A2 CYP2 ancestral sequences. Preferably, variation in the A1 and A2 CYP2 sequences corresponds to that for the A0 CYP2 sequences, with reference to Table 2. It will be understood that variation corresponding to that set forth in Table 2 in relation to the A0 CYP2 sequences set forth in SEQ ID NOS:64-94 can be determined for the A1 CYP2 sequences set forth in SEQ ID NOS:95-125, and the A2 CYP2 sequences set forth in SEQ ID NOS:126-141 in view of the relationship of the A0, A1, and A2 sequences, as herein described, for example using bioinformatic tools known to those skilled in the art.

Certain preferred embodiments of the invention relate to variants of the A0 CYP4F ancestral sequences set forth in SEQ ID NOS:142-151.

Preferably, variants of the A0 CYP4F ancestral sequences set forth in SEQ ID NOS:142-151 comprise amino acid variation at one or more of the amino acid residues $X_1 - X_n$, as set forth under the respective heading in Table 3. By way of example, preferred variants of the CYP4F ancestral sequence CYP4F_N0_A0 comprise amino acid variation at one or more of the amino acid residues $X_1 - X_{391}$ set forth in Table 3 under the heading '(i) N0'.

Preferably, the amino acid at one or more of the amino acid residues $X_1 - X_n$ is selected from the group of consisting of the respective preferred amino acid variants given in Table 3. By way of example, at residue X_7 , preferred variants of CYP4F_N0_A0 comprise an amino acid selected from the group consisting of: S; L; and V.

5 Certain preferred embodiments of the invention relate to variants of the A0 CYP4ABXZ ancestral sequences set forth in SEQ ID NOS:152-155.

Preferably, variants of the A0 CYP4ABXZ ancestral sequences set forth in SEQ ID NOS:152-155 comprise amino acid variation at one or more of the amino acid residues $X_1 - X_n$, as set forth under the respective heading in Table 4. By way of example, preferred variants of the CYP4ABXZ ancestral sequence CYP4ABXZ_N2_A0 comprise amino acid variation at one or more of the amino acid residues $X_1 - X_{411}$ set forth in Table 4 under the heading '(i) N2'.

Preferably, the amino acid at one or more of the amino acid residues $X_1 - X_n$ is selected from the group of consisting of the respective preferred amino acid variants given in Table 1. By way of example, at position X_1 , preferred variants of CYP4ABXZ_N2_A0 comprise an amino acid selected from the group consisting of: L; V; a deletion; F; I; and M.

Certain other preferred embodiments of the invention relate to variants of A1 ancestral CYP4ABXZ sequences. Preferably, variation in the A1 CYP4ABXZ sequences corresponds to that for the A0 CYP4ABXZ sequences, with reference to Table 4. It will be understood that variation corresponding to that set forth in Table 4 in relation to the A0 CYP4ABXZ sequences set forth in SEQ ID NOS:152-155 can readily be determined for the A1 CYP4ABXZ sequences set forth in SEQ ID NOS:149-152, in view of the relationship of the A0 and A1 sequences, as herein described, for example using bioinformatic tools known to those skilled in the art.

Preferably, variants of CYP1, CYP2, CYP4F, or CYP4ABXZ sequences as herein described do not contain variation at one or more of the amino acid positions which are not listed as X residues in Tables 1-4. In some embodiments, such amino acid positions may be referred to as 'conserved' positions. Preferably, said variants do not contain variation at any of said conserved positions.

In some preferred embodiments, variants of CYP1, CYP2, CYP4F, or CYP4ABXZ sequences as herein described do not contain variation at one or more of the amino acid positions corresponding to $X_1 - X_n$, wherein the most frequent amino acid residue in the alignment used to construct the A0 sequence is 80% or less. In some embodiments, such amino acid positions may be referred to as 'semi-conserved' positions. Preferably, said variants do not contain variation at any of said semi-conserved positions.

In this respect, as hereinbelow described, the frequency of the preferred amino acid variants for a given A0 sequence, at a given amino acid X residue, is presented in respective Tables 1-4.

By way of example with respect to CYP1 variants, Table 1 sets forth that for CYP1_N9_A0, at residue X_{204} (corresponding to amino acid position 225) the frequency of the most frequent amino acid residue ('R', with frequency of 85%) is greater than 80%. Therefore, in certain preferred embodiments, variants of CYP1_N9_A0 do not comprise variation at residue X_{204} . Furthermore, in certain preferred embodiments, variants of the A1 and/or A2 CYP1 sequences corresponding to CYP1_N9_A0 do not comprise variation at the respective positions corresponding to residue X_{204} of CYP1_N9_A0.

By way of example with respect to CYP2 variants, Table 2 sets forth that for CYP2_N13_A0, at residue X₃₄₉ (corresponding to amino acid position 394) the frequency of the most frequent amino acid residue ('F' with frequency of 94%) is greater than 80%. Therefore, in certain preferred embodiments, variants of CYP2_N13_A0 do not comprise variation at residue X₃₄₉. Furthermore, in certain preferred
5 embodiments, variants of the A1 and/or A2 CYP1 sequences corresponding to CYP2_N13_A0 do not comprise variation at the respective positions corresponding to position X₃₄₉ of CYP2_N13_A0.

The skilled person will readily appreciate the principle of the above examples also applies in the context of CYP4F and CYP4ABXZ sequences.

10 *Derivatives*

Certain embodiments also relate to derivatives of an isolated protein of the present invention. In a preferred embodiment, the derivative protein has one or more activities of a P450 enzyme as hereinbefore described.

As used herein, "derivative" proteins have been altered, for example by conjugation or
15 complexing with other chemical moieties, by post-translational modification (*e.g.* phosphorylation, acetylation *etc.*), modification of glycosylation (*e.g.* adding, removing or altering glycosylation) and/or inclusion of additional amino acid sequences as would be understood in the art.

Additional amino acid sequences may include fusion partner amino acid sequences which create a fusion protein. By way of example, fusion partner amino acid sequences may assist in detection and/or
20 purification of the isolated fusion protein. Non-limiting examples include metal-binding (*e.g.* polyhistidine) fusion partners, maltose binding protein (MBP), Protein A, glutathione S-transferase (GST), fluorescent protein sequences (*e.g.* GFP), epitope tags such as myc, FLAG and haemagglutinin tags.

For the particular purpose of fusion polypeptide purification by affinity chromatography,
25 relevant matrices for affinity chromatography include glutathione-, amylose-, and nickel- or cobalt-conjugated resins respectively. Many such matrices are available in kit form, such as the QIAexpress™ system (Qiagen) useful with (HIS₆) fusion partners and the Pharmacia GST purification system.

Preferably, the fusion partners also have protease cleavage sites, such as for Factor X_a or Thrombin, which allow the relevant protease to partially digest the fusion polypeptide of the invention
30 and thereby liberate the recombinant polypeptide of the invention therefrom. The liberated polypeptide can then be isolated from the fusion partner by subsequent chromatographic separation.

Other derivatives contemplated by the invention include, but are not limited to, modification to amino acid side chains, incorporation of unnatural amino acids and/or their derivatives during peptide,
35 polypeptide or protein synthesis and the use of crosslinkers and other methods which impose conformational constraints on the isolated protein, fragments and variants disclosed herein.

Methods for producing engineered ancestral proteins

In another aspect, the invention provides a method of producing or constructing an isolated protein, said method including the step of producing or constructing an engineered ancestral amino acid

sequence of at least a fragment of a P450 protein amino acid sequences from one or more P450 amino acid sequences that are different to the engineered ancestral amino acid sequence.

Suitably, the engineered ancestral P450 protein displays or possesses one or more increased or enhanced properties compared to at least one of the one or more P450 protein amino acid sequences that are different to the engineered ancestral amino acid sequence.

Non-limiting examples of the one or more increased or enhanced properties of the protein include thermal stability, stability in solvents (e.g. organic solvents), metabolite production, catalytic versatility, catalytic efficiency (e.g. the efficiency of coupling of product formation to cofactor consumption), ligand binding capacity (e.g. increased or decreased strength of binding; and/or increased or decreased specificity of binding, as desired), substrate specificity (e.g. increased specificity or increased genericity, as desired), enzyme kinetic properties (e.g. increased $V_{\max}$, lower K_m), ability to couple to a diversity of proteins (e.g. P450s and/or other electron acceptor proteins), and ability to use a diversity of electron donors (e.g. both NADPH and NADH, or NADH preferentially as an electron donor), although without limitation thereto.

Suitably, the engineered ancestral protein having P450 enzyme activity is distinct from any of a plurality of corresponding “*extant*” enzymes encoded by respective genomes of different organisms, such as those proteins used to construct or produce the engineered ancestral protein. In this regard, it will be appreciated by persons skilled in the art that a protein comprising an amino acid sequence comprised by the engineered ancestral protein having P450 or P450 reductase enzyme activity may or may not ever have actually existed until its construction according to the method of the invention.

In some embodiments of the method, the step of producing or constructing an engineered ancestral amino acid sequence of at least a fragment of a P450 protein comprises the use of one or more computational methods for the reconstruction of engineered ancestral DNA and/or amino acid sequences. As will be understood by one skilled in the art, such methods can include “maximum parsimony” methods, “maximum likelihood” methods, and “Bayesian inference” methods. In some embodiments, said one or more computational methods include a “marginal likelihood” method and/or a “joint likelihood” method.

In some embodiments of the method, the construction of a sequence of a hypothetical engineered ancestral protein comprises the use of one or more software tools for the reconstruction of engineered ancestral DNA and/or amino acid sequences. Said software tools may include, although without limitation thereto, FastML (Ashkenazy *et al.* 2012), Phylobayes 3 (Lartillot *et al.* 2009) and/or one or more of those listed at http://topicpages.ploscompbiol.org/wiki/Engineeredancestral_reconstruction#Software, incorporated herein by reference.

According to some embodiments of the method, “*evolutionary intermediate sequences*” may be calculated or constructed using one or more software tools, wherein said evolutionary intermediate sequences may or may not have ever existed prior to construction according to the method.

In some embodiments of the method, an evolutionary tree is constructed for the engineered ancestral P450 or P450 reductase protein using one or more of the aforementioned computational methods and/or software tools, and amino acid sequences which represent nodes within the evolutionary

tree are identified. As used herein, a “node” within an evolutionary tree represents a common ancestor of the descendants that share or are linked by the node.

In some embodiments, said sequence which represents a node within the evolutionary tree may be constructed based on the whole tree, and referred to herein as “whole tree” ancestor sequences. As hereinabove described, A0 and A1 sequences may be referred to as a “whole tree” ancestor sequences. By way of example, SEQ ID NOS:1-23 and SEQ ID NOS:24-46 may be referred to as whole tree CYP1 ancestor sequences.

In other embodiments, said sequence which represents a node within the evolutionary tree may be constructed based on subfamily sequences, and referred to herein as a “subfamily” ancestor sequence. As hereinabove described, A2 sequences may be referred to as subfamily sequences. By way of example, SEQ ID NOS:47-63 may be referred to as subfamily CYP1 ancestor sequences.

In one embodiment, the isolated protein having P450 enzyme activity produced according to the method is an isolated engineered ancestral CYP1 protein as hereinbefore described. In certain particular embodiments, the isolated engineered ancestral CYP1 protein comprises an amino acid sequence set forth in any one of SEQ ID NOS:1-63

In one embodiment, the isolated protein having P450 enzyme activity produced according to the method is an isolated engineered ancestral CYP2 protein as hereinbefore described. In certain particular embodiments, the isolated engineered ancestral CYP2 protein comprises an amino acid sequence set forth in any one of SEQ ID NOS:64-141.

In one embodiment, the isolated protein having P450 enzyme activity produced according to the method is an isolated engineered ancestral CYP4F protein as hereinbefore described. In certain particular embodiments, the isolated engineered ancestral CYP4F protein comprises an amino acid sequence set forth in any one of SEQ ID NOS:142-151.

In one embodiment, the isolated protein having P450 enzyme activity produced according to the method is an isolated engineered ancestral CYP4ABXZ protein as hereinbefore described. In certain particular embodiments, the isolated engineered ancestral CYP4ABXZ protein comprises an amino acid sequence set forth in any one any one of SEQ ID NOS:152-159.

This aspect also relates to a modified engineered ancestral P450 protein produced according to the method of this aspect.

In yet another aspect, the invention provides a method of producing or constructing a modified engineered ancestral P450 protein, said method including the step of introducing one or amino acid substitutions in an amino acid sequence of the engineered ancestral P450 protein to thereby produce or construct the modified engineered ancestral P450 protein.

Suitably, the modified engineered ancestral P450 protein displays or possesses one or more increased or enhanced properties compared to the engineered ancestral P450 protein.

Non-limiting examples of the one or more improved or enhanced properties of the protein include thermal stability, stability in solvents (e.g. organic solvents), metabolite production, catalytic versatility, catalytic efficiency (e.g. the efficiency of coupling of product formation to cofactor consumption), substrate specificity (e.g. increased specificity or increased genericity, as desired) and enzyme kinetic properties (e.g. increased $V_{\max}$, lower K_m).

In certain preferred embodiments, said amino acid substitutions comprise functional or functionally important amino acids comprised by an engineered ancestral P450 protein. In certain embodiments a functional or functionally important amino acid is one which is known or predicted to substantially affect a protein property or function, such as hereinbefore described.

5 In certain other preferred embodiments, said amino acid substitutions comprise amino acid positions wherein there is low prediction confidence within an engineered ancestral P450 protein sequence constructed using one or more computational methods and/or software tools, such as the computational methods and/or software tools as hereinbefore described.

10 Said modifications may comprise amino acid positions wherein there is variation amongst a plurality of hypothetical engineered ancestral protein sequences constructed for the P450 enzyme using different software tools and/or computational methods, although without limitation thereto.

In certain other preferred embodiments, said amino acid substitutions comprise amino acid positions wherein there is variation amongst extant and/or evolutionary intermediate sequences used to construct nodes within an evolutionary tree constructed for the hypothetical engineered ancestral P450 protein, as hereinbefore described.

15 In certain preferred embodiments, the modified engineered ancestral P450 protein is a modified CYP1 protein. In certain embodiments, the modified engineered ancestral CYP1 protein comprises a CYP1 A0 sequence with preferred variations as hereinabove described, with reference to Table 1. In certain other embodiments, the modified engineered ancestral CYP1 protein comprises a CYP1 A1 or CYP1 A2 sequence with variations corresponding to said preferred CYP1 A0 variations, as hereinabove described.

20 In certain preferred embodiments, the modified engineered ancestral P450 protein is a modified CYP2 protein. In certain embodiments, the modified engineered ancestral CYP2 protein comprises a CYP2 A0 sequence with preferred variations as hereinabove described, with reference to Table 2. In certain other embodiments, the modified engineered ancestral CYP2 protein comprises a CYP2 A1 or CYP2 A2 sequence with variations corresponding to said preferred CYP2 A0 variations, as hereinabove described.

25 In certain preferred embodiments, the modified engineered ancestral P450 protein is a modified CYP4F protein. In certain embodiments, the modified engineered ancestral CYP4F protein comprises a CYP4F A0 sequence with preferred variations as hereinabove described, with reference to Table 3.

30 In certain preferred embodiments, the modified engineered ancestral P450 protein is a modified CYP4ABXZ protein. In certain embodiments, the modified engineered ancestral CYP4ABXZ protein comprises a CYP4ABXZ A0 sequence with preferred variations as hereinabove described, with reference to Table 4. In certain other embodiments, the modified engineered ancestral CYPFABXZ protein comprises a CYP4ABXZ A1 sequence with variations corresponding to said preferred CYPFABXZ A0 variations, as hereinabove described.

35 In certain embodiments, an isolated engineered ancestral protein of the invention has enhanced thermal stability compared to one or more corresponding extant animal proteins.

40 In certain embodiments, thermal stability is the ability of a protein to resist "thermal deactivation". As used herein, "thermal deactivation" refers to the loss of a properly folded state of a

protein as a result of exposure to heat, and/or the loss of enzyme activity of a protein as a result of exposure to heat.

A measure of thermal stability may be expressed as a $^{\circ}\text{T}_{50}$ temperature ($^{\circ}\text{C}$) or “T50” for folded protein, wherein 50% of protein is properly folded after exposure to said temperature for a duration of x minutes. For example, the $^{10}\text{T}_{50}$ for CYP4ABXZ_N1 is about 69 ± 1 (FIG. X). Another measure of thermal stability may be expressed as a $^{\circ}\text{T}_{50}$ temperature ($^{\circ}\text{C}$) or T50 for enzyme activity, wherein there is 50% of enzyme activity after exposure to said temperature for a duration of x minutes.

Thermal stability may also be measured as the percentage of properly folded protein (%) after exposure to a given temperature ($^{\circ}\text{C}$) for a given duration (min), and/or the percentage of enzyme activity (%) after exposure to a given temperature ($^{\circ}\text{C}$) for a given duration (min).

Yet another measure of thermal stability may be “*thermal deactivation energy*” (E_a) which can be defined as the minimum energy that is required to cause thermal deactivation of a protein.

In one particular embodiment, the isolated engineered ancestral CYP4ABXZ_N1 protein of the invention has enhanced thermal stability compared to one or more extant CYP4 proteins, e.g. one or more of the isolated proteins comprising the amino acid sequences of the CYP4A, CYP4X, CYP4Z and CYP4B proteins set out in Figure 13-14.

As will be evident from Figure 12 and the examples herein, isolated CYP4ABXZ_N1 displayed substantially greater thermal stability than certain extant animal CYP4 proteins.

It will be further evident from Figure 9 and the examples herein that certain isolated engineered ancestral CYP2 proteins possessed greater thermal stability than certain extant CYP2 proteins.

In certain particular embodiments, an isolated engineered ancestral protein of the invention has enhanced solvent stability compared to one or more of the corresponding extant animal proteins.

One measure of solvent stability may be the ability of a protein to adopt a properly folded state at a given concentration of solvent. Another measure of solvent stability may be the enzyme activity of a protein at a given concentration of solvent.

Preferably, said solvent is an organic solvent including, but not limited to: a polar protic solvent including an alcohol, e.g. ethanol, methanol, and isopropanol; a polar aprotic solvent e.g. dimethyl sulfoxide (DMSO), and acetonitrile; and a non-polar solvent including saturated and unsaturated hydrocarbon molecules and aromatic molecules.

In certain other embodiments, an isolated engineered ancestral protein of the invention has altered binding affinity for one or more ligands as compared to one or more corresponding extant animal proteins. By way of example, ligand binding for certain engineered ancestral CYP2 proteins is set forth in Figure 10.

One measure of ligand binding may be a “dissociation constant” (K_d) in molar units. As will be understood by those skilled in the art, K_d indicates the concentration of ligand at which the binding site on a particular protein is half occupied. Therefore, it will be understood that a lower K_d value indicates a higher binding affinity of a protein for a given ligand.

In some preferred embodiments, said one or more ligands comprise a macrolide (e.g. azithromycin, troleandomycin, clarithromycin, erythromycin, and telithromycin) and/or a benzodiazepine

(e.g. 2-keto benzodiazepines such as diazepam, and imidazo benzodiazepines such as midazolam, although without limitation thereto).

In certain other embodiments, the activity of an isolated protein of the invention in a reaction comprising a given substrate produces a different metabolite profile, as compared to the activity of one or more extant animal proteins in a corresponding reaction comprising said substrate.

In certain embodiments, the different metabolite profile may comprise one or more metabolites that are present or absent, and/or a relative increase or decrease in one or more metabolites.

Isolated nucleic acids

Another aspect of the invention provides an isolated nucleic acid that encodes an isolated protein of the invention, inclusive of fragments, variants and derivatives of the isolated protein.

The term “*nucleic acid*” as used herein designates single-or double-stranded DNA and RNA. DNA includes genomic DNA and cDNA. RNA includes mRNA, RNA, RNAi, siRNA, cRNA and autocatalytic RNA. Nucleic acids may also be DNA-RNA hybrids. A nucleic acid comprises a nucleotide sequence which typically includes nucleotides that comprise an A, G, C, T or U base. However, nucleotide sequences may include other bases such as inosine, methylcytosine, methylinosine, methyladenosine and/or thiouridine, although without limitation thereto.

A “*polynucleotide*” is a nucleic acid having eighty (80) or more contiguous nucleotides, while an “*oligonucleotide*” has less than eighty (80) contiguous nucleotides.

A “*probe*” may be a single or double-stranded oligonucleotide or polynucleotide, suitably 21narmaco for the purpose of detecting complementary sequences in Northern or Southern blotting, for example.

A “*primer*” is usually a single-stranded oligonucleotide, preferably having 15-50 contiguous nucleotides, which is capable of annealing to a complementary nucleic acid “template” and being extended in a template-dependent fashion by the action of a DNA polymerase such as *Taq* polymerase, RNA-dependent DNA polymerase or SequenaseTM.

Another particular aspect of the invention provides a variant of an isolated nucleic acid that encodes an isolated protein, variant, fragment or derivative disclosed herein. In a preferred embodiment, nucleic acid variants share at least 60% or 65%, preferably at least 70% or 75%, more preferably at least 80% or 85%, and even more preferably at least 90% or 95% nucleotide sequence identity with an isolated nucleic acid that encodes one or more of the isolated proteins of the invention.

In yet another embodiment, nucleic acid variants hybridize to isolated nucleic acids of the invention, under at least low stringency conditions, preferably under at least medium stringency conditions and more preferably under high stringency conditions.

“*Hybridize and Hybridization*” is used herein to denote the pairing of at least partly complementary nucleotide sequences to produce a DNA-DNA, RNA-RNA or DNA-RNA hybrid. Hybrid sequences comprising complementary nucleotide sequences occur through base-pairing between complementary purines and pyrimidines as are well known in the art.

In this regard, it will be appreciated that modified purines (for example, inosine, methylinosine and methyladenosine) and modified pyrimidines (thiouridine and methylcytosine) may also engage in base pairing.

5 “Stringency” as used herein, refers to temperature and ionic strength conditions, and presence or absence of certain organic solvents and/or detergents during hybridisation. The higher the stringency, the higher will be the required level of complementarity between hybridizing nucleotide sequences.

“High stringency conditions” designates those conditions under which only nucleic acid having a high frequency of complementary bases will hybridize.

Reference herein to high stringency conditions include and encompass:-

- 10 (i) from at least about 31% v/v to at least about 50% v/v formamide and from at least about 0.01 M to at least about 0.15 M salt for hybridisation at 42°C, and at least about 0.01 M to at least about 0.15 M salt for washing at 42°C;
- (ii) 1% BSA, 1 mM EDTA, 0.5 M NaHPO₄ (pH 7.2), 7% SDS for hybridization at 65°C, and (a) 0.1 x SSC, 0.1% SDS; or (b) 0.5% BSA, 1mM EDTA, 40 mM NaHPO₄ (pH 7.2), 1% SDS for washing at a temperature in excess of 65°C for about one hour; and
- 15 (iii) 0.2 x SSC, 0.1% SDS for washing at or above 68°C for about 20 minutes.

In general, washing is carried out at $T_m = 69.3 + 0.41 (G + C) \% - 12^{\circ}\text{C}$. In general, the T_m of a duplex DNA decreases by about 1°C with every increase of 1% in the number of mismatched bases.

20 Notwithstanding the above, stringent conditions are well known in the art, such as described in Chapters 2.9 and 2.10 of. Ausubel *et al.*, *supra*. A skilled addressee will also recognize that various factors can be manipulated to optimize the specificity of the hybridization. Optimization of the stringency of the final washes can serve to ensure a high degree of hybridization.

In other embodiments, isolated nucleic acid variants may be producing using a nucleic acid amplification technique. Suitable nucleic acid amplification techniques are well known to the skilled addressee, and include polymerase chain reaction (PCR); strand displacement amplification (SDA); rolling circle replication (RCR); nucleic acid sequence-based amplification (NASBA), Q-β replicase amplification and helicase-dependent amplification, although without limitation thereto.

As used herein, an “*amplification product*” refers to a nucleic acid product generated by nucleic acid amplification.

Particularly for analytical purposes, nucleic acid amplification techniques may include quantitative and semi-quantitative techniques such as qPCR, real-time PCR and competitive PCR, as are well known in the art.

Suitably, isolated nucleic acid variants may be producing using nucleic acid amplification techniques using one or more degenerate primers based on, or derived from, a nucleotide sequence of an isolated nucleic acid disclosed herein. By way of example, the degenerate primer(s) may be designed to anneal to one or more nucleotide sequences of a variant nucleic acid to thereby facilitate amplification of the variant nucleic acid, or a fragment thereof.

40 **Genetic constructs**

Yet another aspect of the invention provides a genetic construct that comprises an isolated nucleic acid or variant as herein described and one or more additional nucleotide sequences.

Suitably, the genetic construct is in the form of, or comprises genetic components of, a plasmid, bacteriophage, a cosmid, a yeast or bacterial artificial chromosome as are well understood in the art.

5 Genetic constructs may be suitable for maintenance and propagation of the isolated nucleic acid in bacteria or other host cells, for manipulation by recombinant DNA technology and/or expression of the nucleic acid or an encoded protein of the invention.

For the purposes of host cell expression, the genetic construct is an expression construct. Suitably, the expression construct comprises one or more nucleic acid or variants disclosed herein operably linked to one or more additional sequences in an expression vector.

10 An “*expression vector*” may be either a self-replicating extra-chromosomal vector such as a plasmid, or a vector that integrates into a host genome.

By “*operably linked*” is meant that said additional nucleotide sequence(s) is/are positioned relative to the nucleic acid of the invention preferably to initiate, regulate or otherwise control transcription.

15 In one embodiment, the additional nucleotide sequences are regulatory sequences. Regulatory nucleotide sequences will generally be appropriate for the host cell used for expression. Numerous types of appropriate expression vectors and suitable regulatory sequences are known in the art for a variety of host cells.

20 Typically, said one or more regulatory nucleotide sequences may include, but are not limited to, promoter sequences, leader or signal sequences, ribosomal binding sites, transcriptional start and termination sequences, translational start and termination sequences, and enhancer or activator sequences.

Constitutive or inducible promoters as known in the art are contemplated by the invention. The promoters may be either naturally occurring promoters, or hybrid promoters that combine elements of more than one promoter.

25 In another embodiment, the additional nucleotide sequence is a selectable marker gene to allow the selection of transformed host cells. Selectable marker genes are well known in the art and will vary with the host cell used.

30 The expression construct may also include an additional nucleotide sequence encoding a fusion partner (typically provided by the expression vector) so that the recombinant polypeptide of the invention is expressed as a fusion protein, as hereinbefore described.

Isolated proteins of the invention (inclusive of fragments, derivatives and homologs) may be prepared by any suitable procedure known to those of skill in the art. Preferably, the isolated protein is a recombinant protein.

35 By way of example only, a recombinant isolated protein of the invention may be produced by a method including the steps of:

- (i) preparing an expression construct which comprises an isolated nucleic acid of the invention, operably linked to one or more regulatory nucleotide sequences;
- (ii) transfecting or transforming a suitable host cell with the expression construct;
- 40 (iii) expressing a recombinant protein in said host cell; and

- (iv) isolating the recombinant protein from said host cell.

Suitable host cells for expression may be prokaryotic or eukaryotic. For example, suitable host cells may be mammalian cells, plant cells, yeast cells, insect cells or bacterial cells. One preferred host cell for expression of an isolated protein according to the invention is a bacterium.

- 5 Introduction of genetic constructs into host cells (whether prokaryotic or eukaryotic) is well known in the art, as for example described in CURRENT PROTOCOLS IN MOLECULAR BIOLOGY Eds. Ausubel *et al.*, (John Wiley & Sons, Inc. 1995-2009), in particular Chapters 9 and 16.

- The recombinant protein may be conveniently prepared by a person skilled in the art using standard protocols as for example described in Sambrook, *et al.*, MOLECULAR CLONING. A Laboratory Manual (Cold Spring Harbor Press, 1989), in particular Sections 16 and 17; CURRENT PROTOCOLS IN MOLECULAR BIOLOGY Eds. Ausubel *et al.*, (John Wiley & Sons, Inc. 1995-2009), in particular Chapters 10 and 16; and CURRENT PROTOCOLS IN PROTEIN SCIENCE Eds. Coligan *et al.*, (John Wiley & Sons, Inc. 1995-2009), in particular Chapters 1, 5 and 6.

15 Antibodies

Another aspect of the invention provides an antibody or antibody fragment which binds, or has been raised against, an isolated protein disclosed herein.

- As used herein an “antibody” is or comprises an immunoglobulin. The term “immunoglobulin” includes any antigen-binding protein product of a mammalian immunoglobulin gene complex, including immunoglobulin isotypes IgA, IgD, IgM, IgG and IgE and antigen-binding fragments thereof. Included in the term “immunoglobulin” are immunoglobulins that are chimeric or humanised or otherwise comprise altered or variant amino acid residues, sequences and/or glycosylation, whether naturally occurring or produced by human intervention (*e.g.* by recombinant DNA technology).

- Antibody fragments include Fab and Fab’2 fragments, diabodies, triabodies and single chain antibody fragments (*e.g.* scVs), although without limitation thereto. Typically, an antibody comprises respective light chain and heavy chain variable regions that each comprise CDR 1, 2 and 3 amino acid sequences. A preferred antibody fragment comprises at least one light chain variable region CDR and/or at least one heavy chain variable region CDR.

- Antibodies and antibody fragments may be polyclonal or preferably monoclonal. Monoclonal antibodies may be produced using the standard method as for example, described in an article by Köhler & Milstein, 1975, Nature **256**, 495, or by more recent modifications thereof as for example described in Chapter 2 of Coligan *et al.*, CURRENT PROTOCOLS IN IMMUNOLOGY, by immortalizing spleen or other antibody producing cells derived from a production species which has been inoculated with an isolated protein or a fragment thereof. It will also be appreciated that antibodies may be produced as recombinant synthetic antibodies or antibody fragments by expressing a nucleic acid encoding the antibody or antibody fragment in an appropriate host cell. Recombinant synthetic antibody or antibody fragment heavy and light chains may be co-expressed from different expression vectors in the same host cell or expressed as a single chain antibody in a host cell. Non-limiting examples of recombinant antibody expression and selection techniques are provided in Chapter 17 of Coligan *et al.*, CURRENT

PROTOCOLS IN IMMUNOLOGY and Zuberbuhler *et al.*, 2009, Protein Engineering, Design & Selection **22** 169.

In some embodiments, the antibody or antibody fragment is labelled.

The label may be selected from a group including a chromogen, a catalyst, biotin, digoxigenin, an enzyme, a fluorophore, a chemiluminescent molecule, a radioisotope, a drug or other chemotherapeutic agent, a magnetic bead and/or a direct visual label.

It will be appreciated that the antibody or antibody fragment may be used for the detection and/or purification of an isolated protein disclosed herein.

10 **Methods of use of the isolated protein**

Another aspect of the invention relates to a method of performing a chemical reaction, said method including the step of exposing a molecule to one or more isolated proteins disclosed herein to thereby perform a chemical reaction in the molecule.

An aspect of the invention also provides a composition suitable for performing the chemical reaction. The composition suitably comprises one or more buffers, salts, solvents and/or other reagents that facilitate or allow the reaction to proceed. It will be understood that such pH buffers, salts, solvents and/or other reagents are well known in the art and may be selected according to the particular type of chemical reaction.

Suitably, the method includes exposing the molecule to a protein having P450 activity and/or a redox partner for the protein having P450 activity.

In some preferred embodiments, said method includes the step of exposing the molecule to at least one of an isolated engineered ancestral CYP1 protein disclosed herein; an isolated CYP2 protein disclosed herein; an isolated engineered ancestral CYP4F protein disclosed herein; and an isolated engineered ancestral CYP4ABXZ protein disclosed herein.

In preferred embodiments, the redox partner for said isolated engineered CYP1, CYP2, CYP4F, and/or CYP4ABXZ protein comprises a P450 reductase protein as hereinbefore described, e.g. a CPR or NPR protein.

In other embodiments, the redox partner for said CYP1, CYP2, CYP4F, and/or CYP4ABXZ protein comprises any other suitable redox partner(s), which may include, but is not limited to one or more of: cytochrome b and cytochrome b5 reductase; and a ferredoxin (e.g. adrenodoxin) and a ferredoxin reductase (e.g. adrenodoxin reductase) or flavodoxin reductase.

Particular, non-limiting examples of such chemical reactions include redox reactions, hydroxylation at aromatic and aliphatic centres, epoxidation, N-, O-, S-dealkylation and N-, and S-oxidation, acyl migration, oxidative dehalogenation, ring expansion, contraction and cleavage, C-C bond cleavage, denitrosation of N-nitrosamines, oxidative ester cleavage, aldehyde scissions (e.g. to alkenes and HCOOH), ipso attack on aromatic ring substituents and N- or O-dearylation, reductions of alkyl halides, N-oxides, nitro compounds, inorganic molecules such as SO₂, Cr(VI) or NO, desaturations (e.g. dehydrogenations), one electron oxidations, isomerizations and/or phospholipase D activity (e.g. phosphate ester hydrolysis).

These reactions may have applications for: the production of fine chemicals (e.g. pharmaceuticals, agrichemicals, fragrances, and dyes); gene therapy; bioremediation; biosensors; diagnostics; plant biotechnology; and/or medicinal chemistry (e.g. drug discovery and pharmacological testing). With particular regard to drug discovery, one embodiment of the invention contemplates using the isolated protein disclosed herein for structural diversification of molecules present in molecular libraries, such as natural product libraries, synthetic combinatorial libraries, and/or rationally designed structure-based libraries, although without limitation thereto.

As will be understood by those skilled in the art, structural diversification may facilitate structure-activity relationship ("SAR") analysis to thereby generate an array of improved lead compounds having one or more improved properties such as: enhanced pharmacodynamics properties; reduced toxicity; enhanced bioavailability; enhanced half-life; enhanced formulation properties; and/or reduced production cost, although without limitation thereto. As will be understood by those skilled in the art, in the aforementioned context a "lead" compound refers to a chemical compound that has pharmacological or biological activity likely to be useful for a given purpose; for example, for therapeutic and/or industrial application, although without limitation thereto; but may still have suboptimal properties for said purpose.

With particular regard to pharmacological testing, one embodiment of the invention contemplates using the isolated protein described herein to metabolize a xenobiotic, for example a drug, to produce metabolites that are produced during human metabolism of said xenobiotic. It is anticipated that said metabolites can be used for purposes including the assessment of toxicity to an animal, for example "general toxicity", "genotoxicity", "embryo-fetal toxicity", as will be understood by those skilled in the art; and "carcinogenicity", although without limitation thereto.

With particular regard to bioremediation, one embodiment of the invention contemplates using the isolated protein to metabolize an environmental pollutant, for example, although without limitation thereto, a hydrocarbon pollutant such as a diesel, a gasoline, or an oil; a pesticide pollutant such as an organochlorine pesticide, an organophosphate pesticide, or a pyrethroid pesticide; and a solvent pollutant such as perchloroethylene (PCE) or trichloroethylene (TCE). It is contemplated that that in some embodiments, the isolated protein is expressed by a microorganism or a plant, thereby allowing said microorganism or plant to metabolize an environmental pollutant, or improving the efficiency with which said microorganism or plant metabolizes an environmental pollutant.

With particular regard to biosensor technology, one embodiment of the invention contemplates using the isolated protein to detect metabolites in a human blood sample, for example, drugs or drug metabolites; and/or food contaminants, such as carbamate or organophosphate pesticide residues, although without limitation thereto.

EXAMPLES

Example 1. Materials

Oligonucleotides and ancestral gene were synthesized by Life Technologies (Mulgrave, VIC Australia). pCW'/1A1His/hNPR, pCW'/1A2His/hNPR, pCW'/1A5His/hNPR, pCW'/1B1His/hNPR, pCW'/2A6His/hNPR, pCW'/2A13His/hNPR, pCW/2B1His/hNPR, pCW'/2B6His/hNPR, pCW/2C8_{FL}His/hNPR, pCW/2C9_{FL}His/hNPR, pCW/2C18_{FL}His/hNPR, pCW/2C19_{FL}His/hNPR, pCW/2E1His/hNPR, pCW/2F3¹His/hNPR, pCW/2S1His/hNPR, and pCW'/4A11His/hNPR were

available via previous studies in this laboratory and others²⁻¹¹. pCW/hNPR was obtained from Professor F.P. Guengerich (Vanderbilt University, US), and the pGro7 plasmid encoding the GroES/EL molecular chaperone system was obtained from Professor K. Nishihara (HSP Research Institute, Japan)¹².

5 Restriction endonucleases (REs), Antarctic phosphatase (AnP), and T4 DNA ligase were purchased from New England Biolabs Inc./Genesearch Pty. Ltd. (Arundel, QLD Australia). Oligonucleotides and *E. coli* strain DH5 α F'IQ cells were obtained from Life Technologies (Mulgrave, VIC Australia).

Example 2. *CYP1*

10 *Method of construction of engineered ancestral CYP1 sequences*

Sequences of cytochrome P450 family CYP1 proteins were collected from Uniprot, NCBI and the cytochrome P450-nomenclature homepage (<http://drnelson.uthsc.edu/cytochromeP450.html>) database. Only sequences that contain the conserved cysteine and proline-rich motif at the N-terminus were included. The sequences were aligned using MAFFT¹³. The alignment was fine-tuned manually to
15 improve its reliability at gap positions. Phylogenetic relationships of these P450 sequences were reconstructed using the Maximum Likelihood method under the JTT substitution model¹⁴ with MEGA¹⁵. The tree was determined by neighbour-joining (BIONJ)¹⁶. For individual ancestral reconstructions using individual subfamilies of CYP1, two approaches were applied.

First, the deepest common ancestor of the extant sequences within the subfamily in question was
20 inferred using a multiple sequence alignment and a phylogenetic tree generated from only those extant sequences in the subfamily in question. CYP1 ancestral sequences generated using this 'subfamily' approach are set forth in SEQ ID NOS:47-63 (referred to herein as 'A2' ancestral CYP1 sequences). Second, the inferences were obtained from analysis of the entire set of extant sequences within the family in question. CYP1 sequences generated using this 'whole tree' approach are set forth in SEQ ID NOS:1-
25 23 (referred to herein as 'A0' ancestral CYP1 sequences).

Ancestral prediction for all internal nodes in the tree was performed using an in-house bioinformatic tool (denoted bnkit). Briefly, ancestral states were jointly determined using Maximum Likelihood, given the amino acid states at extant nodes of the phylogenetic tree. To enable the exact inference of ancestral states at the scale of the aforementioned protein families, we made several,
30 standard, assumptions, including that amino acid states are defined by a Markov process. Specifically, we assumed that evolution operates by substitution only, with transition probabilities from the aforementioned evolutionary model. Insertions and deletions were handled prior to inference by pruning the tree for that position in the alignment as determined by Maximum Parsimony¹⁷. We assume substitutions at each position are independent of one another. We make the Markov assumption that
35 substitution probabilities at a state t depend only on the preceding state ($t - 1$). Finally, the same Markov process with the same evolutionary rate applies to all positions.

Determining variation in engineered ancestral CYP1 proteins

Specific nodes that were of considered of particular interest (e.g. the last common ancestor of a subfamily) were chosen. For each node, the alignment of its corresponding parents and all 'descendent'
40 sequences were first generated. Based on this alignment, variation at each position within the aligned

sequence was identified. With reference to the CYP1 A0 sequences set forth in SEQ ID NOS:1-23, corresponding to individual nodes of particular interest, variation is presented in Table 1.

Furthermore, for each CYP1 A0 sequence, residues wherein no variation was present within the alignment were identified. These 'conserved' residues correspond to those residues not listed in Table 1.

5 Additionally, with reference to Table 1, residues at which one amino acid variant was present at 80% or greater frequency within the descendent sequences can be identified. Such residues may be considered 'semi-conserved' residues.

It is hypothesized that it may be beneficial to avoid or minimize variation in such conserved and/or semi-conserved residues, in variant CYP1 proteins according to the invention. By way of non-limiting example, such conserved and/or semi-conserved residues may be important for certain functional properties associated with CYP1 enzymes, such as herein described.

Construction of expression plasmids for engineered ancestral CYP1 proteins

Once ancestral nodes were inferred as above, a codon-optimized nucleotide sequence encoding amino acid of specific nodes was then synthesized by GeneArt (Germany). These sequence correspond to the CYP1 A1 sequences set forth in SEQ ID NOS:24-46. To produce the CYP1 A1 sequences the N-termini of the inferred CYP1 ancestral sequence (i.e. A0 sequences, excluding gaps) was replaced with a sequence encoding the peptide, MAKKTSS. Additionally, a C-terminal hexa-His tag was also added to the coding sequence of the ancestral protein linked to the C-terminal end of the P450 coding sequence by a Ser-Thr linker encoding a Sall site.

20 The ancestral P450 open reading frames were then subcloned into the pCW expression vector ²⁰ containing the human NADPH-cytochrome P450 reductase (hNPR) sequence using the Gibson Assembly ²¹, 5' NdeI and 3' XbaI sites. The sequences of the open reading frames in the expression plasmid were verified by automated dideoxy sequencing at the Brisbane Node of the Australian Genome Research Facility (St. Lucia, Australia).

25

Example 3. CYP2

Method of construction of engineered ancestral CYP2 sequences

Sequences of cytochrome P450 family CYP2 proteins were collected from Uniprot, NCBI and the cytochrome P450-nomenclature homepage (<http://drnelson.uthsc.edu/cytochromeP450.html>) database.

30 Only sequences that contain the conserved cysteine and proline-rich motif at the N-terminus were included. The sequences were aligned using MAFFT ¹³. The alignment was fine-tuned manually to improve its reliability at gap positions. Phylogenetic relationships of these P450 sequences were reconstructed using the Maximum Likelihood method under the JTT substitution model ¹⁴ with MEGA ¹⁵. The tree was determined by neighbour-joining (BIONJ) ¹⁶. For individual ancestral reconstructions using individual subfamilies of CYP2, two approaches were applied.

35 First, the deepest common ancestor of the extant sequences within the subfamily in question was inferred using a multiple sequence alignment and a phylogenetic tree generated from only those extant sequences in the subfamily in question. CYP2 ancestral sequences generated using this 'subfamily' approach are set forth in SEQ ID NOS:126-141 (referred to herein as 'A2' ancestral CYP2 sequences).
40 Second, the inferences were obtained from analysis of the entire set of extant sequences within the family

in question. CYP2 sequences generated using this 'whole tree' approach are set forth in SEQ ID NOS:64-94 (referred to herein as 'A0' ancestral CYP2 sequences).

Ancestral prediction for all internal nodes in the tree was performed using an in-house bioinformatic tool (denoted bnkit). Briefly, ancestral states were jointly determined using Maximum Likelihood, given the amino acid states at extant nodes of the phylogenetic tree. To enable the exact inference of ancestral states at the scale of the aforementioned protein families, we made several, standard, assumptions, including that amino acid states are defined by a Markov process. Specifically, we assumed that evolution operates by substitution only, with transition probabilities from the aforementioned evolutionary model. Insertions and deletions were handled prior to inference by pruning the tree for that position in the alignment as determined by Maximum Parsimony¹⁷. We assume substitutions at each position are independent of one another. We make the Markov assumption that substitution probabilities at a state t depend only on the preceding state ($t - 1$). Finally, the same Markov process with the same evolutionary rate applies to all positions.

Determining variation in engineered ancestral CYP2 proteins

Specific nodes that were of considered of particular interest (e.g. the last common ancestor of a subfamily) were chosen. For each node, the alignment of its corresponding parents and all 'descendent' sequences were first generated. Based on this alignment, variation at each position within the aligned sequence was identified. With reference to the CYP2 A0 sequences set forth in SEQ ID NOS:64-94, corresponding to individual nodes of particular interest, variation is presented in Table 2.

Furthermore, for each CYP2 A0 sequence, residues wherein no variation was present within the alignment were identified. These 'conserved' residues correspond to those residues not listed in Table 2. Additionally, with reference to Table 2, residues at which one amino acid variant was present at 80% or greater frequency within the descendent sequences can be identified. Such residues may be considered 'semi-conserved' residues.

It is hypothesized that it may be beneficial to avoid or minimize variation in such conserved and/or semi-conserved residues, in variant CYP2 proteins according to the invention. By way of non-limiting example, such conserved and/or semi-conserved residues may be important for certain functional properties associated with CYP2 enzymes, such as herein described.

Construction of expression plasmids for engineered ancestral CYP2 proteins

Once ancestral nodes were inferred as above, a codon-optimized nucleotide sequence encoding amino acid of specific nodes was then synthesized by GeneArt (Germany). These sequence correspond to the CYP2 A1 sequences set forth in SEQ ID NOS:95-125. To produce the CYP1 A2 sequences the N-termini of the inferred CYP1 ancestral sequence (i.e. A0 sequences, excluding gaps) was replaced with a sequence encoding the peptide, MAKKTSS. Additionally, a C-terminal hexa-His tag was added to the coding sequence of the ancestral protein linked to the C-terminal end of the P450 coding sequence by a Ser-Thr linker encoding a SalI site.

The ancestral P450 open reading frames were then subcloned into the pCW expression vector²⁰ containing the human NADPH-cytochrome P450 reductase (hNPR) sequence using the Gibson Assembly²¹, 5' NdeI and 3' XbaI sites. The sequences of the open reading frames in the expression plasmid were

verified by automated dideoxy sequencing at the Brisbane Node of the Australian Genome Research Facility (St. Lucia, Australia).

Expression and thermostability measurement of the ancestral CYP2 proteins

Recombinant proteins were expressed as described previously²² with minor modifications.

5 Starter cultures (5 mL LB media supplemented with 11.1 mM glucose, 100 µg/mL ampicillin and 20 µg/mL chloramphenicol, in 25 mL flasks) were inoculated from glycerol stocks or freshly transformed colonies and incubated overnight at 37°C, with shaking at 400 rpm. Expression cultures were set up in 100 mL flasks by inoculating 100 - 500 µL of starter culture into 10-50 mL Terrific Broth (TB)²³ containing 100 µg/mL ampicillin, 20 µg/mL chloramphenicol, 1mM thiamine and trace elements²⁴ (TB expression medium). Cultures were incubated at 25°C with shaking at 180 rpm for an initial 5h.

10 Recombinant protein expression was then induced by adding arabinose (4 mg/mL), δ-aminolaevulinic acid (0.5 mM) and isopropyl-β-thiogalactopyranoside (IPTG) (1mM) and the flasks were incubated at 25°C with shaking at 180 rpm for a further 43 h. One or more of recombinant extant CYP2 proteins selected from the group consisting of CYP2A6, CYP2A13, CYP2B1, CYP2B6, CYP2C8, CYP2C9,

15 CYP2C18, CYP2C19, CYP2E1, CYP2F1, CYP2S1, CYP4A11, CYP1A1, CYP1A1, CYP1A5 and CYP1B1 were expressed in parallel as controls as appropriate.

Cultures were harvested by centrifugation at 3000 x g for 10 min then resuspended in whole cell assay buffer (WCAB: 100 mM potassium phosphate, 6 mM magnesium acetate, 10 mM (+) glucose, pH 7.4). The resuspended enzyme solution was heated at various temperatures (30-75°C) for 1h in Bio-Rad

20 MyCycler Thermal Cycler, cooled at 4°C for 5 min and equilibrated at room temperature for 5 min. The residual folded protein was then quantified by Fe(II) CO versus Fe(II) difference spectroscopy²⁵. Results are set forth in Table 4 and Figures

Characterization of ancestral CYP2 enzyme activity

For comparisons of engineered ancestral CYP2 proteins with the respective extant P450 control forms (as

25 indicated for individual experiments), membrane fractions were isolated from bacteria expressing either an ancestral or an extant protein, with or without hCPR. Recombinant enzymes were expressed in 50 ml cultures, harvested and fractionated according to established procedures²⁶.

(i) HPLC analysis of steroid hydroxylase activity

Testosterone metabolic analyses were carried out with isolated membrane fractions as described

30 previously using 1 µM P450 and 10 - 500 µM testosterone for 10 min²⁷. Reactions (250 µL) were quenched by the addition of 25 µL progesterone 1 mM (as internal standard) and metabolites were extracted with 1 ml of ethyl acetate prior to HPLC analysis on a C18 column (4.6 x 150 mm, 5 µM, Agilent Technologies), initially equilibrated in 24% (v/v) acetonitrile:water at a flow rate of 1.5 mL/min. The following gradient was used for elution of testosterone metabolites: 0 – 5.5 min, 24% acetonitrile;

35 5.5-12 min, linear gradient to 62% acetonitrile; 12-16 min, 62% acetonitrile; 16-18 min linear gradient to 24% acetonitrile; 18-22 min, 24% acetonitrile. Metabolites were detected by absorbance at 247 nm. Under these conditions, the major metabolite, 6β-hydroxytestosterone eluted at approximately 7 min. Products formed were identified by comparison to the previously calibrated retention times of 6β-hydroxytestosterone and other identified testosterone metabolites.

40 (i) Analysis of drug metabolism by LC-MS^E

Bacterial membranes containing 0.1 μ M P450 were incubated with the substrates listed as follows, at 10 μ M: Acetaminophen; Midazolam; Aminopyrine; Nevirapine; Amlodipine; Olanzapine; Amodiaquine; Omeprazole; Atorvastatin; Paclitaxel; Benzbromarone; Pioglitazone; Carbamazepine; Pravastatin; Celecoxib; Procainamide; Chlorzoxazone; Propranolol; Clopidogrel; Ritonavir; Clozapine; Rosiglitazone; 5 Dextromethorphan; Sulfamethoxazole; Diclofenac; Tacrine; Diltiazem; Procainamide; Donepezil; Propranolol; Ethinylestradiol; Ritonavir; Erythromycin; Rosiglitazone; Fluoxetine; Tamoxifen; Flutamide; Ticlopidine; Furosemide; Tienilic acid; Imipramine; Valproic acid; Indomethacin; Valsartan; Levofloxacin; Warfarin (R, S and racemic); Metoprolol; Zafirlukast.

Incubations were prepared in 250 μ l total volume of 0.1 M potassium phosphate buffer pH 7.4 10 and initiated by the addition of an NADPH-generating system consisting of 10 mM glucose-6-phosphate, 250 μ M NADP⁺, and 0.5 U/ml glucose-6-phosphate dehydrogenase. Reactions were quenched at 0 and 30 mins by the addition of two volumes of ice-cold acetonitrile. Precipitated protein was removed by centrifugation and samples were lyophilized then resuspended in 50 % v/v acetonitrile in water for injection into a Waters ACQUITY UPLC liquid chromatography system coupled to a Waters Synapt 15 HDMS instrument (Waters, Milford, MA, USA) with an electrospray ionisation (ESI) source. Separation was achieved with a 130 Å, 1.7 μ m x 2.1 mm x 100 mm Waters ACQUITY UPLC BEH C18 column (Waters, Milford, MA) at a column temperature of 45 °C. Mobile phases consisting of ultra-pure water supplemented with formic acid (0.1% v/v; mobile phase A) and pure acetonitrile (mobile phase B) were employed at a flow rate of 0.5 mL min⁻¹.

20 The gradient used was as follows: 0.0–6.0 min (10–70% mobile phase B); 6.0– 6.7 min (70–90% mobile phase B), then a return to the initial mobile phase composition over 0.01 min. The MSE analysis was performed with a Waters Synapt HDMS operating in V-mode positive electrospray ionization (ESI) conditions. A routine method with two scan functions was used, comprising an m/z range of 80–1000, cone voltage of 20 V and scan time of 0.1 s. The trap collision energy (CE) in function 1 was 20 V; in 25 function 2 an energy ramp of 15–45 V was applied, and the transfer cell CE was 12 V. Data were collected in a centroid mode. Leu-enkephalin (250 pg mL⁻¹) was used as a lock mass (m/z 556.2771) for internal calibration at a flow rate of 0.04 mL min⁻¹. The MSE data were processed in MetaboLynx 4.1 (Waters, Milford, MA) using the dealkylation tool and mass defect filter and the proposed metabolites were manually reviewed.

30

Example 4. CYP4F

Method of construction of engineered ancestral CYP4F sequences

Sequences of cytochrome P450 family CYP4F proteins were collected from Uniprot, NCBI and the cytochrome P450-nomenclature homepage (<http://drnelson.uthsc.edu/cytochromeP450.html>) database. 35 Only sequences that contain the conserved cysteine and proline-rich motif at the N-terminus were included. The sequences were aligned using MAFFT¹³. The alignment was fine-tuned manually to improve its reliability at gap positions. Phylogenetic relationships of these P450 sequences were reconstructed using the Maximum Likelihood method under the JTT substitution model¹⁴ with MEGA¹⁵. The tree was determined by neighbour-joining (BIONJ)¹⁶.

For ancestral reconstructions, inferences were obtained from analysis of the entire set of extant sequences within the subfamily (F) in question. Ancestral CYP4F sequences generated using this ‘whole tree’ approach are set forth in SEQ ID NOS:142-151 (referred to herein as ‘A0’ ancestral CYP4F sequences).

5 Ancestral prediction for all internal nodes in the tree was performed using an in-house bioinformatic tool (denoted bnkit). Briefly, ancestral states were jointly determined using Maximum Likelihood, given the amino acid states at extant nodes of the phylogenetic tree. To enable the exact inference of ancestral states at the scale of the aforementioned protein families, we made several, standard, assumptions, including that amino acid states are defined by a Markov process. Specifically, we
10 assumed that evolution operates by substitution only, with transition probabilities from the aforementioned evolutionary model. Insertions and deletions were handled prior to inference by pruning the tree for that position in the alignment as determined by Maximum Parsimony¹⁷. We assume substitutions at each position are independent of one another. We make the Markov assumption that substitution probabilities at a state t depend only on the preceding state ($t - 1$). Finally, the same Markov
15 process with the same evolutionary rate applies to all positions.

Determining variation in engineered ancestral CYP4F proteins

Specific nodes that were of considered of particular interest (e.g. the last common ancestor of a subfamily) were chosen. For each node, the alignment of its corresponding parents and all ‘descendent’ sequences were first generated. Based on this alignment, variation at each position within the aligned
20 sequence was identified. With reference to the CYP4F A0 sequences set forth in SEQ ID NOS:142-151, corresponding to individual nodes of particular interest, variation is presented in Table 3.

Furthermore, for each CYP4F A0 sequence, residues wherein no variation was present within the alignment were identified. These ‘conserved’ residues correspond to those residues not listed in Table 3. Additionally, with reference to Table 3, residues at which one amino acid variant was present at 80% or
25 greater frequency within the descendent sequences can be identified. Such residues may be considered ‘semi-conserved’ residues.

It is hypothesized that it may be beneficial to avoid or minimize variation in such conserved and/or semi-conserved residues, in variant CYP4F proteins according to the invention. By way of non-limiting example, such conserved and/or semi-conserved residues may be important for certain functional
30 properties associated with CYP4F enzymes, such as herein described.

Construction of expression plasmids for engineered ancestral CYP4F proteins

Once ancestral nodes were inferred as above, a codon-optimized nucleotide sequence encoding amino acid of specific nodes was then synthesized by GeneArt (Germany). To produce the sequences for expression, the N-termini of the inferred CYP4F ancestral sequences (i.e. A0 sequences, excluding gaps)
35 were replaced with a sequence encoding the peptide, MALLLAVFL. Additionally, a C-terminal hexa-His tag was added to the coding sequence of the ancestral protein linked to the C-terminal end of the P450 coding sequence by a Ser-Thr linker encoding a SalI site.

The ancestral P450 open reading frames were then subcloned into the pCW expression vector²⁰ containing the human NADPH-cytochrome P450 reductase (hNPR) sequence using the Gibson Assembly
40 ²¹, 5’ NdeI and 3’ XbaI sites. The sequences of the open reading frames in the expression plasmid were

verified by automated dideoxy sequencing at the Brisbane Node of the Australian Genome Research Facility (St. Lucia, Australia).

Example 5. CYP4ABXZ

5 Method of construction of engineered ancestral CYP4F sequences

A diagrammatic overview of the ancestral sequence construction process is shown in Figure 11. Sequences of cytochrome P450 family CYP4ABXZ proteins were collected from Uniprot, NCBI and the cytochrome P450-nomenclature homepage (<http://drnelson.uthsc.edu/cytochromeP450.html>) database. Only sequences that contain the conserved cysteine and proline-rich motif at the N-terminus were included. The sequences were aligned using MAFFT¹³. The alignment was fine-tuned manually to improve its reliability at gap positions. Phylogenetic relationships of these P450 sequences were reconstructed using the Maximum Likelihood method under the JTT substitution model¹⁴ with MEGA¹⁵. The tree was determined by neighbour-joining (BIONJ)¹⁶.

For ancestral reconstructions, inferences were obtained from analysis of the entire set of extant sequences within the subfamilies (A, B, X, and Z) in question. Ancestral CYP4ABXZ sequences generated using this 'whole tree' approach are set forth in SEQ ID NOS:152-155 (referred to herein as 'A0' ancestral CYP4ABXZ sequences).

Ancestral prediction for all internal nodes in the tree was performed using an in-house bioinformatic tool (denoted bnkit). Briefly, ancestral states were jointly determined using Maximum Likelihood, given the amino acid states at extant nodes of the phylogenetic tree. To enable the exact inference of ancestral states at the scale of the aforementioned protein families, we made several, standard, assumptions, including that amino acid states are defined by a Markov process. Specifically, we assumed that evolution operates by substitution only, with transition probabilities from the aforementioned evolutionary model. Insertions and deletions were handled prior to inference by pruning the tree for that position in the alignment as determined by Maximum Parsimony¹⁷. We assume substitutions at each position are independent of one another. We make the Markov assumption that substitution probabilities at a state t depend only on the preceding state ($t - 1$). Finally, the same Markov process with the same evolutionary rate applies to all positions.

Determining variation in engineered ancestral CYP4F proteins

Specific nodes that were of considered of particular interest (e.g. the last common ancestor of a subfamily) were chosen. For each node, the alignment of its corresponding parents and all 'descendent' sequences were first generated. Based on this alignment, variation at each position within the aligned sequence was identified. With reference to the CYP4ABXZ A0 sequences set forth in SEQ ID NOS:152-155, corresponding to individual nodes of particular interest, variation is presented in Table 4.

Furthermore, for each CYP4ABXZ A0 sequence, residues wherein no variation was present within the alignment were identified. These 'conserved' residues correspond to those residues not listed in Table 4. Additionally, with reference to Table 4, residues at which one amino acid variant was present at 80% or greater frequency within the descendent sequences can be identified. Such residues may be considered 'semi-conserved' residues.

It is hypothesized that it may be beneficial to avoid or minimize variation in such conserved and/or semi-conserved residues, in variant CYP4ABXZ proteins according to the invention. By way of non-limiting example, such conserved and/or semi-conserved residues may be important for certain functional properties associated with CYP4ABXZ enzymes, such as herein described.

5 ***Construction of expression plasmids for engineered ancestral CYP4F proteins***

Once ancestral nodes were inferred as above, a codon-optimized nucleotide sequence encoding amino acid of specific nodes was then synthesized by GeneArt (Germany). To produce the sequences for expression, the N-termini of the inferred CYP4ABXZ ancestral sequences (i.e. A0 sequences, excluding gaps) were replaced with a sequence encoding the peptide, MALLLAVFL. Additionally, a C-terminal
10 hexa-His tag was added to the coding sequence of the ancestral protein linked to the C-terminal end of the P450 coding sequence by a Ser-Thr linker encoding a SalI site.

The ancestral P450 open reading frames were then subcloned into the pCW expression vector²⁰ containing the human NADPH-cytochrome P450 reductase (hNPR) sequence using the Gibson Assembly²¹, 5' NdeI and 3' XbaI sites. The sequences of the open reading frames in the expression plasmid were
15 verified by automated dideoxy sequencing at the Brisbane Node of the Australian Genome Research Facility (St. Lucia, Australia).

Thermostability Measurement of CYPABXZ_N2

Enzyme preparations were heated in a 96-well plate at various temperatures (30-80°C) for either 10 or 60 minutes using a Bio-Rad MyCycler thermal cycler, then incubated at 4°C for 5 minutes and
20 room temperature (RT) for 5 minutes. The residual concentration of intact P450 protein was quantified and compared to an unheated control. T_{50} values, i.e. the temperatures at which 50% residual enzymatic activity remained after n minutes, were calculated using the equation for sigmoidal melting in Graphpad Prism. Results are set forth in Figure 12.

25 Throughout the specification, the aim has been to describe the preferred embodiments of the invention without limiting the invention to any one embodiment or specific collection of features. Various changes and modifications may be made to the embodiments described and illustrated without departing from the present invention.

The disclosure of each patent and scientific document, computer program and algorithm referred
30 to in this specification is incorporated by reference in its entirety.

TABLES

Table 1. Variable residues $X_1 - X_n$, and amino acid variation at each residue, of engineered ancestral CYP1 sequences corresponding to nodes (i) – (xxiv). For each of the ancestral sequences corresponding to nodes (i) – (xxiv), variable residues $X_1 - X_n$ are given in sequential order. For example, for (i) CYP1_N9, 476 variable residues are given: $X_1 - X_{476}$. For each variable residue, the format of the data is as follows: [amino acid position]:[first amino acid variant][percent frequency of first amino acid variant]...[last amino acid variant][percent frequency of last amino acid variant]. Position is given relative to the corresponding A0 CYP1 sequence, as described herein. Frequency is relative to all sequences used to construct the A0 ancestral node sequence. Note that ‘-’ represents a ‘gap’ or amino acid deletion. By way of example, X_5 of (i) is given as 5:-71L11M08A03P01T01, which sets forth that:

the amino acid position of the variant relative to the alignment to CYP1_N9_A0 is ‘5’;

the first amino acid variant is a deletion;

the frequency of the first amino acid variant relative to all sequences used to construct CYP1_N9_A0 is 71%;

the second amino acid variant is ‘L’;

the frequency of the second amino acid variant is 11%;

the third amino acid variant is ‘M’;

the frequency of the third amino acid variant is 8%;

the fourth amino acid variant is ‘A’;

the frequency of the fourth amino acid variant is 3%;

the fifth amino acid variant is ‘P’;

the frequency of the fifth amino acid variant is 1%;

the last amino acid variant is ‘T’;

the frequency of the last amino acid variant is 1%

Only amino acid variants with frequency of 1% of greater are listed. Where the combined frequency of all listed amino acid variants is less than 100%, this is due to the presence of one or more additional variants with frequency of less than 1%.

(i) N9
1:-87M12 2:-86A10G01 3:-85T11 4:-77S09M08G01 5:-71L11M08A03P01T01 6:- 70S10L02A02N02D02G01K01Q01T01 7:-53M20P07A05L03I02S02V01 8:-50D16A11M06V05E02N01G01L01 9:-93T03 10:-94E04 11:-94F05 12:-94G05 13:-94V04 14:-94K05 15:-94G04 16:-98S01 17:- 48L15D08S06M04F03A03G02V02E01 18:-41M17S16P08T03A02V02L02H01 19:- 40I15L11V08A04W04M03Q02S02P02R01F01 20:-32L23M08P07I05Q04F04V03A02E02Y01S01D01 21:- 32P21G11L07S06R05I04E03D01K01M01A01 22:-27F18S13L11E07I06M04Q03N02V01 23:- 26P15S11I11L07W05A04N03Q03D03G01V01F01 24:-20G19L19I10S08V06A02T02M02R01P01K01Q01 25:S30P21-18A11G06I03L02F02 26:I22V22-10T09F07Q07S06L04A04M03 27:S55Q11- 08T06V05L03P02M02A01 28:A38V19Q17-05P04R04L02H01T01I01S01 29:T51S22P06-05G04A02M01N01

30:E66T09A06-05V02L02S01M01D01 31:L51V20S09-04G04I03F02A01 32:L77T07V06-04I01
33:L52V17A08I07T06-04S01 34:A57S14L11V05-04F02C02T01 35:L30S27A13M08F05V05-04I03T01
36:A37T15V15S12I08-04C02L01F01 37:V34I25T18L06F05-04A03 38:F47L35V06-04I02M02A01
39:C59A12V09F06-04L02T01 40:L55A14I07C05-04V03M03S02T01F01 41:V70L13I05-04M02G01T01
42:F43H18Y15L10E06-03 43:L36W29V13A07M06-03I02 44:V32L17G12I09C06F06A04W03-03T01R01
45:V28L23I19Q11R03-03M03K02T01F01 46:R44W22K13Q12-02L01 47:A28L21S16V08F04T04-
03G03Y02H01R01I01 48:L33W16F14R13S07-02M02Q02T02K01 49:R52Q20N07H05K03G03-02S01M01
50:Q28P24T14S08L07R05N03-02K01W01 51:R41K11Q11H10E10-04W03P02G01 52:V38I20R12-
12L07A01S01Q01D01 53:P61-15R14G04 54:K43-15E13Q13R06P01G01A01T01 55:G61-14P09K07L02R02
56:L60G07K06R04Q04A03W02T01-01H01V01F01 57:K47R20S12P04V03Q03L02-01
58:S46R25A08Q04N03G02K01T01P01E01 59:P68L30 61:G95E04 63:W35F27R17K12T02L01
64:G42P25A20S10 65:W58L18Y13F08 67:L51I30V14F02 68:I60L28V11 70:N74H23S01 71:V46A29L12M08I02
72:L69A17M07P01 73:E31T28Q26A07S03 74:L75V17M06I01 75:G83R12H01
76:K44S12Q11N08D06R05P05E02A01 77:N35A17D12M06H06K06S05T02Q02R02 78:P85T06S03A02I01
79:H84Y14 80:L86I08V04 81:S36A29T16V09Y07 82:L66F32 83:T47S25A19M05I01 84:R57K13A11E09Q05
85:L58M41 86:S60A26R09V01G01 87:Q42K29R18E04A01L01 88:R48K35Q09T02C01 89:Y96F02
91:D78N10H03P02S01 92:V97I02 93:F47L26M18Y07 94:Q77E13L06K01 95:I78V14L04M01
96:R60Q19K12H05T01 97:I59L38 99:S42M20T16C14N02R01 100:R38T28C11V06S06L02W02
101:P81D07T04N01R01A01 102:V91I08 103:V61L36 105:L92V06 106:S62N35G01 108:L46E15S07D06M05-
05N04Y03G01 109:D46E26R13S03N02A01Q01 110:T63A24M05V03S02 111:I75V22L01 112:R67K24H07
113:Q88E06K01H01 114:A93V06 116:V69I20L08T01 117:K44R32Q20 118:Q81H07D05K03 119:G88S08A03
120:D35E34A11T06S03L01V01P01I01N01 121:D57E18A11H05N01T01I01V01 123:A49K29M15S05
124:G86D11S01 127:D69N13P10S02R01E01 128:L61F32M05 129:Y54A12H12V05T05P04F02 130:S87T11
131:F96S02 132:R32T26Q22S11K04H01 133:F32L29V12Y10H06M05A02N01 134:I55V37L04F01
135:S46T19A16N12G02 136:D44G22N22E08 138:Q41K30R17D02T02H01E01N01 140:L54M41F01I01
141:A46T39S13 143:S52G20N20T05 144:P38-28T19V05E02S01 145:D60N14H04T03Q03K03S02G02P01R01
146:S44Y34Q11V03K02C01T01 147:G55S25A13T02V01 148:E39P30G15K05D05Q02
149:V57S09Q06W05R05H03L03A03I02 151:K46A28R21L01 152:A67L12V09T04M03 153:R62H24Q12
154:R89K09 155:K53R46 156:L64I14A11V07 157:A97C01 158:Q59H13Y11S05K02M02L02
159:N48S40D03G02K02A01T01 160:A68T25G02S01M01 161:L75V10M09I04 162:R53K35N09
163:S38T31A21M03N03 164:F98L01 165:S93A05 166:T34I32S10V07K04N03Q02M01L01
167:A54L13R11G08S05T01V01I01 168:S30E20N14P14Q11A01H01K01D01 169:D28S26P18G13A08
170:P45Q13R13K10T08S03H01A01 171:T43A22S20G04N04-01L01 172:S55R14K13P10A02
173:S37E14R12K11T09A04Q03G01L01V01 174:S41-29Y15C10A01 175:S55-28T14 176:C70-29
177:L29Y29V16A11T06M02I02 178:L84F14 180:E66Q11G10D02H01K01N01M01R01 181:H94Q03
182:V75I18L02A01 183:S45L17C13V08T07I03R01A01 184:K57G11A10S06E05C02T01D01N01
186:A74G09V09F02T02I01S01 187:E41R17D10S08T04K02M02L02N02Q02A02 188:Y38E32A14H05V03D02
189:L97M02 190:V54I30L14 191:S19K18T14A10E08G08R08Q06N02H01

192:K37L17V14R12Q08E03I02T01A01 193:F52L44I02 194:Q29L28V18N06T03A02S02H02R01M01K01
195:E35R20Q17K08T06S04N02A01D01G01 196:L48V17G11Q07K06R04 197:M58S23T11C01G01-01A01
198:A44E15K13S11D05R03T02Q01 199:E32G28A11K10D05T03V02Q01R01S01
200:G23E15V13P09K08D08N06A04S03Q03 201:G53K15A13Q09R04 202:S28H18F14R13Y11G04C03K02A01
203:F82L13I02V01 204:D78N08E05Q05H01 205:P94L04 206:Y36F16R13A08N04T04V03M03S02H01G01
207:R46N12P09Q08H06S05T04G02K01D01 208:Y41H14L09Q09E08P04A04S02V01N01
209:V30I27L26T09F03M01 210:V75T15L04I03 211:V80C06L03E02A01I01T01S01 212:S69A28T01
213:V86A07T05 214:A96T02V01 215:N97K01 216:V92I06 217:I67M23V09 218:C63S22G14 219:A82G15
220:M49L20V17I11 224:K39R26Q18C11N01H01 225:R85H11N02 226:Y85F13
227:D44S24P13G07N04E03T01 228:H78Q10Y06E01R01 229:D47N20S15E05H03G02K01 230:D75S13N05H04
231:Q44E22A13K05D03L03P03V01G01 233:L47F39M12 234:L70R16V05Q03T01
235:S45E11N08T07R06G05Q05A02D02K02 236:L60I25V12 237:V67L21I09
238:N43K16S13G11H02D02E02T02Q01R01 239:L37R14H12N07S06T06V04I03M02K01
240:N41S40T06V04G01L01A01M01 241:D34N28E22H10K01 242:E57D17Q11K08N02R01 243:F91L05V02
244:G60V19L08T07S01N01 245:E37R17Q17K14D10N01 246:V41T36A10I03S02N02L01
247:V47A35T08S06F02 248:G47A30S19T02 249:S55A40V01 250:G92A06 251:N64S31Y02H01
252:P64L26I05A01 253:A50V45S01 255:F70V26A01 256:I51F18M17L12 258:I34W29V16C05L05F04A03
259:L90F07M01 260:Q49R44K04 261:Y71R09S06F05L04I01 262:L65F31M02 264:N62S30L05
265:P51R22S09T06K05Q03A01 266:-70V22I05 267:-70R23K05 268:-70T19S08A01
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513:K56E14P14Q05M03R01T01 514:V63L31P02A01 516:M52L36I09 517:T94S03 518:P96T01
519:I33E21Q13T12L08V02D02N01 520:Y96F03 523:T83S08A04V03 524:M89L08 525:K97R02
526:H69P14Y09-04N01 527:K50A27P07-05T03R02G01 528:R63P10K08-05H04C03I01T01 529:C84Y08-05
530:E56-35K04Q01 531:H63Q10C06-05Y03R02L02A01S01 532:F43L26V18-06I05 533:Q67R12-
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536:L27M19P16Q13K07-07V04A01R01S01 537:R90-07Q01

(iii) N14

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 477:S98G01 478:V42L23T13A10M05I01S01 480:K95R04 482:R98K01 486:E72D22N01S01T01
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(iv) N17

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367:R86K11Q01 368:L90I04V04 369:Q91H06R01 370:E44Q26K16L13 371:E86D11G01 372:V88I11
373:D96A01G01 374:K49R47L01N01 375:V96A01K01 376:V86I08A04 377:D60G36A01Y01
378:R93H03G01S01 379:S62E18D11N04Q01T01 380:R96H01Q01 381:L86V11F01 383:S62T16A08R08C03I01
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396:F93V06 397:I86L11V01 398:Y91H08 400:V83I08M03A01S01T01 401:M90F09 403:F91H08 404:T86S13
406:F98L01 407:V85I09T04 409:L68V22F08 411:I95L04 414:S80C18A01 416:T62V29I06L01
417:T83K13A01V01 418:D98N01 420:S80V09T08A01 421:I83L11F03V01 422:M70N26D01Q01 423:G81S18
425:T42P24A14F08H06R01S01 426:I96V03 427:P98L01 429:N54D34G11 431:V96I03 432:I80V19 434:I68V31

435:N98S01 436:Q95M04 437:W98R01 439:I39V36L18S04T01 442:D95A01N01S01 444:A39S37T16Q04K01
 445:K31I16M16L13N09T09R01V01 446:W96F03 447:S47D18P13A09T04V03G01H01
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 459:D93N04S01 460:E34Q31P29A03K01 461:N32D19E16Q16S11T03 462:G98S01 463:-91T08
 464:A45K18E14S11M08T01 466:N96D03 467:K93S06 468:D91T08 469:L90K06M01Q01 470:T85A06I04V03
 471:S68T11A08D08G03 472:N57S32K08R01 473:V91F06M01 474:L88M11 475:I78L14P03V03
 476:F96L01Y01 477:S91G08 478:L75V08A06M06Q03 480:K88R11 484:I98V01 487:E75D16Q08 488:L90V09
 489:S91A08 490:K91R08 491:M60L26I13 492:Q83E09H06 493:L90M08I01 496:F88L08Y03 497:T73V18L08
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(x) N29

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 88:R46K33Q16 92:V98I01 93:L56M40F02 94:Q68E28 95:I71V28 96:R81H08Q03T02K01S01 97:I95L03
 99:S50T29C16M01 100:T63R34 101:P98Q01 103:L74V25 106:S98N01 109:D84E10N03 110:T98A01
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334:N78S13T03H02G01 335:L44I33V20T01 336:V90I09 337:N63L20M05F03I02S02Y01T01 339:L70I29
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225:R54H35N08L01 226:Y53F46 227:D51P44S02 228:H53Q34E05R05 229:D43S33N09K05R02T01E01-01
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296:E48D45N05 297:K84E12P01 298:G50N39S06R01D01 299:H47S38R05N03V01C01 300:I72V27 301:-
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309:I52F35L11 310:K51E44A02 311:H97Y01 312:C52S31N07Y04V01R01T01 313:Q52E39K07
314:D47K27E17N06 315:K43G22S10N09R09D02Y01 316:S32K26R23P07Q07
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326:Q48L34H09A02R01F01K01 327:L49I43M03V02 328:S55P41L02 329:D50Q33H09E04R01
330:E78K11D05Q02 331:K94H01Q01N01 332:I84T09V05 333:V74I25 334:N79S13T04G01 335:L39V30I28T02

336:V85I14 337:N48L30M07F04I03S02T02 339:L60I39 341:G96A03 344:F98L01 345:D96E03 346:T93P05S01
 347:V75I24 348:T97S01A01 350:A97T01 351:I91L06 352:S92T04Q02 354:S94C02V01G01 355:L94I04F01
 356:M68L26I03 357:Y93L06 359:V98M01 360:T88M04A03K03 361:N56K16S14R04Y03W02
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 369:Q91H08 370:E73K24Q01R01 372:L97I02 374:T85R07A03 376:I88V07T03 378:R95S02
 379:A56E13D13S07G03V03 381:R45Q40W07L02K01P01Y01 383:R91Q06W01 384:L95F04
 385:S91T02A02E02C01 387:R97K02 388:P71S14L11A01T01 389:Q88H07N02 392:Y97L01 393:L51M44T03
 395:A98S01 396:F96V02S01 398:L96H02 400:T66I18V07L04M01 401:F95Y04 403:H93Y06 404:S75T19A04
 407:V78L15I05 411:I97V01L01 414:S96C03 416:T92I05V01 417:R88K11 418:D96A01N01
 420:S46T41N07V03I01 422:N65K17S13C02G01R01 424:F96Y03 425:Y87F07H05 428:K97E01R01
 429:G51E41D03K03 430:R78C11H04T03 431:C95V01Y01L01 432:V90I09 434:V66I33 435:N98S01
 436:Q98M01 438:Q92H05S01 439:V53I45 443:Q59P28E08R01 444:K77E14Q03S01T01 445:L80V11Q07I01
 447:G64E14D07V07K03P01 448:D89N09 450:S67F24N04D02 451:E77V09A07K04 453:R84L07N03W02Q01
 458:L97I02 459:T86S05N02D01V01A01 460:A43P25S07L06T05D04E02N01V01
 461:D65N12S08E03H03K02G01Y01 462:G86N06D04S01 463:-49T45S03 464:T50A39S04E02G01
 465:I80V09L09 466:N71D23S03 467:K96R01S01 468:T37A33V12P06I04F01N01H01R01 469:L91A04Q01E01
 470:S95T03 471:E95D03 472:K97Q01R01 473:V88M06I03F01 474:I47M39L08T03V01 475:L75I21M02
 477:G98S01 478:L50M47A01 482:R55K43 484:I98L01 487:T49V34I07L02N02E01S01 488:I50L36P06M06
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 502:Q92H07 503:Q74R23H01 504:L54V34I06M02C01 505:E97K02 507:S85R04K02N02H01T01E01
 508:V91I04S01N01 509:P68S18T09L02 510:P75A09L04Q04D02S02R01 511:G96K01D01
 512:V73T09E07M03L02 513:K91E03R01T01Q01 514:V95L03 515:D98V01 516:M49L49 517:T97D01
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 527:A65P17T08K03G02Q01V01 528:R68H11C07P04I03T02S01N01 529:C97F01 530:E83K09Q04H01
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(xii) N46

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 40:L89-05I05 41:V56I15L13T06-05M02 42:F76L14-05S01V01 43:L73M14-03I02T01V01 44:L64V23A03I03-
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 53:P94R03-01 54:K74E07Q05P04H02-01Y01 55:G93K03-01E01 56:L94R03-01 57:K80R16-01Q01

58:S50R38N07-01K01 59:P77L18I03 60:P98S01 61:G98E01 63:R92F03W01 64:G94P03S01
65:Y76L09F07W03I01 67:I56L25V13M04 68:L69I28V01 70:N92S07 71:V76M09L08A03I02 73:E92Q05D01
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84:R73Q16K09E01 85:L67M32 86:S91R05G02 87:Q74R19K05 88:K85R09Q03E01 91:D98E01 92:V98I01
93:M94F05 94:E68Q25M01T01G01 95:V66I33 96:R71T06H05Q05K04S03W01A01 97:I94L04
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109:D73E23N01 110:T96A03 111:I97L01 112:K60R40 113:Q94E02K02 117:K87R12 119:G87A12 120:E92D05
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138:Q87K05H03E03 140:L92M07 141:A55T41G01S01 143:S94G04 144:P64T23R03Y03H01S01
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152:A93L03V01 153:R95H03 155:K96R03 156:L93I03V02 158:Q98R01 159:N88S11 162:K94R04N01
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252:P90L09 253:A86V08S02T02 258:V61L26I06W03M01 259:L97M02 260:Q72R27 262:L94F05
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280:F91L07 281:N36L30S14I05M03D02V02G01T01 282:S24H21A13F10R07L06D05K03I01M01
283:F84L13Y01 284:V47L45I06 285:Q91E04H02 286:K84D07N02R02T02 287:I79M07R04A03K03N01
288:V96I01 289:K55Q39E03 290:E94N03D01 292:Y95R01L01 293:E40T34S09R06A02K02D01I01V01
294:T50S49 295:F69Y30 296:D85E09N03 297:K89E06P03 298:N37E36D18G05S01 299:H49N43V03S01Y01
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316:K63S29N02-01T01 317:V65A09T05-05I03M03L03K01 318:G40E40D11-03 319:E44A34T05-05D03V03G02
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 347:V92I07 348:T80A14S05 350:A82G11T03S01 352:S94Q03 354:S88C07V03G01 355:L95I03
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 426:I97V02 429:D89G06N03 430:T44R34L20 431:C96V03 434:V54I45 436:Q98M01 438:Q96S03 439:V97A01
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 450:S61L21E05Q04D03F01 451:T60A26S07K03R01 453:N81D06K05R04S01 455:E96K01
 459:N65S20T03D02R02A01C01H01 460:A85P05E04T01D01 461:A29E26D24G07T05N04S01 463:T93K02-
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 469:E58D36L02N01K01 470:S45G40A09T03 471:E62D37 473:V91I05F02 474:L54M41V03
 475:V32T21A18I14S06L03M02P01 478:L94A02M02 480:K94R05 482:R75K23 484:I89L10
 487:S41T21P18N09A03E03 488:I95L03 489:A52G47 490:R94K05 491:W89M05S01G01 492:E70Q29
 493:V72I23M04 498:T38S30A29V01 499:T95I03 500:L78M18I03 501:L98V01 503:Q92K02R02E01
 504:L96C03 505:E89H04K03Q01 506:F96I02 507:S91K02N02E01T01 508:V48L39I06S03N01
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 519:Q50L32I05T03H03R01V01 523:T66S29V01L01 524:M72L26 526:H52Y38P04N02F01 527:K95E01T01
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(xiii) N52

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 23:I68L15V06S04F03-01 24:G91T06-01 25:S48P32A18 26:V51I25L23 27:S95L04 28:V93I04A02
 29:S89L04T02C02 30:E95H03 31:S57G28V12 33:V81I14L04 34:A96S03 35:M45L26I15V10A02
 36:T34V33I18A12 37:T86V08M02A01 38:V41L18I16M13A06F02 40:L64V14I12T06F02 41:V93I04A02
 42:Y93F06 43:L84M14 44:I49L31T08V04A02M02F01 45:L67M18I08V02G01 46:K61R30T03Q02W02
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133:F90Y08 135:N79S20 136:D73N12E11A02 140:L95M04 141:A89S06T04 144:T94S04 145:D95N04
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153:R94H04 155:K98R01 156:L97I02 158:Y59M13L12Q09H04 159:S81N18 163:S85T12F02 165:S76A23
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197:M89S04T04L02 198:K57E14D10T05S04Q03R02 199:A61T15V14K05S02 200:D46E18S12N11K05G03
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208:H65Y26Q04N02 209:I96V03 210:V95T04 212:S95A03 214:A97C02 219:G93A06 220:M88I10L01
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269:T69S14A06K03D02N02 270:M93L04I02 271:K86R04Q03T03E02 272:K57T14R11N08A05S03
274:V36M35L18K03Q03I02 275:D43N24S12R06E04Q04A03G01 276:I84L12M02 277:N97L01
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377:G95D03 378:L58M24R08N02Q02T02P01 379:D73E10I08N08 381:T69M10L05N04S03K02R02
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 407:L91V06M02 411:I97L02 414:C96S03 415:T87S11 416:T61S27I08V01 417:K95R04 418:D94N05
 420:S88A05V05 421:L98F01 424:Y93F06 425:F90Y08 428:K97N02 429:D92N04G02 431:C96V03 432:V97I02
 434:I84V15 436:Q97M02 438:Q96S03 439:I62V35T01 441:H97R01 444:E79K07S04A03D02T02
 445:L87Q05I02V02M01 446:W98F01 447:K81E09Q04P03 448:D74E25 450:S89F04D04T02
 451:S78L07A03M03K02D02T01 453:N79I07S07K03L02 454:P97I02 455:D80E19 458:L97V02
 459:S61N27T06D04 460:A77E10D08T01 461:D93N04E01 463:T84S08V03M02I01 464:E85T06D04S02G01
 465:V58L32I09 466:N98K01 467:K88R08S02 468:L56M19T09V08A02I01Q01 469:E79D14L03K02
 470:G81A11T04S02 471:E96D03 473:V90M06F02 474:M68L25V03T02 475:V52I18T11A10L04M02P01
 478:M53L42A02 479:G95D03 480:K90R09 484:I93V06 487:V60A21S10E03I02Y02 488:I96L03 489:A67G32
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 500:L69I24M05 501:I59L26V14 503:K49R36N08Q06 504:L96C03 505:H33R20K19Q12E04N04C03S02
 507:H31S15Q14Y14L09E07K05R01 508:E18S18A18T12P08K07N06G06Q03 509:L32M32K14I08S06V02P02
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 528:R90-02N02D02P02 529:C91F03-02Y01 530:-95E04 531:H44Q26L09Y06-05F02N02R02M01 532:L85-
 08V04 533:R53K17-08G07S06Q03C02 534:A73V16-08 535:T48S28-08A08K03R02 536:M45L25P14-08A04V02
 537:R84-09Q05

(xiv) N53

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 11:-80F20 12:-80G20 13:-80V20 14:-80K20 15:-80G20 16:-80S20 17:L28-20Y16T12G08C04I04K04R04
 18:L40S28M20-04I04V04 19:S36L28F20P08-04N04 20:L52I20A12T08-04P04 21:K40E28M16-04A04L04T04
 22:E44S28D20-04N04 23:S52N20G12-04D04F04I04 24:S44T32L08P08-04Q04 25:S80F08-04C04H04
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 68:V60I40 71:L88M08F04 72:L92F08 74:L36M36V28 75:G96E04 76:D48K24E20N08 77:Q84H08Y08
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211:T60V28S12 212:S68A20T12 214:A88C12 217:V64I36 219:A96T04 220:L84I16 224:K80R20 227:D96S04
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367:K84R08E04H04 368:I76V24 369:H48Q48V04 370:Q72E28 374:E52D24R20N04 375:H52V24K16Q08
376:I92V08 378:S60R24I04K04M04P04 379:A52D28S12N04P04 380:R96Q04 381:L96M04
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 06A01 42:F90-06L03 43:V71L12I09-06 44:F76V09-06A03S03L01 45:V66I15L11-06 46:R82-06T06K03N01
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 90:G96-03 91:D96-03 92:V95-03I01 94:L85Q07T04M01 95:I63L33V03 96:K80R14H04 97:L98F01
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212:A87T06V04S01 213:V95M04 214:A95C04 215:N98S01 216:V96I03 217:V85I14 219:A93T04F01
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 525:K76R23 526:P57-41N01 527:K58-41 528:P52-41N06 529:Y49-41F09 530:-90E09 531:-41Q41H15E01
 532:L57-41I01 533:-41Q33E07S07K03T03I01P01 534:A44-41V14 535:E44-41T07K04A01 536:-41P36L14R07
 537:R57-41H01

(xvi) N72

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 14:-95K04 15:-95G04 16:-95S04 17:D53-14A11S09E04L04G02 18:P56-14H10S05T04A03R02L01 19:L37W25-
 14Q12R08 20:P41Q27-14L10S05 21:P42L33-14E03M02 22:S41N18-14I14T04A03G02 23:P45S16-
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 29:T75S12-10A01 30:T66-10M10A05E03S03I01 31:L86-10V03 32:L89-10 33:L83-10V06 34:L69F12-10S05V02
 35:L82-10F03A02V02 36:S76-10C05V04T01 37:V82-10L06 38:L89-10 39:A73V10-10C03 40:A76-10T05I04V02
 41:V80-07I07L05 42:H92-04F03 43:V56L30A05-04M04 44:G82A05-04V03W02S01 45:Q77K11L05-04
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 51:R72-11W10Q02C01H01 52:R83-05Q05L04K01 53:R87-06Q05 54:Q64K12R07-06G02L02P02
 55:P60L16R07-06Q03K02S01 56:G50W19R15A06-03C02L02 57:S73R08L04-03K02A02F02C01P01
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 73:A51Q19S18T05E04 74:V48M28L21 76:P35Q22S18R15K04N02 77:A89Q03T02N01V01 78:P61S22A13
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 87:R79Q08K05S03G02 88:R80T09K05A02I01 91:D92A05S01 92:V96I03 94:Q94K02T02 95:I86L13
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 121:A69T09I07D06V06 124:D74G22S02 127:P67S13R10D06 129:A74P18Y03T02 132:R75Q21
 133:V76L15F06E01 134:V91I08 136:G88N07A02D01 138:R84K05L05H02G01 140:L69M22V05I01
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184:G59S20A12C05M01Q01 186:A92V05T01 187:R92Q06 188:E84A12F02 190:V93I03L02
191:A66E15R12K03 192:L76V19A02 193:L93M03F02 194:V89L06A04 195:R89E03Q02S02W02
196:G76R15L04K02 197:S86C12 198:A82S12E02K02 199:G77D15K03E02S01 201:A87Q04S02K02T02
202:F82V05Y02C02G02P02-01A01 203:L79V07F06I06 204:D97N02 206:R55T21A12S05G02M01
207:P56Q23R19 208:L56P21S08V05Q03N02 209:T59I18L16V03A01 210:V60I24L08T05 211:V98L01
214:A97C02 217:M94I05 218:S94C05 220:V77L17I02A01 224:C79R12K05H02 227:S73N18D04R01
229:D82G11S04 231:A69P15G05K03E02S02 234:R51L44Q04 235:E69R12G08N03A01S01 236:L96I03
237:L82V13I04 238:S79G16K02N01 239:H79R16L03 241:E91D07 242:E75Q17K03R02D01 244:G98M01
245:R92K02N02Q02 246:T91A08 247:V96A03 248:G97A02 249:A97S02 255:V83A10F03M01 256:L74M22I03
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269:A65T22V07S03 270:F84Y11L03 271:R92Q05A02 272:E63A13Q11T03D02N02K02
274:E61Q17R13K03M02 275:Q77D05E05T05K02A02R02 276:L90V07I01 277:N98L01 278:R92Q04H02
279:N70D16S04E03R03 280:F96L03 281:S69Y19T05N03 282:N69G12S09D07 284:V87I12
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316:A66-17E07K06V01 317:A58-22T10E02S02K01 318:G34E25-22R05A04D02K01P01Q01T01 319:G44D29-
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327:L95Q02T02 328:D79P08Q05S04E02 329:L64V13M07E05D03K02T02A01 330:E87D05-02A02
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370:A76E23 372:L79I10V09M01 374:Q74R20K04 375:V89I10 376:V96I03 379:D89H03N02E01
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389:N58H28K06R05 391:P96H02 393:V82I12T04 394:M82L10E04V01 396:F97V02 397:L92I06 398:Y96H03
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414:A90S07 416:T91N05A02 417:A64T23D03K03V03 418:N62D23S12 419:T56A43
420:S63F25V05C02T02L01 421:V72I15L10F01 422:L76M18N03 425:H66Y19L08F05 429:D74N22G02
432:V69I30 434:V96I03 436:Q97M02 444:V61A25S03Q02E01G01L01T01 445:K96L03 446:W98F01
447:P69S26Q02L01 448:N91D05S01 450:E95D04 451:D76N13A02K02E02 453:D76N20E02
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 519:S48N25T22 523:T95S02A01 524:I92M03L02 527:K97Q02 528:S76P17N02A02 529:F97L01 530:-96E03
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(xvii) N98

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 34:L76F13S05V02-01 35:L89F04A02V02-01 36:S88V05-01C01T01 37:V95-01L01 38:L98-01 39:A80V12C04-01
 40:A83T05I05V02-01 41:V90I04L03-01 42:H95F04 43:V65L24A05M05 44:G86A04V04W02S01 45:Q89L05K03
 46:W85R10T03 47:L95S04 48:L95Q04 49:R96W02 50:Q89R03L02W02-01 51:R77W11-08C01
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209:T68I21L04V04A01 210:V55I28L09T06 214:A97C02 217:M94I05 218:S93C05 220:V89L05I03A01
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235:E80G10N04A01S01 237:L95I05 238:S90G04K02N01 239:H90L04R04 241:E90D09
242:E87Q05K03R02D01 244:G98M01 245:R93K03N03 247:V95A04 248:G96A02 249:A96S03
255:V93F04M01 256:L70M25I04 259:L96M03 260:Q90R05K01 261:R54L25Y19H01 264:N95R03
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274:E71Q20K04M02 275:Q85T05K03E02R02 276:L89V08I01 277:N98L01 278:R91Q05H02
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389:N68H18K07R05 391:P96H03 393:V85I09T05 394:M80L12E05 396:F96V03 397:L90I07 398:Y95H04
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414:A91S06 416:T90N05A02 417:A68T20D04K04V01 418:N66D17S15 419:A50T49 420:S68F23V05L01
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468:D75E07N07A05T04 469:L95K01M01 470:A69T30 471:S90D04G02N02 472:S70R14N07K05G03
473:V96F03 475:I95L02P01 477:S95G04 478:V84M08A04T02 480:K95R05 488:L93I06 489:S95A05
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(xviii) N127

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85:L76M23 86:S95R04 87:Q82K11A03R01 88:R63Q20K11L02H01 92:V98I01 93:L86M07F06 94:Q93E04T02
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117:R74Q13K12 118:Q97K01 119:G95A03S01 120:D85E11N03 123:K93A05M01 127:D97N02 128:L94F05
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138:Q79K15H02Y01 140:M91L07 141:T74S15A09 143:N63S36 144:P87T11 145:D95N04 146:S92Y04C02
148:P91E08 149:V93R03 151:A91K04R02V02 152:A95L04 153:R93H04 154:R98K01 155:R90K06H02
156:L97I02 158:Q95L02M02 159:N77D18S02K01 162:N59K34R04 163:T56S41A01 166:I70V16T09L01M01
167:A92S04G03 168:S93E03K01P01 169:D88S08N03 170:P95K04 171:A63T17S07G06-02N02
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180:E79D13M06 181:H97R02 182:V95A02I02 183:S83R04I02Q02T02C02N01 184:K90R04Q02A01M01
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202:R40H36C11S04A02G02P02 204:D85E13 206:Y76V11T04F03H02S02 207:N50S25R09G07D06
208:Q63H22E05Y04L02 209:V85I11M02 210:V77L17T04 211:V43L20E13A11G04M02S02R01 212:S95A03T01
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236:L75I22V02 237:V66I24L08 238:K55E14N09R06M05S03T02H02 239:N46S36L08T03G02H02
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252:P84A11L04 253:V91A04L02 256:F89I09L01 258:I84F06V05W03 259:L94F02M02 260:R59K20Q18H01
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 434:I63V36 436:Q97M02 438:Q86H09S03 439:V96I02 443:P47Q35E14R01 444:K74E11Q06S03T01
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 530:E75K13Q06H01 531:H94Q02Y02 532:V70I09L09F08M02 533:Q95S03 534:A88V06-04 535:R76W06K06-
 04T03Q02 536:L52P41-04 537:R95-04

(xix) N128

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 23:P33S30-20G05L03R03A01 24:I57V09T08L06M06A04-04N02 25:P51S37F09-01 26:I69M18T05V02F02L01
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271:D62N20K06Q03R02S02 272:A37T11L10V10F09I08G06S02N02D01 273:F97Y02 274:K97M02
275:D87E07Q04 276:L93V04I01 277:N97L01 278:K45E26Q13R12 279:K63R36 280:F90L06I02
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 383:R90Q09 384:L92F07 385:S87T05E04C02 387:R97K02 388:P64S18L11A03T01 389:Q79H14N04
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252:P89L09 253:A85V09S02T02 258:V62L27I04W03M01 259:L97M02 260:Q70R29 262:L95F04
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275:D79E12Q05A01 276:F49I36L07V06 277:N97L01 278:R40K38Q06T06A02Y02 279:R90Y04K02S01
280:F90L07 281:N36L33S13I05M04V02T02D01G01 282:H22S20A13F11R08L06D05K03I02 283:F85L12Y02
284:L48V43I06 285:Q95E02 286:K84D07T02N02R02 287:I78M07R04A03K03N02 288:V97I02 289:K52Q42E03
290:E93N03D02 292:Y95R02L01 293:E43T33R06S06A02K02D01I01 294:T51S47 295:F66Y33 296:D84E10N03
297:K88E06P03 298:E39N38D15G05 299:H50N43V03S02Y01 300:I98V01 301:-97P02 304:I88V11
307:S95A02C02 308:L96F03 310:E79G11A04Q02D01 311:H47Q47E02 312:C81S12V03A02 313:Q61L28M03-
02V02 314:E82D12-02K02 315:K82N10E01R01S01 316:K61S31N02-01T01 317:V65A10T06-05L03M03I02K01
318:G43E42D06-04 319:E43A36T06-05D03G02 320:N50D36-05S02T01 321:-96G03 322:-96E03
323:A48T29S07V05-03G02 324:A33N21H20R15-02C01S01V01 325:V35T25I22M04P04A03L02
326:Q68P24A04L01 327:L55I38P04V01 328:S50P48 329:K43N37D14S02 330:E87G08K02Q01
331:K88S04H03Q01 332:I97V01 333:V52I45M01 334:N72S16H07G02 335:L52I43T04 337:N90Y04T03S01
339:L88I11 343:G97A02 346:T97S02 347:V92I07 348:T79A15S04 350:A83G10T04S02 352:S95Q04
354:S89C05V03G01 355:L95I03 356:M90L06I01 358:L60V29A09 359:V55A39M02S01 360:T50L40K04S04
361:Y91H04N02 363:D63N18E08H06K01 364:I93M02V02 366:K95R02E02 367:K79R20 368:I97V02
369:Q93H06 370:E86A06K03D02Q01 372:L93I06 374:Q81R13E03 375:T85V06I03N02R01 376:I98V01
378:R54Q40W03 379:E95D04 381:R92L04K02 384:L95F04 385:S93E04A02 388:G72P15S06A04
389:T56M27N04L03S02K01Q01 390:L98M01 392:Y97H01 393:T95M02 396:F97V02 398:L95H04
400:M86V06I04T01 404:S97T01 406:F93L04Y01 407:L84V10M04 410:T97A02 411:I95L04 414:S76C21-01
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426:I97V02 429:D90G06N02 430:T46R36L15 431:C96V03 434:V52I47 436:Q97M02 438:Q96S03 439:V97A02

443:E91P06K01 444:K85T06S04N02 445:L94I05 446:W98F01 447:K93P03E02 448:D88E11
 450:S59L23E06Q04D04 451:T60A25S08K03R02 453:N81D06K05R04 455:E96K01
 459:N65S20T03D02R02C02H01 460:A86P06E04D01T01 461:A31E24D22G08T06N04S01 463:T94K02-01A01
 464:E86K06R02T02 465:V50I36L13 466:N75S21D02 467:K53R43S02 468:T49V25A12E06D02M02
 469:E54D38L02N02K01 470:G43S42A10T04 471:E61D38 473:V91I05F02 474:L57M38V03
 475:V34T20A19I13S06L03P01 478:L93A02M02 480:K95R04 482:R76K23 484:I88L11
 487:S39T22P18N08A04E03 488:I95L04 489:A52G47 490:R95K04 491:W90M05G01 492:E68Q31
 493:V75I20M04 498:T35S33A29V02 499:T95I04 500:L76M20I03 503:Q93R02E02 504:L95C03
 505:E88H04K04Q01 506:F96I02 507:S91K02N02E02 508:V47L40I05S03N02 509:C38R35S16A04Q01
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 530:E95D02K01 531:H58C29A04S04 532:F93L06 533:Q95S03 534:V54I36A04M03 535:K84R09T03Q02
 536:Q50K34P09L02R02

(xxii) N207

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 47L36W15 20:-47L26Q21P05 21:-47E26M21P05 22:-47A26S26 23:S52-47 24:-47T26R21L05 25:-47S31P21
 26:-47I26S26 27:L63-36 28:Q52V26-21 29:S78-21 30:A31E26-21S21 31:L52V26-21 32:L78-21 33:V47L31-21
 34:S36-21F21L21 35:L63-21A15 36:C36V31-21T10 37:V52L26-21 38:L78-21 39:A31C26-21V15I05 40:A52I26-
 21 41:I47L21-15V15 42:H57F26-15 43:L84-15 44:G36V26-15W15C05 45:K52L31-15 46:L31W26T21-15R05
 47:L47S26-15A05V05 48:L57Q21-15V05 49:R47Q21-15W15 50:Q52-15H15W15 51:R63-15Q15H05
 52:R42L31-15K10 53:R63-21Q15 54:R42-21K21G15 55:R36-21K21Q21 56:R84-15 57:R42K21-15L10S10
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 82:F73L26 83:A52T26S21 84:R68K31 85:L57M42 86:A73R26 87:R36K31S26G05 88:T47K42R10 91:D68A31
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 109:R57E42 111:I94M05 112:R63K26-10 113:Q68E21-10 114:A89-10 115:L89-10 116:V89-10 117:R47K42-10
 118:Q73K15-10 119:G84A15 120:A73E26 121:A52D47 127:P52D47 129:P52Y26T15S05 133:L52F47
 134:V73I26 136:G73N26 138:K42L31R26 140:L57M42 143:G73S26 144:-78T21 145:G52N36S10 147:S73G26
 148:E89D10 149:R52L47 152:L68V26F05 153:H78Q21 154:R94W05 155:R57K36S05 156:I31A21V21L15-10
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 167:G94-05 168:S42N26E15K10-05 169:P63S31-05 170:A42K26Q21-05R05 172:R52K21S21-05
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 196:G52L31K15 198:A57S26K15 199:G57K26E15 201:A52Q31K15 202:F52Y21P15A10 203:L52F47
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 244:G89M10 245:R57K21N21 246:T63A36 247:V73A26 253:V94L05 255:A47F26V26 256:L52I26M21
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 363:E47K36D10N05 364:V63I36 366:A63K21E15 368:M42L31V15I10 369:Q78H21 372:I47V42M10
 375:V57I42 376:V73I26 383:C57R26S15 384:A31F26I21V15M05 387:Q68R26K05 388:P68A31 389:H73N26
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 471:S73D26 472:S73K26 473:V78F21 475:I78L10P10 477:S73G26 478:L42V36A21 489:S73A26 490:K73R26
 491:M73V26 492:Q73E26 493:L68M26I05 497:T63L26I10 498:S68A31 499:I73T26 501:V68L31 502:H73Q26
 505:N52K26T21 507:T68K21E10 508:A73S26 509:N73S26 511:N68K31 513:D73E26 514:L47P36S15
 515:K52T31V15 516:M52L47 518:F63S26C05Y05 524:I63M26L10 528:P78N21 530:-73E26 531:T73H26
 532:L57I26V15 533:N68S31 536:L73P26

(xxiii) N223

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 35:A76S09-06L06K01 36:A76V10-09N01T01 37:V78T07A06-03I03S01 38:F89L07-03 39:C89-06F03S01
 40:L79I12-06E01 41:V64I17L12-06 42:F78L14-06C01 43:L85-06M06R01 44:L70V20A04-03R01 45:I60L23T09-
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135:T45A34S12G06V01 136:D87N12 138:Q89K10 140:L85M14 141:T57A40S01 144:P68T26-01H01L01
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231:Q89K09E01 233:L90F09 235:N59S29D04R04K01 236:I65L21V12 237:V90I09 238:N93K04A01
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243:F98L01 244:G34V26T20N04A03E03M03S03D01 245:D51N25E17K04I01 246:V87T09A03
247:A85T07V04G01 248:A90G09 249:S51A42V06 251:N90S07Y01 252:P87L12 253:A87V09T03
258:V59L23I09W07 259:L93M06 260:Q73R26 262:L92F07 264:S93R06 265:R84P14C01 266:-92V07 267:-
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385:S90E09 387:R98Q01 388:G76P12A07S03 389:T64M18N10Q03S03 392:Y98R01 393:T98M01 396:F93V06
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 424:Y98F01 425:Y81F17H01 426:I93V06 429:D90G09 430:R78T15L04C01 431:C92V07 434:V76I23
 436:Q95M04 438:Q92S07 439:V96A01T01 443:E84P15 444:K89S07R01T01 446:W96F03 447:K92P07
 450:L50E14S14Q10D09M01 451:T68A21K06S03 453:N96D01R01 455:E98G01 459:N64S28D06T01
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(xxiv) N224

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 05L05G01 36:A77V11-05T04N01 37:V63A15-08T06I05 38:F86L08-05 39:C93-05S01 40:L83I11-05
 41:V66I15L12-05 42:F80L12-05P01 43:L90M05-02A01 44:L75V18-02F02A01 45:I62L22T09-02V02
 46:Q80R13T05 47:S76R08T06W04P02C01 48:L80F12R06 49:R65Q29W04K01 50:Q95P02R01
 51:H62R15P09Q05K04A01N01 52:V76I11L08A02T01 53:P91R06-01 54:K81E08Q05-01A01S01 55:G90K06-
 01E01 56:L91R06-01 57:K77R18Q02-01 58:S58R27N12P01 59:P94L05 63:R93F06 64:G88P06S04
 65:Y66F11L11W08I02 67:I63V20L11M04 68:L79I18V02 70:N93S06 71:V86L09A02M01 73:E90Q09
 75:R81G18 76:K97G01R01 77:D81N09Q06H01 78:P55T44 81:V50A31S18 83:T98A01 84:R81K13Q02E01
 85:L77M22 86:S90R08G01 87:Q69R20K09 88:K83R11Q04L01 91:D98E01 93:M88F11 94:E76Q15T04G02R01
 95:V75I25 96:R72K06T06H04Q04A02S02 97:I90L08V01 99:T73S23M02 100:R97Q01W01 101:P91Q06R01
 103:L79V20 106:S91N06G01 108:L93Y05-01 109:D70E27H01 110:T93A06 111:I97L01V01 112:K61R38
 113:Q94E05 117:K87R12 119:G87A12 120:E91D06Q01 121:D95E04 123:M84A11I01K01L01 127:D97G01K01
 128:L91F08 129:H52Y33P12F01 131:F98W01 132:Q68R22K06H01L01 133:Y69F25H05 134:I75V23F01
 135:S80A08G05T05 136:N72D25S01Y01 138:Q79K12H08 140:L87M12 141:A79T18G01S01 143:S97G01N01
 144:P72T18Y06-01H01 145:D81E09N08 146:S81Y09C06V01 148:E93D06 149:V83A06R06M01S01
 151:K87R12 152:A91L08 153:R90H08L01 155:K94R05 156:L95I04 158:Q97R02 159:N87S12 162:K88R09N01
 163:T84S13A01 166:I70V12T11L02S02 167:A70S13T08G06 168:P76A09E06K02S02V01 169:S98T01

170:P87K09L01S01 171:T94N02-01R01 172:S88A06-01C01V01 173:S88T08-01P01 174:S77C18-02Y01
175:T63S31I02C01 177:L95P04 178:L94I05 181:H95R04 182:V93I05T01 183:S88Q05C04T01
184:K81Q05T05A02M02N01 187:D43E31Q08S06N05A04 188:Y91E04F04 190:V98I01 191:T80K11S05A01I01
192:K91A04V04 193:F87L12 194:L93M04Q02 195:Q83E15R01 196:L88V11 197:M91S08 198:E55D26K09S08
199:E79K16Q02D01 200:E66K20G09Q02 201:K76Q16G05R01 202:S72R16A04P04G01T01 203:F95I02L01
204:D93N05E01 205:L48P48I02 206:N56Y29T09C01F01K01 207:R51Q41S05N01 208:Y91Q08 209:L77I11V11
210:V88T08I01M01 212:S91A06T01 214:A95C04 218:C98W01 220:M75I20L02T01 221:C98F01 223:G98A01
224:K98Q01 225:R98H01 226:Y98H01 227:D83E16 228:H98-01 229:N58D29E08S02-01 230:D97N02
231:Q91K08 233:L91F08 235:S75N20D01H01K01 236:V40L37I22 237:V88I08L01M01
238:N87K04D02G01H01S01T01 239:L87M08D01F01I01 240:N66G19S13 241:N80D11T06H01 242:E94D05
244:G97M02 245:D61E26N05K04M01S01 246:V87T06A05 247:A93T04P01V01 248:A72G27 249:S69A25G05
251:N76H16S06 252:P91L08 253:A84V06S05T02 258:V48L33I08W06M02 259:L94M05 260:Q55R44
262:L93F06 264:S86N08R05 265:R84P12H02 266:-93V06 267:-94R05 268:-94S05 269:T76A12S09N01
270:M91L08 271:Q50E23K12A06D04H01R01 272:L65A12I08T08V04S01 274:K95M04 275:D91Q08
276:I70L13V12F02 277:N97L02 278:R69K12Q08A05T02G01 280:F88L11 281:N68S26D02G02
282:A26F23S20L13D06I04C01M01N01 283:F97L02 284:V86I13 285:Q93E05H01 286:K97N02 287:I91K06N01
288:V98I01 289:Q77K19E01R01 290:E90N06D02 292:Y91R04L02F01 293:T66S13R12A04I02 294:S70T27G01
295:F93Y06 296:D97N02 297:K91P06R01 298:E77G09N08D04 299:H93V06 301:-95P04 304:I88V11
305:T98M01 307:S91A04C04 308:L93F06 310:E65G23A08D01Q01 311:H95N01Q01R01 312:C93V06
314:E87D11K01 315:K84N08S02R01T01Y01 316:S63K29T02G01N01Q01 317:V68T11A09I04-02K02G01
318:G76D13E04-02R01V01 319:E86D06-02A01G01K01 320:D73N18-02E01G01T01V01 321:-93G06 322:-
93E06 323:A72S09V08T05-01G01P01 324:H41R31N20C02Q01S01 325:V69I18P08L02A01
326:P47Q40A08L02S01 327:L83P09I05V01 329:N66D29K02S01 330:E94K02G01Q01 331:K79S09H06Q02M01
333:I77V19M02 334:N44S33H15G04A01T01 335:I83T09L06 337:N80Y08T06S02G01 339:L95I04 347:V86I13
348:T59A30S09 349:T98S01 350:A91T06G01 351:L98I01 352:S90Q08T01 354:S80C09V06G02
355:L91I05M01V01 356:M86L11A01I01 358:V59L20A18S01 359:A77V13M05S02 360:L79T11K08S01
363:D80E09H06N02 364:I94V02M01T01 366:K91E04R04 367:K84R15 368:I95V04 369:Q91H08
370:E86A06D02K02Q01 372:L90I09 373:D98G01 374:Q79R16E04 375:T81V12I02A01R01 376:I98V01
378:R51Q40W05C01G01 379:E91D08 381:R90L08K01 384:L91F08 385:S91E08 388:G76P11A06S05
389:T55M22N08S04K02Q02A01I01R01 392:Y97H02 393:T94M04L01 396:F94V05 398:L91H08
400:M81I08V05T02A01 406:F91L06I01 407:L84V15 411:I93L05V01 414:S84C13R01 417:K97R02 418:A72D27
420:V72A26T01 421:L97F02 422:N98K01 424:Y98F01 425:Y86F12H01 429:D84G11N04 430:T93L04R02
431:C93V06 434:I66V33 435:N98S01 436:Q95M04 438:Q93S06 439:V97A02 440:N98H01 443:E83P13K02
444:K75T11S08N04A01 445:L93I06 446:W97F02 447:K90P06E01Q01 448:D93E06 450:S90D08L01
451:T47A38S08K05 453:N79K11R08S01 455:E95K02Q01 459:N79S09D05T04G01 460:A76P12E08T02
461:A62D13T12N08S02 463:T95A02-01 464:E93T04K02 465:I70L20V08 466:N55S43D01 467:R84K09S05
468:T83A09M04I01P01 469:E91L05K02 470:S75G12T08A04 471:D75E25 473:V94F05 474:M63L31V04
475:A31T25I19S12V05L02P02 478:L90A05M02V01 480:K95R04 484:I88L11 487:S66T16E06A05D01F01P01

488:I93L06 489:G83A16 491:W88M11 493:V69I22M08 498:A52T41S05 499:T94I05 500:L52M40I06
503:Q97H01R01 504:L93C06 505:E77H09K08Q01R01T01 506:F93I05V01 507:S88K05E04N01
508:L79V08S06N04F01 509:R59S15C11A09L01Q01V01 510:P93D05G01 511:G91K06-01 512:E83Q09A02-
01K01V01 513:E61K16Q09P06R02A01H01 514:V88L11 515:D93V04T02 516:I72L11M11V04A01 517:T93D06
518:P93S06 519:Q88T08H02 522:L98F01 526:Y80H11P08 528:K65R15Q08N06P02S01 529:C90F06Y02
530:E91D05K02 531:C58H19A09S09L01R01 532:F88L11 533:Q91S06A01 534:I70V18M06A04
535:K80R06T06Q05 536:K59Q19P16R04

Table 2. Variable residues $X_1 - X_n$, and amino acid variation at each residue, of engineered ancestral CYP2 sequences corresponding to nodes (i) – (xxxi). For each of the ancestral sequences corresponding to nodes (i) – (xxxi), variable residues $X_1 - X_n$ are given in sequential order. For example, for (iii) CYP2_N13_gen, 444 variable residues are given, which correspond to $X_1 - X_{444}$. For each variable residue, the format of the data is as follows: [amino acid position]:[first amino acid variant][percent frequency of first amino acid variant]...[last amino acid variant][percent frequency of last amino acid variant]. Position is given relative to the corresponding A0 CYP2 sequence, as described herein. Frequency is relative to all sequences used to construct the A0 CYP2 sequence. Note that ‘-’ represents a ‘gap’/amino acid deletion. For example, X_{11} of (iii) is given as 14:V29L23A21F15I04T02-01, which sets forth that:

the amino acid position of the variant relative to the alignment to produce node CYP2_N13_A0 is ‘14’;

the first amino acid variant is a ‘V’;

the frequency of the first amino acid variant relative to all sequences used to construct CYP2_N13_A0 is 29%;

the second amino acid variant is ‘L’;

the frequency of the second amino acid variant is 23%;

the third amino acid variant is ‘A’;

the frequency of the third amino acid variant is 21%;

the fourth amino acid variant is ‘F’;

the frequency of the fourth amino acid variant is 15%;

the fifth amino acid variant is ‘I’;

the frequency of the fifth amino acid variant is 4%;

the sixth amino acid variant is ‘T’;

the frequency of the sixth amino acid variant is 2%;

the last amino acid variant is a deletion;

the frequency of the last amino acid variant is 1%

Only amino acid variants with frequency of 1% of greater are listed. Where the combined frequency of all listed amino acid variants is less than 100%, this is due to the presence of one or more additional variants with frequency of less than 1%.

(i) N3

4:M95-04 5:E36D36A08L08-02V01G01S01M01 6:L41P21A18F03S03V02-02G01T01M01 7:-
48L23S13G05A04W01T01 8:-51G42S01E01 9:-59A14L10T06M03V03I01 10:-95W03 11:-
32T14S10L10A08I08V06F03G02 12:T35V21F10L10S06A05-04I02G01M01 13:V41L26I18T06A01F01M01-01
14:V28L23A21F15I05T02-01 15:L88I04F02V02-01 16:L41V38A08G03-02T01F01
18:L36V19I16A15T04F02G02-01 19:C50L19W08S03V03G03F02T02-01Y01A01I01 20:L62I15V13F02M02A01
21:S50L13T12A11V04I02-01C01F01 22:C49G10V07F06A05L05T05I03S02-01 24:L79M08F04V02W01-01
25:L67V13I11F03A01M01 26:L61F11I06S05V03C02A02W02T01-01 27:L59F15I09M07V04S01

28:S51A13L11F10I04V01-01M01T01W01 29:L38V17A16I07T06F03S03-01R01
30:W74R10P03T02K01L01Q01V01 31:R39K30G11N08L02Q01S01T01
32:Q45K10H09S08R08G05T03N02W01-01 33:S26R22P10I10N05G04M03K03T03V02-01L01 34:-93A03T01
35:-94R03 36:-98G01 37:-90Y05H02 38:S40K18H07R06Y06-04N03Q03A02T01P01
39:G29A12S11K10R06Q06L05-04T03E02N01V01 40:R29K29W11H06G06-04S02Q02Y02L01 42:G72-
10R07E03K02S01 43:-98G01 44:K60R14H10N08Q01 45:L86M06Q02E01F01
50:T58R11F07A07I05V02M01P01W01 51:P90A05T02 52:L89F06I04 54:I50F23L22V03 55:I50L37V09F02
58:L37I32Y09V07F06M04A01T01 59:L88F07M01 61:L52I21V14M10 62:D44N25R11K10E03G01S01
63:T19V16P13R11L11I08S06F03K02M02A01 64:K56G08R07E06Q04D04W04S03N02T01
65:N34D26G11A08Q06E05K01H01R01 66:I37L30M14T06V04P02F02
67:S25P18L16Y12F07A04D02R01T01V01C01G01N01 68:K53Q11N09E05S04T04R02A02D01L01
69:S82T07G03A01C01H01 70:L60F29I07 71:T24S17M17L14K05Q05R03V02C01E01H01I01N01
72:K45N18R13E08Q04M04A01S01 73:L73F14I08M02 74:S58A19R14Q02G02 75:K48E42Q02D02R01A01
76:K33V19R16E11T07D03Q02A02 77:Y93F04W01 79:P80D10S07 80:V95I03 81:F86Y10M02
83:V52L32I13F01 84:Y68H27R01 85:L65F26M04V01I01 87:P36S22M21T06L06W01R01Q01 88:-95W04
89:R43K27Q14E04D04N01H01 90:P60R33K04 91:V49T28I11A06M01S01 92:V97I01L01 93:V85M08I04
94:L94V03M01 95:H45C28Y12V06S04 97:Y71H15T07Q01 98:E55D22K10Q07N01 99:A80V11T05I02
100:V80I13L04 101:K82R14Q02 102:E96D01Q01 103:A91V07 105:V43I40L09G03D01 106:D88G04N02L01
107:Q47H17L12R11Y03K03N03 108:A46G41K06S03 109:E64D26N07 110:E66D13A11V02N01I01K01
111:F98L01 112:S78A13L02T01G01 113:G86A06D02E01 115:G89A04T01S01
116:S20E19T10H08K07D06N05R05P04A02I02M01Q01 117:F24I20L18M12Q09V04Y03S02N01
118:P65A29S01 119:V33I17T16L12A06S05M03F03 120:F29L16I14A12V12G04S03T01M01
121:D37E35Q08K04F03H02N02R01S01Y01 122:R28K27P08W08N05A04D03E02Q01G01V01M01T01L01
123:I19L15V14A12T12F06N05H05Y03S01M01 124:F37N24T12K06S05Q02A02V02I01R01L01
125:K41Q27N08-07R06D03E01H01 126:G83D07N02E02 127:Y28L22H14N06F06K05T05R02Q02S01
129:I55V37L06 130:V34I30A18F04L04G03T02 131:F80L06T04I02S01M01 132:S72A17N07T01
133:N87S04H02T01 134:G93N04 135:E59K16N08P07D04T01R01 136:R60T18K05E03I02S02Q01V01L01
137:W90A08 138:K79R14L04 139:Q43E22A08D08V05T04I03H01 140:L52T16I13M11V05
142:R90K03H01N01Q01 143:F97L01 144:S70T14A13 145:L78I11V05M02T01
146:T35M30A12S07L04Q03G01 147:T72I10V09A05 148:L89M09 149:R95K03 150:N53D40S02E01
151:F74L12M07Y05 153:M88V08L01 155:K94R03 156:R70K19Q06 157:S61G18T11E03N02
158:I70V11N07G03M03L02 160:E62D26Q02A02S01N01H01 161:R88L03W02K01Q01 162:I73V26
163:Q89L05K03 164:E85R06A03K01Q01 166:A83S04T04G02V02I01
167:Q29R21G12H10L06S05E04C02K02A01P01 168:C47F29Y13H04S01 169:L97M01
170:V61L24I08M02R01 171:E83A04K03Q02D02G01 172:E60A23R07S01V01Q01 173:L70F17I10
174:R69K12Q08N04H02S01 175:K70G09N08E02D02A01S01T01 176:T83S08Y02F01
177:K31N27Q14E09H07R05 178:G69A19E07S01 179:S28A23Q16R07K06T05L04E03G01
180:P82L07F05S01Y01 181:F40C31I12L08V02Q01 182:D89N07E02 184:T77S08G03I01R01V01Q01L01H01

185:F75L07Y04N03S02I01R01 186:L30I28F21V06Y05M04T01 187:L79F12I06V01
188:S36G33A06H05Q04T03V03I02N01D01 189:C50R18H06S06Q05A02F01K01Y01N01L01G01
190:A63T15I07V06S05G01 191:P42V37T16S01 192:S44C40A10Y01F01 194:V73I26 195:I96V02
196:C75S17A05N01 197:S86D07C02T01 198:I72V18L07 199:V50I32L14T01 200:F98L01
201:G55Q25H08R05N03 202:N27K20D19E13S08L02Q02R02H01 203:R92H06 204:F90Y07L01
205:D74E08S03P03N03G01H01Q01A01 207:E31K29N09D08T07S05Q03R02G01 208:D96N02
209:K43Q21E18P08R03 210:K24E22Q14T10N08D07R05H01 211:F85L07C03G01 212:L83Q09V01H01I01
213:T22R17N16S15A10K06H03Y02D01E01Q01 214:L81I07F04V03M02 215:L40M36I16V04Q01
216:E21R16D12K12N11Q05S05H04G03Y01T01A01 217:L36M16K16Y07N05R04A04I03V01
218:F32L23I18M16A03V03T01 219:N55L07Y07H06E03D03S03G03T01F01
220:E58G10Q08D08N05K02S01R01 221:N52S19I10T09V01 222:F56L11V09N06I05A02T02S01G01
223:R22K17Q14E10S06Y05L04I04A03T02H02N01V01 224:I36L30F11E07M04G03Q01
225:L35M18I12T08V06Q05F04A02S02N01 226:S68N16A09G02T01R01 227:S66T28K01
228:P57S10F10I04H02L02R02T02A02V02G01 229:W70S08T06Q04M02Y01L01
230:G31I24S11L08A07T06M04V02C01 231:Q89E06A01 232:L50V26I07M07T02F02A01
233:Y58C22F12L02H01 234:N59E22D08Q03S03 235:M26N17L14I11F09A09T04S03V01
236:F83Y08L03W02I01 237:P61S28Y04H01A01 238:S25G12A11T07I05K04N04V04D03W03F03L03R02P01
239:L43I18V15F15Y05 240:L39M32I22-03 241:D38K24Q09H09R06E05N02Y01
242:Y65H16W06P02R01F01C01V01 243:L59F24I05C04V04M01 246:P39S32T08R05A02I02E02K02
247:H87Q10Y01 248:N29R22Q16H11K10T05S01 249:K38Q22R14T08E04N02A01V01H01I01
250:L30I29V16A08F08M04 251:F38L19Y15I09S05M04V01A01T01
252:K63R05Q04N04T03Y03A03G02E02S02H01 253:N63E11L06H05I03R02D02K01Y01
254:L23F20I19V15Y05M04T03S03A01 255:Q18A18E18D09S07G06T05N05K03L01Y01I01V01
256:E33Y13G09K09D07A04F04T03L02R02N02C01 257:L35I26V15Q07M06T02F02A01
258:K50R12E10N06A04D03L03I01H01Q01 259:D25S17A13N10K09E07Q04T02V02H01R01 260:F62Y33L03
261:I55V20T07A06L04F03M01 262:L39A19S09G08T04M04V03I02K02R01E01F01
263:E56K13R08Q05H04S03D02A02 264:K44R21S11E08Q06I04N01 265:V64I25A04T02L01
266:K56E19Q08R06A03N01M01 267:E51K11Q09R05M05I05D03A02H01L01T01S01 268:H80N18
269:Q66R13E08K06L02H01 270:E43A21K09R07Q07D04G03S01 271:S55T39N01 272:L92F02R01M01
273:D93E01N01Q01 274:P56I14V08L04T02M02A02H01S01F01 275:N49S29T08D02Q02A01G01H01
276:N43S25C15A06G03D01E01F01 278:-95A04 279:R86Q11K01 280:D96N03 281:F83Y07V04L04
282:I87T06V05 284:C52Y13S12A11T08 285:F78Y12L06M01 287:I60L15S06N05T03M03V02D01
288:K61R22E07Q06H01 289:M88I04L02R01 290:E52Q16D08A07H04K03R02N01 291:Q49K33E16
292:E89D06A01 293:K79Q05N04E03R02-01 294:H31Q14S10K09N09D07G06E05Y01-01
295:N69D13S07H02I02K01 296:P50Q17K09G04A03S03E03H01D01L01T01
297:Q24N21H14E12D04K04S04L03A02T02 298:S55T29P06L04M01
299:E73H05S03V02K02M01G01L01Q01D01 300:F88Y09 301:T46H23N12Y06D02S02Q01I01
302:M28L21I11H09V06Y04T04E04F02D02Q01 303:E44K28D16Q04R02 304:N79T10S05H02G01

305:L89I07M02 306:V34I21L12A11S06T05M04E02F01
307:M17I15L14T12V10A08R05N02S02G02F01Y01H01 308:T79S11C03A01N01
309:V36T33I10A08G03S03L02 310:L36S10A10F08T07W06H05V05I04N02M01 311:D53N28S11Y03
312:L89V05M02I01 313:F88L10 314:F48G16S07L06I06A05V05T02 315:A92G07 317:T95S02I01
318:E86G06V02M01Q01 319:T97S02 320:T66V25S04I01 321:S93G04T01 322:T70S17I03A03L01N01
324:L83I06M05V03 325:R90K05 326:Y85H08F06 327:G74A19S02T02 328:L64F32I02 329:L95S01
330:L68I20V06F02 331:L90M07I01 332:L55M33Q04I03 333:K97R01 334:Y52H45N01 335:P97T01
336:E59H13D11K09Q03 337:V68I31 338:T31E27Q23A09V03S01 339:A54E40K01 340:K85R12
341:V68I14L09M04A02 342:Q56H35R03Y02 343:E76K16Q03A02 345:I93L05 346:D75E11N04T02H01
347:R58Q18H09C03S03T01A01N01 348:V95E04 349:I72V22L04 351:R58P14S08K07Q03A03H02
352:H38N24S14D07G04A03E02T01 353:R93Q04 354:S42I11Q09L08A05R04P04V03C03M02K01T01
356:C44A16S14K07T05N02R02G02Q01 357:M48L19V11I09F07Y01 358:Q31E25K12A11D10G03S01N01
360:R92K05H01 361:S39A18T09L07V05M04K03N03G02Q01I01
362:K27R19H15Q14S06E06A02N02D02C01 363:M89L10 365:Y95F04 366:T84M12L01S01 367:D78E15N04
369:V90M05T01L01 370:I50V35L13 371:H96C01N01 373:I76V17A03 376:F57Y30L08V01
377:I54A11S09G08L07T05V02 378:D73N10S06A05T03 379:L66I15F06V06M05 380:V38I34L19A04T01
382:M25L19T17S11N10I10F02V02 383:G39N38S18A01 384:L57V33I05M02 385:P87A07L01 386:H82R17
387:A41R13T11E08K04M04S03N03V02Y02I02 388:V75A13L04T04I01 389:T73I12N03L02V02A01S01
390:K31R30Q16C15H01S01T01 391:D91T03N03 392:T60I23V13
393:K39H14Q07C04S04E04R03T03V03M02L02A02P02N01I01 394:F94L04 395:R94Q02K01
396:G47N23D12E10Q06 397:Y83F14H01 398:L40F17V15T11I09H02 399:I72L27 401:K94Q04
402:G84D11N04 403:T96M01 404:T34E23D12V08N05M04A02L01S01I01F01 405:V53I44L01
406:F34I24L20Y13M03V02 407:P64T27A03I02V01 408:S29L26I14M11T07V05 409:L96I01M01
410:T31S28G18D07N04H03C01K01V01 411:S87T08P02 412:V76A12L06I03 413:L91H05M01
414:H51Y17R11K08F02N02T01Q01L01 415:D95E02N01 416:P37S21D19N07E04K01C01G01R01
417:K62Q11R05T04E03S03H03N01 418:E54Y14Q09F08H03V03M01 419:F96W02
420:P53E13S11K08R04A03L03 421:N56K09D09T06Q05Y03S02E01H01R01
423:E50D18Q07N06K05R02G01T01Y01W01H01 424:K20E14T12Q09D08V08A08S04I03M03R02C01
426:D45N39K07Y05H02 428:G50E16Q14D09A02N01R01S01T01 429:H91R04N04 432:D82N16
433:E51A22K12D07G01Q01 434:N48S20K13D06Q04E02G01R01 435:G95Q02
436:N32K12A10R10T10Q09S08C02H01E01 437:F87L11 438:K83R13Q02 439:K88Y07R01S01
440:S65N24T03Q02H02 441:D65E22P06N03 442:Y44A41F06H04G01 444:M57V18L08K07I06 445:P82A16
447:S98A01 448:A48I15T14L08S08M02P01 450:K95R04 452:I41V23A09M08Y06L04N02S01F01
454:L35V31A18F07P04I01 456:E96A01 457:G75S14A08 458:L86I08M04 460:R94K01
461:M82A05T03N03S02 463:L88I09 465:L89I09 466:F71L13Y08I05V01 467:L65F26I05V01
468:T84A05S04V04 469:T56A18S17N03I01 470:I92L03V02 471:L94M04 473:N62H14K09S04A03R02D01
475:T36S23N16R07K07H02C02Q01 476:L81F11V05I01 477:K68S05Q05R05A05E04T01L01G01
478:S55P37C02T01A01 479:L43P26V19S02T01E01Q01A01 480:V63Q07G06I04C03K02M02T02L01E01

481:D48A17P12E05S04H03G02N02L01 482:P84L04H03T02R01 483:K53E18Q11A05D03G03N01R01T01
 484:D74E11N04A03S02 485:I78L18V01 486:D80N10S05E01 487:L30I29T26V09F01P01
 488:T59S23K05Q03A02I02N01 489:P94A01S01 490:V22K17I14L10Q08A06T05E05R03M01N01
 491:V21A11E11L10T07S07H06I05Y03P03N02F02M01C01 492:S41N22V10T07I06K04C01L01
 493:G85S05T04F01A01 494:F51L27V07I05T04M01 495:G42A28V07S04F04T03L03I03N01
 496:N37S27K11T08R07H03C01 497:I37V36L16M04A01 498:P96L01 499:P72R19Q02K01H01
 500:P20S17T10F09A08N07H05V04R03L03E02K01D01I01 501:Y80F17 502:Q50K20E16T08R01
 503:L62I16M11V06F02 504:C63S17R08Q03I02Y01 505:F61V15L13A07 506:I40L29V14R06T03Q01M01
 507:P85A10S02 508:R62V24I02L02H01S01A01

(ii) N8

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 16:A51V38S06I02L02 17:-87L12 18:G63L14V12A08T02 19:L89V06A02I02 20:I63L14T14V08 21:L53-
 12T12A08S06V06I02 22:A53V26G10L06S02T02 23:-93L06 24:L91F04C02V02 25:L87M06F04C02
 26:W87L12 27:L53F24I12M10 28:L51F34I06R06V02 29:S46N30L12W06G02T02
 30:V38L20R16G08W06I04A02F02Q02 31:K63R30H02N02Q02 32:N53K12S12-08R06H04T02Y02
 33:R24N18-16K14S10E06T06D02G02 34:-97S02 35:-97K02 36:-93G06 37:-95K04 38:R65Q16N06K04S04T04
 39:K57R18N16G06H02 40:Y40L16H12W12R10Q06T02 41:-93L06 42:-95G04 43:-93G06
 44:R71H12N06S06A02C02 45:L97F02 50:T34S18P14A10N10L06R06 51:A55P30G12T02 52:L95F02I02
 53:P97S02 54:L91I04F02V02 55:I81L16V02 58:L95V04 59:L83P14H02 60:Q91T06L02 61:L51I38M06V04
 62:D75N14K06E02G02 63:K87T08N02R02 64:K44N32D06S06R04T04A02 65:A73E08Q06V06G04R02
 67:F91Y06S02 68:K83R14L02 69:S73T26 70:F48I20L20Y04C02M02V02 71:V42L38M12F02R02T02
 72:K57E42 73:F55L38W06 74:S97R02 75:E42K40Q14D02 76:T83K08S04N02Q02 77:Y97H02 79:P95S04
 81:M91F06L02 83:V53F16I14L14M02 84:Y67N14H08W04A02F02K02 85:L75M22I02 87:W71P18S06L02T02
 88:-93W06 89:Q97K02 90:R93P06 91:T59V24A10M06 92:V97M02 93:V79A14F04I02 95:V83T08C06L02
 98:D81E18 99:A79T16V04 102:E93D06 106:D93N04E02 107:Q91H08 108:A93G06 109:D87E12 110:D93E06
 112:T67V18A06S06I02 113:G93S04P02 115:A73G18M06Q02 116:P91A06R02 117:L36I34T12V08M06F02
 118:P97A02 119:F79L12V08 120:L83I08M04F02T02 121:H44Y14F10V10L06N06Q06M02 122:K48R36N14
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 129:L48I44V04M02 130:G67A20V10I02 131:I73S14V10T02 135:E91S04D02N02 136:R97C02
 138:R89K06Q04 144:T97A02 145:L91M08 146:T75S24 149:R97K02 150:D93N06 151:F97L02 155:R93K06
 156:K93R06 157:G85R06S06K02 158:M93I06 159:E97D02 160:E77Q20A02 161:W93R06 162:I97V02
 164:E97N02 165:E91V06S02 166:S91A06D02 167:K51E20R20Q06S02 168:H83Y12D02V02
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(iii) N13

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14:V29L23A21F15I04T02-01 15:L87I04F02V02-01 16:L42V38A07G04-02T01F01 18:L37V19I16A16T04F03-
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21:S52L12T12A11V04I02C01-01F01M01 22:C50G10V07F06L05T05A04I03S02-01 24:L79M08F04V02W01-
01 25:L66V13I11F03A01M01 26:L62F11I06S05V03C03A02T01-01 27:L59F15I09M07V04S01
28:S53A14L10F09I04V01-01M01T01W01 29:L39V18A16I07T06F03S01-01R01 30:W76R10P03T02K01Q01
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38:S41K18H07Y06R05-04N03Q02A02T01P01 39:G29A13S11K09R06Q06L05-04T03E02V01
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61:L52I21V14M10 62:D43N25R12K10E03G01S01 63:T20V17P13R11L11I08S06F03M02A01
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66:I38L31M14T06V05F02 67:S26P18L17Y12F05A05D02R02T01V01C01G01N01
68:K52Q12N09E05S05T04A02R02D01L01 69:S83T06G03A01C01H01 70:L61F29I06
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74:S57A20R15Q03G02 75:K48E42D02Q01R01A01G01 76:K34V19R16E11T05D04Q02A02 77:Y93F04W01
79:P80D10S07 80:V95I03 81:F88Y10 83:V52L33I13 84:Y68H27R01 85:L65F27M04V01I01
87:P36S23M22T06L06R01Q01 88:-95W04 89:R44K28Q12E04D04N01H01 90:P61R31K04
91:V50T27I11A05M01S01 92:V97I01L01 93:V85M09I04 94:L94V03M01 95:H47C29Y12S04V03
97:Y70H16T07Q01 98:E56D21K10Q07N01 99:A80V11T04I02 100:V80I13L04 101:K82R15Q02
102:E96D01Q01 103:A91V07 105:V42I41L09G03D01 106:D88G05N02L01 107:Q45H18L12R11Y03K03N03
108:A45G42K07S03 109:E66D24N07 110:E68A11D11V02N01I01K01 111:F98L01 112:S80A13L02G01
113:G86A06D02E01 115:G91A03T01S01 116:S21E20T10H08K08D06N05R05A02I02P01M01Q01
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120:F30I15L14A13V12G04S03T01M01Y01 121:D38E36Q08K04F02N02H01R01S01
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125:K40Q28N08-07R06D03E01H01 126:G83D07N02E02 127:Y26L23H15N07F06K05T05R03Q02S01
129:I55V38L04 130:V34I31A18F05L04T03G01 131:F82L06T04M01S01 132:S71A17N07T02
133:N87S04H03T01 134:G93N04 135:E58K16N08P07D04T01R01 136:R59T19K05E03I02S02Q01V01L01
137:W90A08 138:K81R12L04 139:Q42E23A08D08V05T04I03H01 140:L51T16I13M11V05
142:R90K03H01N01Q01 143:F97L01 144:S72A13T12 145:L78I12V05M02T01
146:T35M31A13S06L05Q03G01 147:T72I10V10A06 148:L88M10 149:R95K03 150:N55D39S02E01
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174:R70K12Q08N03H01 175:K71G09N08E02D02A01S01 176:T85S08Y01K01 177:K29N28Q14E09H07R06
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209:K42Q22E19P09R03 210:K24E23Q12T11N08D07R06H01 211:F84L07C03G01 212:L83Q09V01H01I01
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228:P56S10F10I04H02L02R02T02A02V02G01 229:W71S09T06Q04Y01M01F01G01L01
230:G29I25S11L08A07T06M04V03C01 231:Q90E06A01 232:L51V27I07M05T03F02A01
233:Y57C23F13L02H01 234:N58E23D08Q03S03 235:M26N18L14I10F09A09T04S04V01
236:F82Y08L03W02I01 237:P60S28Y04H01A01 238:S26G12A12T07I06N04K04V04D04F03L03R02W02P01
239:L42I18F16V16Y05 240:L40M30I22-03 241:D38K25Q10H09R06E03N02Y01
242:Y67H16W06P02F01C01V01 243:L58F24I05C04V04M01 246:P39S32T08R05A03I02E02K02
247:H87Q09Y01 248:N30R23Q16K11H09T05S01 249:K39Q22R14T06E04N02V01A01H01I01
250:L31I29V15A09F08M04 251:F36L19Y16I10S05M04V01A01T01
252:K65R05Q05N04T03Y03E02G02S02A01H01 253:N64E11L06H05I03R02D01
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261:I55V20T07A06L04F03M01 262:L40A19S10G08T04V03M03I02R01F01
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266:K57E19Q06R06A03N01M01 267:E50K11Q09R05I05M05D03A02H01L01T01S01 268:H80N18
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312:L89V05M02I01 313:F88L10 314:F49G16S08I06A05L05V05T02 315:A91G07 317:T95S02I01
318:E86G06V02M01 319:T97S02 320:T65V26S05I01 321:S92G05T01 322:T72S15I04A03L01N01
324:L85M05I04V03 325:R89K05 326:Y85H08F06 327:G75A17S03T03 328:L63F32I02 330:L69I21V04F02
331:L90M07I01 332:L57M34Q04 333:K97R01 334:Y52H45N01 335:P97T01 336:E61H13D11K08Q03
337:V69I29 338:T32E27Q21A09V03S02L01 339:A55E39K01 340:K85R12 341:V70I15L09A02M02
342:Q55H36R04Y02 343:E77K16A02Q01 345:I93L05 346:D75E12N04T02H01
347:R60Q19H09C04S02A01N01 348:V95E04 349:I72V22L04 351:R58P14S08K07Q03A03H02
352:H38N25S15D07G04A03E01T01 353:R93Q04 354:S43I11Q09L09A05R04P04V03M02K01T01
356:C45A17S14K07T05G02R02N02Q01 357:M46L20V11I09F07Y01 358:Q31E24K13A12D10G03S01N01
360:R92K05H01 361:S40A19T09L07V05M04N03G02Q01I01P01
362:K28R19H16Q14E06S04A03N03D02C01 363:M92L07 365:Y98F01 366:T84M12L01 367:D78E15N05
369:V89M05T01L01 370:I49V36L13 371:H96C01N01 373:I78V15A03 376:F56Y31L08V01
377:I55A11S09G08L05T05V02 378:D72N10S07A05T03 379:L67I14F06V06M05 380:V37I35L19A04
382:M25L18T18S11N11I10V02F01 383:G40N39S16A02 384:L57V34I04M02 385:P87A08L01 386:H81R17
387:A42R13T11E08K04M04S04N03V02I02 388:V77A11L05T04I01 389:T75I13N03V02A02S01
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393:K40H14Q07C05E04R03V03T03M02L02A02P02S02N01I01 394:F94L04 395:R94Q02K01
396:G46N23D12E10Q06 397:Y83F15H01 398:L42F17V15I10T09H02 399:I71L27 401:K94Q04
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406:F34I23L20Y14M03V02 407:P63T28A03I02V01 408:S30L25I14M11T08V06A01 409:L96I01M01
410:T31S29G19D07N04C01K01V01 411:S87T08P02 412:V76A12L06I03 413:L91H06M01
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424:K21E15T12Q09D08V08A08I03M03R02S02C01 426:D46N37K07Y05H02
428:G51E16Q12D09A02N01R01S01T01 429:H91R04N04 432:D81N17 433:E52A23K12D07G01
434:N47S21K13D06Q04E02G01R01 435:G95Q03 436:N30K13A10R10T10Q09S08C02H01E01 437:F87L11
438:K83R13Q02 439:K88Y07R01S01 440:S67N22T03Q02H02 441:D67E22P04N03 442:Y46A40F06H04
444:M58V18K07L07I06 445:P82A16 447:S98A01 448:A47I16T14L08S08M02P01 450:K95R04
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458:L86I09M04 460:R94K01L01Q01 461:M82A06T03N03S02 463:L88I09 465:L91I07 466:F70L13Y08I05V01
 467:L66F27I03V01 468:T86A05S04V01 469:T57A19S15N03I01 470:I94V02L01 471:L94M04
 473:N63H14K09S04A03R02 475:T35S23N17R07K07H02C02Q01 476:L83F09V05I01
 477:K69Q05R05A05E04S03L01G01T01 478:S56P38T02 479:L45P25V19S01T01Q01E01
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 487:I29L28T26V10F01P01 488:T60S23K05Q03A02N01I01 489:P94A01S01
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 493:G87T04S03F01A01 494:F50L28V07I05T04M01 495:G43A27V07S04F04T03I03L03N01
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407:P47T40A04I03V02 408:S51T13L11I06V05M05A01D01C01 410:T51S29D13K01N01Q01 411:S95P03
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439:K85Y13 440:S93T04N01 441:D85E07N04 442:Y78F10H07A01 444:M72K13V07I03L02F01 445:P73A25
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469:T57A18S16N03I01 470:I96V01 473:N61H23K13Q01 475:T51N28K11S03V01H01 477:K97Q01
478:P49S48 479:L57V31P03Q01I01E01A01 480:V81I06T03G03L01 481:D79E07H04N04P01
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490:V38I24L10T09A04E02M02N01K01S01 491:V27A18T13L12S05H04N03F03I02D01Q01E01P01Y01

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 495:G36A27V12S07I05L04T03N01 496:S45N29H06K05R05C03T01A01 497:V49I24L12M07A03 498:P97L01
 499:P80R11K03Q01H01 500:S23P23F13H09A06L04R03E02V02T02N01K01Y01D01Q01 501:Y87F11
 502:Q49K26E20R01 503:L76V10I07F02M02 504:C85S09R03Y01 505:F68V16A07L07 506:I66L18V11T01
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(vii) N37

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226:S72A24 227:S57T38K01 228:P33F25S22T05L04A03V01I01 229:W41S24T19Y04M03F01L01
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261:I75V08A06T04M04 262:A40G23V10T09I05E02S01D01L01 263:K28E16Q15R14H12S10
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311:N50S33Y11 312:L97V01 313:F87L12 314:F93I02L01 315:A95G03 317:T96S02 318:E86V06M05
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343:E63K27Q03A02 345:I86L11V01 346:D69E09N09T07I01M01 347:R51Q42H01S01 348:V87E11
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310:S21A21F13W12T10L06N04V04I02G01 311:D92N07 312:L81V10M05I01 313:F93L04V01
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436:N56K23T11S07C01 438:K80R19 439:K83Y14 440:S93T05N01 441:D84E08N05 442:Y79F10H07
444:M70K14V07I03L02F01 445:P69A28 448:A68T20I06L03S01 452:I40V29A13M12S02
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(xii) N70

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(xiii) N77

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364:P98H01 367:D98N01 369:V98M01 372:E97-02 373:V88I10A01 375:R98C01 377:A89I06L03
379:V56I40L02 380:I86V07-02L01M01 382:M98L01 383:N84S10G05 384:L97F01Y01 387:R88A06M03H01
388:V97I01L01 389:T64I34S01 390:R94Q05 393:A56P11N07H06D03V03E02Q02T02L01 395:R97H01Q01
397:F89Y10 398:L88T09Q01V01 399:L57I42 401:K97E01R01 402:G94D03S01 404:D88T06N03E01
405:V77I22 406:I96F03 407:T89P10 408:L98V01 410:N88S11 411:T88S10A01 413:H90L09
414:Y81H14Q02S01 416:P89S10 417:S75D09K07T05E01N01 418:Q98L01 419:F96W03
420:L65K23V03Q02M01P01R01 421:T71K15N10A01M01 423:Q76E10K03R03H02N01W01
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443:F98Y01 450:R84K10S02H01P01 452:L81M06I05Q03V02 454:L97M01V01 456:E98Q01
457:S71P17G10A01 459:A98R01 460:R98S01 461:M97G01K01 462:E98A01 463:L98F01 465:L94I05
466:Y73F26 467:L82F17 468:T94A02S02 469:A71S14T13G01 470:I93L05T01 473:S55N35K03-02R01T01
475:S59T39L01 476:L94F05 477:Q81H05K05R05E02 478:P98S01 479:L97Q01T01 480:G67V25E05A01C01
481:A75D11E09K02S01 484:D84E11S02N01 485:I98A01 486:D98N01 487:L97I02 488:T98S01
490:L82E05I05A02Q02R01 491:S85V09G02C01T01 492:S96T02P01 494:L90F07P01 495:G97C01N01
496:N94K03H01 497:L73V13I07M05 499:R98G01 500:P96S03 501:F86Y13 502:Q90E09 503:L82M15V01

504:C77R18S02T01 505:L60V17M11A06I02F01 506:R75I06V06S05L02C01H01Q01
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(xiv) N81

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14:L60I17V17F03 15:L96I03 16:V64A25L07F03 17:-89L10 18:I42L25M25F03V03 19:C64L21A10F03
20:L53V35I07A03 21:S75F07M07L03T03V03 22:C50F17Y17L14 23:-71L28 24:L96M03 25:L96S03
26:L71F10N10I03M03 27:L82T10F03M03 28:S53L14I10-07N07H03W03 29:T25A17L14F10Q10S10-07W03
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62:D46E25K25R03 63:V25T21L17G10R10I07A03P03 64:K75R17E03N03 65:E60D25A14
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71:M53R28L10D03V03 72:K75E21D03 73:L85I10F03 74:S92G03K03 75:E60K32Q07 76:K53T35R10
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124:S57T21A10F07L03 125:K57H25Q10N07 127:Y46N39H10D03 129:I64V28L07 130:V82A10I03T03
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179:K50Q21A14E07L03M03 181:F89V10 185:F96Y03 186:F53L25Y14C03G03 187:L85F14 188:S96G03
189:C71R14K10S03 190:A96T03 191:G50V50 194:I57V42 196:C96S03 197:S57T42 198:L50I42V07
202:E50D39Q10 205:E53D46 207:E46T46N03R03 208:D96N03 209:K50E21Q17H03P03T03 210:K64E17Q17
211:F96Y03 213:T75R10F03M03N03S03 215:L96M03 216:N64D17G07H03K03Y03 217:L75I14F03M03N03
218:I89L10 219:N96T03 220:S39E35Q10N07K03R03 221:N46T25I07S07V07Y07 222:W50F46L03
223:R46K42S07H03 224:L71F17G10 225:M75V17F03T03 226:S92A03N03 227:S96T03 228:T57P28V10A03
231:Q96V03 232:L92M03V03 233:L53Y42F03 234:F60N39 235:T53I39V07 237:P96D03 238:K67S17R10N03
239:I75L14V10 241:R53D25G10C03K03Q03 242:H82K10L03W03 243:L39V32I28 248:R50H32N10K03Q03
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255:L53E28D07V07N03 256:K85S07D03V03 257:L96I03 258:A50K35Q07G03H03 259:E35A32D28K03
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 328:L71F25I03 329:L53R46 330:I89V10 332:L92Q07 333:K53R46 334:H67Y28W03 336:E71H17D10
 337:I57V42 338:E64Q35 339:E96G03 340:K85R14 341:L46V39I14 342:H78Q21 343:E71K17Q07G03
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 412:V46S28A25 413:Q53L46 414:H42A25F17Y07K03S03 416:P96V03 417:T50K42E03S03 418:Q92K03V03
 419:F89W10 420:K96Q03 421:N89Y10 423:E35N25T25D07A03Y03 424:A32C25T21S10E03I03N03
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 474:F96Y03 475:T71K21N03Q03 476:L85F14 477:K50R42I03S03 478:P50T25S17A03R03 479:L75P21T03
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(xv) N82

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 14:L51A21F18T03-01V01 15:L82F06V03I02-02M01 16:L55A17V11-05F02G02T01 18:A44L26I11T09V03-
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 22:G31C25V19L12I04A01-01T01 24:L59M22F10V02H01 25:L60V25A04I04F02 26:L60I16V07T05A04F02S01
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 33:R38P31M06T04I04-03L02K01Q01W01A01S01V01 34:-87A06T04 35:-87R09P01 38:K51-
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 50:T55R26A07W03M01H01I01 51:P96A01 52:L88I11 54:F60L34I01Y01 55:L62I34F02 58:L59Y25F06I04V03

60:Q96H01 61:L44M29V15I10 62:D34N26R23K10S02G01 63:T37R32P14S03I02H02A01
64:G22E20K18R13D11S06Q02N01T01 65:G33A21Q19E10D04K04N02 66:L43M26T17F04I03V02P01
67:L38Y36F15V03S01 68:K36N26Q14S12D03L02R01T01 69:S84G11C01T01 70:L47F45I06
71:M45L38Q04T03I03E01K01 72:K53R23Q11A05E04 73:L66I23F06M03 74:R44S37Q08G03K02H01
75:E68K21D05Q02 76:K68R23Q03H01 77:Y98H01 79:P60D32S04 81:F95Y03 83:V72I21L05 84:Y55H43
85:L79M10F08 87:P77S11T05L03 88:-86W12 89:R91K04Q02S01 90:P57R39Q01 91:V80I15A02
92:V94L02I02 93:V65M24I08 94:L98I01 95:C77V11Y06W02 97:H36Y29T22Q04V01P01A01I01
98:E60D28Q06K03 99:A88T07V01 100:V66I30L02 101:K57R34Q07 105:V78G11I06L02 106:D87G10
107:Q83K05H05R02N02 108:A94G04 109:E83D15 110:E53A29D12V01 112:S93G02A01N01
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148:L69M30 149:R94K05 150:D79N16E01S01 151:F85L12 153:M73V24F01 155:K97R01 156:R87K06Q02
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175:K56G23E05N04S03D03A01T01 176:T66S23Y05V01 177:K38Q24R14E09N04H03G02C02 178:G92E05
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217:M46L34A12I02K01 218:M31F25I22A11L04T02V01 219:N27Y23L20G11F04S03T02Q01H01M01
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226:S72A25 227:S55T40K01 228:P34F26S23L04A03T03V01I01 229:W39S25T19Y04M04F01L01
230:G45S34A16T03 232:L52V25T08M03F03A02I02 233:Y60F32L01C01Q01 234:E69D25N03
235:M61L29I04F01 236:F72Y21L03I01 237:S59Y13P11H05A01V01W01E01
238:S35G33W07R06D05N03C02P01A01 239:V33F28I26L11 240:L50M49 241:K66Q23R04N03D01
242:Y52H35P07F01R01 243:L55F40I02 246:P54T15R13A07S03I01 247:H70Q28

248:Q27R26T15N13K06H03S01V01 249:Q57R20K09E05H03 250:I41A24L19V13
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253:N30E20L19H12I06D04K02M01 254:L63I16V06M06T02F01S01 255:Q50E25G09K05S02A01D01N01
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262:A42G22V11T09I05E02D01S01L01 263:K29Q15R14E14H13S10 264:K30S25R25Q12N04 265:V92I06
266:E53K27Q13R03 267:K30Q26I12R11H05E04M03A02L01T01 268:N52H46 269:Q48R31E15K02
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315:A95G03 317:T96S02 318:E86V06M05 319:T96S02 320:V61T23S11I03 321:S95G03 322:T62S27A07N01
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337:V82I16 338:E39Q24A16T12L02 339:E48A44K04Q01 340:K72R26Q01 341:V76I17L03M02
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377:G25S25A16T13L12I01V01C01 378:D78A12N08 379:L50I24M14V06F03 380:I41V32L15A07T01
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 466:F73Y15L08I01 467:F67L30V02 468:T97A01 469:T64S16A10N05I02 470:I89V04L02M02 471:L86M12I01
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(xvi) N97

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(xvii) N98

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 299:S58E35N01T01 301:H69T21Y04N04 302:M79T04I04L04E02Y02V01 303:K61E38 304:N96S03
 305:L89M06S02V01 306:I70V23L05 307:T78M17 308:S66T18C15 309:T64A14S08C08V03 310:F69L19I10
 311:D93N05 314:I58G18F07S05T04L04 315:A95G03 317:T98S01 319:T95S04 322:T95S04 324:L41I39V19
 325:R94K05 327:G97S02 328:L94F05 330:L68I26V04 332:L75Q23 334:Y94H04 336:K61E29H03D02-01Q01
 337:I97-01 338:Q75E23-01 339:E97-01 341:V88I10 342:Q91H08 343:E93K04Q01 347:R62Q28H04F02W02
 349:V82I16 351:R94Q04 352:S85N04A02D02M02T02 353:R97Q02 354:R44K20M14S13L04 355:P97A01
 356:C79S10G06A03 357:V61M33A02 358:A93E05 359:D96N02 361:T55G16S12A06R05I01P01
 362:Q87R06K05 366:T96I02 368:A98T01 370:V67I26L04 377:I91V04L02M02 378:S79A09D07T03
 379:L94I03V02 380:I50V41L03A02T01 381:P93S06 382:L83V07M05I02 383:S37G32A30 384:L79V18I02
 386:H95R04 387:T65A18S13M02 389:T65A10V08S05D04I02N01 390:K83Q07R07N01
 393:C30P26H14S10Y04R03L02E01N01Q01V01 395:R97G02 396:E47G26D16Q08 398:V69I20T08L01
 402:G94D04-01 403:T98-01 404:T95S03 405:I80V18 406:F80Y11I03V03L01 408:I47V33L14S03
 410:S68T21D04N02 414:H94Y04 416:S80G09P05 417:K97N02 418:E93Q05 419:F97W02 420:P91K05R01
 421:N97D02 422:P96A02 423:N49T20E13H09D03 424:E83Q09T03K02 426:N75D24 428:G75E17Q06
 432:N84D07K04S02 433:E62K30P03A02D01 434:N74D22S03 436:T84S12A02 438:R87K12 440:S93N05
 441:E48D37N10K01 442:F72Y20A05L01 444:M90V04I04 452:I87M05V04L01 454:P62A20L14V03
 457:G92S07 458:L95M04 463:I70L29 465:L97M02 466:L48F43I04V02 467:I38L27F12M09T08V03
 468:A56T35V06S01 469:T75S20I03A01 470:I95L04 473:N93K04 475:T77K21 476:L96F03 477:K96R03
 478:P83S12A04 479:V60L28I06F02T02 480:V63T20I08M03E02 481:D80N18 483:Q67K24E08
 484:E71D25K02 485:L61I38 486:N51D41S07 487:I84L11V04 488:T70S13K05M04A02I02
 490:T59E09A05H05L04M04R04Q02V01 491:L79V08E04K04M03 492:S91K04G03 493:G80S12P04N01
 494:T62F10I09M08L07V01 495:G78S08N08M02T01 496:N94R04 497:V71I12F05L04M03A01 498:P98S01
 499:P66R20Q06H02K02S01 500:A49P31V12S04 501:Y96F03 502:Q77K12E05R04 503:L86F13 504:C98R01
 505:A68V22L04F03 506:L50V30I16F02 508:R96C03

(xviii) N112

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 12:M45T18S12L09A03D03E03G03I03 13:A33L24S24V06F03G03T03W03 14:T51I21L15A06C03V03

15:L45V39G06T06S03 16:L66V27F03T03 17:-90L09 18:L87T06A03P03 19:L87A06C06 20:L87S06C03P03
21:L72S18I09 22:L81A09C06F03 23:-84L15 24:L54V30M09A03T03 25:L96M03 26:A60L21C09M06V03
28:A60S15L12V06M03W03 29:W33R30L27A06S03 30:W63R27A03G03Q03 31:G57R30A03C03S03W03
32:W60K27R06Q03V03 33:G72R15V06-03L03 34:A69-12V06L03R03S03T03 35:R42-21Q18H09K09
36:G63R21Q09S03V03 37:A33T33K18-09S03V03 38:Q51R36-03G03K03L03 39:T42R33M15-03I03P03
40:R60Q33G03P03 41:-84L15 42:G72K09R09-03E03S03 43:-84G15 44:A39R30G15D09P03V03
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63:S66T24P09 64:G36R36K21Q03S03 65:R48E15A12H12G09D03 66:L75M12P12 67:D72L12F06Y06H03
68:R60K30C03H03Q03 69:A48S27V18R03T03 70:L87F06Y06 72:E69K30 73:L96V03 74:S96E03
75:G45E15S15R09K06Q06P03 76:R63K27H03N03S03 77:W66Y27F03S03 78:G96S03 79:P93F03S03
80:V96L03 81:F93-06 82:T96E03 83:V96M03 84:R39W36Y12H09G03 85:L96Q03 87:P63S27A03L03R03 88:-
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132:S96F03 134:G93R06 135:P42E27R18A03H03L03Q03 136:R93A03L03 137:W96L03
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151:F87L09E03 152:G93L03R03 153:L42M33V21R03 155:T51K30R12A03S03 156:R87S09L03 157:T60S39
158:I93M03V03 160:E90D06K03 161:R93H06 162:I84V15 163:L66Q30R03 166:A96T03
167:A63Q27D03S03V03 168:C78Y18A03 169:L87V12 170:L66V30P03 171:G54E15Q15D12S03 172:E90A09
173:F96L03 174:Q72R12S12A03 175:A69K18E09V03 176:T96I03 177:I24K24V21M09T09A06Q06
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185:R63F24Q09S03 186:L96H03 187:L96I03 188:D66S27G03R03 189:N69C15R12S03 192:S93A06
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207:E51G45T03 209:P72K24A03 210:E69K15Q09D06 212:L87R09Q03 213:R69T30 216:D69N27E03
217:L87I12 218:F72I24L03 219:N45H39S15 220:D72E27 221:N81I06T06Y06 223:R69Q18S06C03H03
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258:R69K24Q06 259:V60D27L09A03 262:S72A18R09 264:Q69R24E03K03 265:I72V24T03
266:Q69K15E06R06P03 267:R66M09Q09W09K03S03 269:Q54R39K03W03 270:Q63E36 271:T81S12L03R03
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 341:V90A03L03M03 342:Q81H18 343:A57E27K06Q06S03 344:E93-06 345:L63I30-06 346:D93-06
 347:A60R27-06E03S03 348:V87T09M03 349:V69I30 351:R93Q03W03 352:A33T21N18M15D09S03
 353:R87H06L03W03 354:A39S27T27P06 356:R57S18A12C06N03V03 357:L75M18I03Q03 358:E90A06G03
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 397:Y51H45C03 398:F63T21L09I03S03 399:L78I18V03 400:P81H12R03T03 402:G96S03
 404:F63N15T15M06 405:V96I03 406:I90F09 410:V57S27A06M06I03 412:A48V27S24 413:H78L21
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(xix) N117

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 27:L97F02 28:L57A19-06M06V03S02W02T01 29:V28L27A20F10-08T02I01 30:R53P20W08Q05K04S03-
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 64:G36K29R27N02S02Q01 65:G69A25E02 66:L88F09P01 67:L66Y24V03F03
 68:K51N18S17L04R02Q01A01P01 69:S71G24T01 70:F66L25I05 71:L61M19Q08I05R02K01
 72:R50Q21K19A05L01 73:L78F14I05M01 74:R56S29Q12 75:E59K26D08Q02G01 76:K95Q03R01 77:Y97H02

79:D68P29 83:V91L04I03M01 84:Y62H35 87:P80S14Q01L01R01T01 88:-70W27R01 89:R90K05Q03T01
90:P73R24S01 91:V91A05 93:M51V36I11 94:L97I02 95:C65V25Y06W02
97:T48H22Y13V04P03A02I02Q01R01 98:E74D12K06Q05 99:A84T14 100:I60V37M01 101:R73Q15K11
105:V73G24L01 106:D75G21E01N01 107:Q87H07N04K01 108:A95G02 109:E91D07
110:A61E29D02S02V02T01 112:S95A01N01 115:G94A03T01 116:T42K27M11H05P03A02E02I01R01
117:I64L20V12M02 118:A94P03T01 119:V45T29I16M03S03A01 120:V43L36I11T03M02A01F01
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127:Y63H26T04P01 129:V87L08I02M01 130:V34I29F26N03A01L01G01 131:F96L01V01 132:A69S28V01
133:N95S03 135:E78D08K07N03 136:R87S07H02C01 138:K75R23 139:A40Q29T14V13I01 142:R76K21Q01
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173:L70F27M01 174:R62Q26K07S01 175:K67G14E07N06R01S01T01 176:S49T39Y07M01
177:Q48K29E18R01A01 179:A59R15G07Q06H02S02T01D01K01V01 180:P49L39Y06A01F01
181:L43F28Q12V11M02 182:D94N04 183:P97N01 184:T58S26L05I03K02H01V01 185:F67L26M03S01
186:L70F23Y03I01 187:F69L30 188:H35Q31A24S04N02 189:S36Q26C24A09R01 190:I48A35V11M02
191:T91V04M02A01S01 192:A67S30C01 194:I82V16 195:I83V14 197:S95L02T01 198:I70L26T01V01
199:V76I09T07L05 200:F98L01 201:G96D03 202:E45K24L19Q04I02R02 203:R98C01 204:F93L05
205:D44P20S14A07N05G03H03E01 207:K38E23Q15R08T06D05S01 208:D97N01
209:P35R17E16K13Q06H04G01T01 210:E44Q41R05K02V01D01 211:F97L01 212:L71Q25R01
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265:V91I07 266:E68Q25K03G01R01 267:K54R23Q12E05M02T01 269:R66Q26K03E01
270:E49G19A16K06Q02R02D01V01 271:T67S14N11M04R01 272:L95F01V01 273:D93Q02G01H01E01
274:P72T17A06C02S01 275:S89N07T01A01 276:A34G24N22S12T01V01 278:-70A27P01

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(xxi) N133

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262:L78M08S04R03F02 263:E85K08A02G01 264:K85R07E04Q02 265:I48V41T07A01
266:K84R04Q02E01I01M01V01 267:E93R02K01 269:Q88E05K02A01 270:E73A16K06Q01D01 271:S88T09
272:L95M03 273:D96N03 274:I43V24L09M08P04F04H01 275:N68T11D07S06A03H02 276:N94S02D01I01
279:R89Q09 281:F96Y02 282:I97V01 284:C58Y39H01 285:F87Y10L01 287:I94M03 288:K91R04Q03
289:M82R05L03I02G02Q02W01 290:E77K10R03G02Q01S01 291:Q69K27E02 292:E88A04-01D01V01K01
293:K80N12-01S01D01 294:H68Q08D07N05G03Y02C01-01 295:N86I04S03E01K01
296:Q47K24P14E06H02N01L01 297:Q60E11H09K08N02P02S01 298:S71L14T07M03A01
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 320:T92M02L01V01 321:S97G01 322:T86S08I02L01 324:L85M12I01 325:R88K10 326:Y92F07
 327:G63A29S06 330:L94M01V01I01 332:L81M16I01 334:H78Y20 335:P94T04 336:E78H11D06Q01
 337:V84I15 338:T81A07S06Q01 339:A93E02V01 341:V86I07A05 342:Q91R04H03 343:E92K04A01
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 370:V58I27L13M01 373:I72V27 376:Y80F18 377:I92V03L01S01T01 378:D89N09 379:L92I03F01M01
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(xxii) N134

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 21:A50V14T14L08S07I02 22:T42C21F17V05I04A03L03 23:-97L02 24:L98F01 25:L63I13V10M07S03

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270:Q34E33K24R02T01 271:S77T13I03V02L01 272:L97P01 273:D83E09N03K02A01
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433:E68K29G01 434:N79S09D03E02H02K02 436:K65S24C05N02R01 437:F95L02V01 438:K80R17Q01
439:Y62K37 440:S77T17N04 441:D92E05K02 442:Y76H14C03A03F02 444:K62V19M13I03 445:P59A39V01
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 478:S54P43T01 479:L79V14P03M01 480:V79G13I04E01K01 481:D71E26S02 482:P93T02Q01R01
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(xxiii) N140

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217:L77W14I04M03 218:L70I26M03 219:E45D42N12 220:E95A01D01K01Q01 221:N91T04I02Y02
222:N85F08S03D01E01 223:K67R18W05S02A01D01H01N01Q01 224:L91Y04F03I01 225:Q91L03V03M02
226:N68S21T03G02L02A01M01 227:S94R03A02 228:I75P11V08L02F01T01 229:Q85W11H02T01
230:T80G08A04I04P01V01 231:Q97H01L01 232:L92-02I02V02A01 233:Y96-02T01 235:F92I05V02
236:F92I05L02 238:T68I08N06S06A04R04 239:V70I16L13 240:M94L05 241:D63E36
242:Y76H10F05R04I01N01S01 243:L96I03 246:P97C01G01 247:H98Y01 248:Q66K26H05N01
249:K73Q14T10L01R01 250:M54L33I12 251:I81F11M04A01L01V01 252:K84E10A03G01Q01 253:N98S01
254:I36T33F18V10A01 255:E90G04D03H01K01 256:K81E05N04T04A02M01Q01 257:V76I11L10A01F01
258:D77N10K08H02R01 259:Q61K22D12E02H01R01 261:T70I25A02V02 262:L57T18S13A04R03F01K01
263:E81D17Q01 264:I88R08Q02 265:I61V38 266:A57M14K10T07E03I02L01R01S01V01
267:E75A10M07R03K02D01 270:E51K45A01G01Q01 271:T87S12 272:L92F03W03R01
274:P93A03L01R01S01 275:T77S11N10G01 276:C91S08 278:-94A05 281:F95Y04 282:I95V04
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294:G76Q10E07R05 295:N95K04 296:G47S24D12P08A04H02 297:H70D13N06Y03K02Q02L01R01 298:S92-
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311:D93N05E01 314:L75F24 318:G91E08 321:S98G01 322:I48T30N10V06L03M01 323:T95A03S01
325:R98I01 326:H54Y30F14N01 327:G80A16S03 328:L72I20F04V03 329:L92V05M01R01 330:I96V03
332:Q64H18L15M01 334:Y91H07F01 336:E90H04D03K01Q01 338:V73E13Q08A03T01 339:E98G01
340:K98G01 341:I60M23V16 342:Q87H12 343:K84E08Q06 347:C53S21R20H04A01 349:I96V03
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362:Q88K07R03 363:M95L03I01 365:Y85F14 370:I51V48 371:H98R01 373:I95V04 376:F83Y16
377:I95L03V01 379:F86L08I04 380:L76V16I06 382:L74I08F06M05A01N01T01V01 383:N90G05S04
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393:K88H05E02Q02R01 394:F90L08I01 396:D80G13Q03N02E01 398:F85T07I03L02Y01 400:P93S05R01
402:D84G13K01N01 404:M72T13L08I03V02 405:I94V05 406:F87I05L04-02 407:P93-06
408:M64L12T07V07-06A01 409:L93-06 410:S47T36-06N03R03C01H01 411:S72P21-06 412:V70I21-
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418:E92Q07 419:F96W03 420:P92K07 423:E98K01 424:K87Q06T04A01 426:D88N11 428:G96E03
432:N88D11 433:A82E13P03T01 434:N96D03 435:G98D01 436:T85S12A02 437:F98L01 438:K93R06
439:K95R04 440:S92N07 441:D98N01 442:Y85A07H04C01F01 444:M98L01 448:A84T13I01V01
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494:L87F08A02M01 495:A77V13G08 496:N95S03H01 497:M70I16V06L04F01T01 498:P98S01 499:R95Q04
500:P74S08D07H07L01 502:E84Q14D01 503:V86L11I02 504:S84C11G03A01 505:F94A04L01

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16:L90F04V04 17:-98L01 18:A65T18I09L03S01 19:L73V18C02F01I01 20:L84F11T02
21:T42V18L16I07M06S04A03 22:G91S02C02L01 23:-97L02 24:L68F30 25:L91V06F01 26:L82V12I02F01
27:L97F02 28:L75M08-07W03S02V01 29:V38A26F14-10L05T02I01 30:R72W11Q07K05-02 31:G84R10S02
32:H63Q14R07Y05K04C02P01 33:P86R03T03S02A01 36:-97G02 37:-98K01 38:K79N06T04R04A03
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90:P95S01R01 91:V88A08 93:M70I15V13 94:L96I03 95:C88Y09W02 97:T66Y15V05P05A03I03
98:E78D12Q05K03 99:A79T19 100:I81V15M01 101:R85K13 105:V98L01 106:D94G02N01E01
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145:L91V06Q01 146:A78T13V04L01 148:M88L11 149:R91K08 150:D91N06E01 155:K96R02 156:R93Q05
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246:T45A22P16S06I04V02K01 248:R72T08V05H04K04S03 249:Q65E12R11K04H03D01 250:I65V25L09

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294:S86Q04A03L01 295:N63D33 296:P66Q16H09S03 297:H43N29E10D05S05Q01Y01 298:T63S34
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391:D92H04 392:T96I01 393:H47L22S08C03N02Y02M02Q02P01V01 397:Y83F12H02
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460:R95H01 461:N29T24A21S12M09 465:L97I02 466:F96I02 467:F89L10 469:T91S05A02
470:I82L06M05V05 473:N98K01 475:S83T11N02 476:V48L34I14F01 477:A46S31G10R03T03K02
478:S85T07P02G01 479:P84S07L03N02 480:V67M15K11E01L01 481:A85D07P05 482:P95L02S01
483:E70K27 484:D91E05 487:L84F08I06 488:T80S15 490:Q39K32R13M05E02A01I01
491:E80V08N02R02K01I01 492:S56N16C11V08I02F01 494:V40F25L20I11A01 495:G88A04S02T01
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24:L92H05 25:L66A12I09F05V04 26:I51L36V06F02A01 27:L68I16V07F03A01 28:I45S33W05L04A03F02T01-
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75:E74K13D07H01Q01 76:K91I02R02Q01T01 79:P83S13T01 81:F97Y02 83:V94L03I01 84:Y89H05W01F01
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93:V87I09F02 95:C96Y01 96:G98D01 97:H82Y12S01 98:E74D14Q08-01 99:A92T04V02 100:V91L07M01
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168:Y46F45C05M01 170:L79V14M03I01 171:E90Q05K02 172:E83A07K03S03T01 173:F54L38I06
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179:A52K21S07L05E04Q04N01T01V01 180:P98Y01 181:I47F44V03L02T01 182:D67E24N05K01 183:P94L03
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189:R79C11H06 190:T59A35S03 191:V93T03 192:S93A02C02 194:V85I14 196:S56C43 197:S98A01
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(xxvi) N169

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(xxvii) N170

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209:K66E21Q05R05D01 210:T60K31Q05M02 211:C39G23F20A11I02S02 212:L88Q06R02V01
213:R91T05H01 214:L79I11M08 215:M68L15Q15 216:S41R15Y15H12N07K03T03 217:L90M04I02A01
218:F88L04I03Y03 220:E97A01 221:N88D07T01I01Y01 222:F96L03 223:Y71H13R07Q05S01 224:L98F01
225:L94I01V01M01 226:S97N02 227:T90S09 228:P86G07S03N01 230:L64I30G05 231:Q97L01
232:L84V06A03F03I02 233:Y95H03F01 235:N70I15S05Y04F01L01 236:F94V01Y01I01 237:S50P37A07G03
238:S49D24G09N08R01H01Q01T01 239:Y68F12L11C05I01 240:L81M09I07V01
241:R38H31Q13D05Y03N03C01K01 242:Y93H04C01 243:L89M10 246:S87P05N03T01 248:R88H04W04Q01
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260:Y90F08 261:A44T30V16I07 262:L60S26A06F03R01 263:E82A16 264:R76K09G05Q04M01
265:V70A22T03I01L01 266:K98E01 267:E80D13M03R01 268:H96N02 269:Q47L27H18E03R01Y01
270:Q50E22K18R03T01 271:S88T07L02V01 273:D83E14A01 274:P79S08A05L04I01 275:N62S30G02K01
276:C89S05N03 277:P95L01S01 278:-96A03 279:R90Q07 280:D93G05 281:F60V18L17Y02 282:T79I13L06
284:C74T13S09V01 285:L79M13F07 287:I32M20V20L14A05T03R01 288:E88K07Q03 289:M90L09
290:E80Q09A05R03-01 291:K91Q05-01E01 292:E90D06G01 293:K81R15N01 294:H64Y16Q12K03
295:S76N11K03T03G02R01 296:A39G10K10P10T10S08Q05E01V01 297:E68D13K11N03Q01
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302:L56M35F03Y01S01 303:D50E49 304:N75G16S05D02 305:I84L07V07 306:A55S18T18V07

307:V85A06M05I01 309:V66L22T05I03 310:A92L04F01S01 311:D96N03 312:L94M03 313:F79L20
314:F98S01 318:E96V03 321:S98N01 322:T96A03 325:R96K03 327:G96A01S01 328:L98F01 330:I90V07L01
332:M83L15Q01 334:Y83H16 336:E96H02 337:I62V37 338:E95Q04 341:L92V07 342:H98Q01
343:E92K05Q01 347:R98K01 351:P92R07 352:S75N09T08D01E01H01 354:I73V11S07L03M02
356:A83S13C02 357:I58V26M10F02 358:K88R05E04A01 360:R93K06 361:L75Q11V04S03A02I01M01
362:E66D18Q07K03N03 366:M74L17T07 370:V92I07 374:Q98L01 377:I96L01T01 378:D45N42T11
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404:V77T10I06L05 405:V67I26L04 406:I77V14F05Y03 408:T92L07 410:D88S09T01 412:L57V39I02
413:L96M03 414:Y72F17H06L03 416:N35S28K16D08P04R04E01 417:Q88K08E01H01 418:E95Q04
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(xxviii) N196

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(xxix) N200

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263:K79E11R06Q02 264:K93R04Q01 266:E77K15R05 267:Q66H17M04R03E03A02V01 268:N92H06
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105:V79I19L01 106:D93E03N02Q01 107:R90H09 108:A86G13 109:D91E08 112:A90S09
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416:P83T05R04Y02S01A01C01 417:K82R05N05S02Q01T01 418:F92Q04Y02 419:F97W01
420:S80P08K05A04 421:N74S10K06C04H01 423:Q41E16K16R12G06N03D01H01L01 424:D85A06E03T02
426:N86H09D01Y01 428:Q79K06G05E04N02R01 429:H94N05 433:E67D29R01 434:K78N16R03

436:Q92S04R02H01 437:F88L11 440:S62N33I02 441:D87A06N02P01E01 442:A94G04 444:V80M11L04I03
448:I76L08V06A04S01T01 449:G98R01 450:K98R01 452:Y67N14F09I04M02 454:F78L21 456:E89D09
457:G93N02S02 459:A97T01 460:R92K08 462:E98Q01 465:L95I02V01 466:F94L03Y01 467:L75F24
469:T77N12I05S04A01 470:I94L02V02 471:L54M44I01 473:N97K01 475:R65H13C12T06S01 476:F89L10
477:K83R11Q05 478:S86F09P04 479:P84S06L04Q02 480:Q75K08V05L03E01M01R01
481:A32S32L09K08P08D04E01M01T01 482:P84L10T02K01 483:Q57E22K18R01 484:D90E04A04
485:I98L01 486:D85N09Y04 487:V78I09E08L02 488:S89T08P01 490:K80R07Q05E03A01T01
491:H46L17P16V06M04Y03F02N01S01 492:V76L13S06E01 494:F97L02 495:A73T15G07S02V01
496:T74R16N08 497:I93M03V02L01 498:P83I09L04V02 499:R57P41Q01 500:N65S09T09K06P03R03
501:Y97F02 502:T92Q08 503:M86L07I05 504:S90C08 505:F91L05A02 506:L69Q17V09I02M01 507:P90S08
508:R87I08L02

Table 3. Variable residues $X_1 - X_n$ and amino acid variation at each residue, of engineered ancestral CYP4F sequences corresponding to nodes (i) – (x). For each of the ancestral sequences corresponding to nodes (i) – (x), variable residues $X_1 - X_n$ are given in sequential order. For example, for (i) N0, 391 variable residues are given: $X_1 - X_{391}$. For each variable residue, the format of the data is as follows: [amino acid position]:[first amino acid variant][percent frequency of first amino acid variant]...[last amino acid variant][percent frequency of last amino acid variant]. Position is given relative to the corresponding A0 CYP4F sequence, as described herein. Frequency is relative to all sequences used to construct all sequences used to construct the A0 CYP4F sequences. Note that ‘-’ represents a ‘gap’ or amino acid deletion. For example, X_7 of (i) is given as 7:S90L03V01, which sets forth that:

the amino acid position of the variant relative to the alignment to produce node CYP4F_N0_A0 is ‘7’;

the first amino acid variant is a ‘S’;

the frequency of the first amino acid variant relative to all sequences used to construct CYP4F_N0_A0 is 90%;

the second amino acid variant is ‘L’;

the frequency of the second amino acid variant is 3%;

the last amino acid variant is ‘V’;

the frequency of the last amino acid variant is 1%;

Only amino acid variants with frequency of 1% of greater are listed. Where the combined frequency of all listed amino acid variants is less than 100%, this is due to the presence of one or more additional variants with frequency of less than 1%.

(i) N0
1:L69F23V02P01M01 2:G62R23W03S02L01F01 3:P58L13S08T04V03Q03A02H01I01M01 4:V54Y18L09G04W03E03M02 5:A78T06V04S03L02I01 6:A58V19S05T05G03L01I01F01 7:S90L03V01 8:P66A15S04L03G03V01T01I01M01 9:W67L23G02I01V01 10:L83H06Q03V02I01 11:L93I02T01F01 12:L68S12F04G03A02Q02V02P01 13:L84V04F03M03 14:L89V05F01M01S01 15:V46F17A15G07I06L03T01 16:G62F13L08V04A04I02T01S01 17:A52L17G09V07T04F03S02 18:S64F20L05T04A01C01 19:W69R19L02H01C01V01 20:L75I10A04F03T02W01V01 21:L93V04I01 22:A67L19V06M01 23:R62Q17H06K03C02Y02A01D01G01 24:V46I25F14L05A02C01G01M01 25:L89W03F03V01 26:A57R13T13V03Q02G02S01M01K01 27:W61L14Q05F04A03R02V01I01S01 28:T48C17I15S04V03A02R02K01 29:Y68W12H06L04R01T01F01Q01 30:T34A28R16S08H03D01V01G01K01 31:F75Y05L04S04H03V01A01I01 32:Y81R04H04A04C02 33:D42I14E11N10V05W03A02T02G02R02H01 34:N66T19K04Y04I03 35:C66S17Y05T03A02R01 36:R65C13Q07H06S03L02 37:R88H06Q02 39:R73Q16S06C01 40:C88G07 42:P90S03L01N01R01 43:Q88E05K03 44:P97S01 46:K63R22T02G02L01S01W01M01 47:R78Q10H02P02K01 48:N83S11H03 50:F64L34I01 51:L57W35M03F01 54:L78Q08M06V04T01 55:G92S02D01A01 56:L49M40Q05T01I01V01 57:V32I31Y18M07A05G01S01F01 58:Q23T21L16P13K10H04R02S01 59:P57S33N05G01 60:T50N32S15 62:E60Q20T05K03S02A02M01R01D01 63:G97D01 64:L67M30 65:R31Q28K16L14S03I02V01T01

66:D17Y15L11E11V10K07N07Q04M02R02T02F01A01 67:V26L26E16T10I08F04M03S01A01
68:T45Q14K13E09D07A02S02I02 69:Q37K20E14D08S07G06H02R01 70:L70V16M07I02
71:V47L16G14A12S07I01 72:A38D15H12S06R05C04Q04T03K02N01G01
73:T57N17Y07S02H02K02A01D01R01Q01 74:Y51F30M14L01 75:P32R21H18G11S10K03T01
76:Q33D31H24R02K01P01Y01 77:G40V37A05S05I04M03 78:F38C20H12I11Y06L03V02Q02
79:L46C15K10M09V05R05S03T03 80:W32V23I11T10C05M04L03R02S01F01A01 81:W94F04
82:M40L22V16I11F07G01A01 84:P98A01 85:I32F21V21W15T04L01M01A01
86:L22I18Y17F14H10T04V03Q02S01C01 87:P82A11H03S01 88:L33I29V24F07M03 89:L37I35V25
90:R37V24T11I10S06H04N03 91:L72I14F10V02 92:C39V30F22I02Y01 93:H95D03L01 94:P98S01
95:D63T12K08N06A04S03 96:Y30F20I17T11M06L06C05V01 97:I71V21L05A01 98:R41K40A16
99:P63S26T05I01 100:V53L28I15F01 101:L57T14I10V09A06 102:N31G14Q14S13F10L06M03T02H01
103:A96T02 104:S70P29 105:A94D02V02 106:A74T09S05L03N02F01 107:I60V32L03A01T01
108:A79T08V07I03 109:P84L04V03D02 111:D90E04N03 112:M31D17K16V13E10A02I01T01Y01
113:L32V26F14I14T08D01 114:F89S03L02I02 115:Y91I04L02 116:G41S32R11N04D03K03E01T01
117:F87H03T02M01L01V01P01 118:L97M01 119:K83R08E06 120:P98L01 124:D86E08Q02N01 125:G95S03
126:L94I05 127:L95F03 128:L88V05I03M01 130:A51K16G09N07S06R02T01D01V01 132:D83E10N02Q01
133:K93E03R01 135:S86R04A02G02N01 136:R69H15S10Q02W01 137:H93R02K02 139:R94H04 140:M55L43
146:H98R01 148:N53D38E05K01 151:K98R01 152:P86S06N05 154:M52V35I10L01 155:K92A01T01
156:I93T02V01 158:N85T11S03 159:K36Q25D15E14S02T01G01 160:S82C16 161:T41V32A24
162:N59D31T02K02E01 163:I85V08T05 164:M97L02 165:H91L08 166:A79D12G02N01T01V01
169:Q58R23K10E02H02L01 170:R72H11L09C02A01 171:L96A01 172:A62V14I10T06C02G01S01
173:S47A13E12T09L08K01Q01 174:E59G24K05Q05A01 175:G82S13P01 176:S59V12H10T04P03N03E02
177:A40T33V14S06I01N01 178:R54S21H14C03N03 179:L93F02I01 180:D89E08N02 181:M96V02 182:F97L01
183:E93D02Q01 184:H89N06Q01 185:I75V21L03 186:S96T02 188:M93L06 189:T98A01 192:S92T04I01
194:Q93L06 195:K98R01 197:V74I15A03L03T03 199:S95G03 200:F61Y32H03I01 201:D67N23E06
203:N68H23D06K01 207:K72S12R08N03H01Q01 208:P75M15S05N01T01 210:E71D23K02 212:I96V02
213:A68S24T03D01 214:A89T08S01 216:L74I16M03V02Y02 217:E97D01 220:A78S14D03T02 221:L98F01
222:V78I15A03S01 223:V36A27E09T09S08I05M01 224:K72R21D02E01Q01 225:R98K01
226:H35Q24N14S07Y05R03E02T01I01 227:Q53Y16H11E05R04F02N01L01 228:Q54R22H07K05E03Y02N01
229:I47L38F05P05V02 230:L40F35H17P03S01 231:L63H24Q07M01V01 232:H60Y33Q02F02
233:M31I18L16V08W07T04P03K03F02A01 234:D96N01 235:F78W07L07S03C01 236:L72I22V02F01
238:Y69H10F05W04R03N03Q01 239:L83R13K02 240:T91S08 241:P45A23S10H07Q05C02R01E01
242:D82N05Q04E03C02 244:R58Q26W05M05K03 245:R95C01H01 247:R78H05K04L02Y01S01A01C01Q01
248:R57K21Q17E01 250:C96L03 251:R51D31N05H03S02A01E01K01 252:L68T16I07V04M02
255:D54N13R11H09K03S02E01A01 257:T98S01 258:D68T16A06R03G02 259:A69E17D07N01G01T01
260:V95I03A01 261:I90V09 262:Q88R10 263:E84K05Q03R02D01 265:R95H02
266:R75Q06H05A03C03L01K01 267:T66A22L03I02Q01 268:L97I02
269:P46S12R10N05A05H04T04I03Q01D01C01L01 270:S40Q20T10D08K06E04N03H02R01

271:Q77E08L05H02K02 272:G84D04S04N03R02 273:V35I20A17S06T05G02L02H02R01P01M01
 274:D61E26H03Q03G01N01 275:D60A23E09S02T01 276:F64W22V03L02S01D01 277:L90I02F01V01
 278:K73Q16T02R01E01 279:A66S11D06T04G03N02 280:K92A02R01 281:A61-26T05E02R01V01
 282:K71Q23R02P01 283:S40G23T16A11Q02 284:K96R03 285:T92K02V01S01 286:L87M05K04V01
 289:I95V03 291:V91I05L03 292:L97I02 294:L96M02 295:S41A38T18 296:K87R10E01 298:E94K04
 299:D79H08N07E03 301:K87Q04N03R01H01 302:E52G18A08K07Q04T02R01P01 304:S93T06 305:D97N02
 306:E96K02 307:D94E04 308:I96V01M01 309:R89Q04A02K01 312:A98V01 313:D96N03 318:E64G20A13R01
 324:A83S16 326:G91A08 327:L92I07 328:S95C02A01 330:V68I19A04T04L01 331:L98F01 332:Y83F16
 333:N84H15 336:K55R36Q04C01 337:H83Y15 338:P94Q02 339:E93H03K01 340:Y95H03 342:E93D04
 343:R72K21Q03H01 346:Q75E18K03A01 348:V76I22 349:Q79R11M03T01K01N01 350:E87D09Q01
 351:L82V15I02 352:L80M19 353:K50R39Q04E02G01A01 354:D65G32N02 355:R95K02 356:E79D15Q02
 357:P59L16S11T06G02V01 358:K41E38Q07D02H02T02I01V01 359:E93D03N01 360:I81L17 361:E95D02
 363:D86E12 364:D98E01 366:A69T16S11V01 367:Q90N04L01H01 368:L93M06 371:L72T23I02
 375:I87L08V02M01 376:K98R01 381:L83Q14 382:H81F14Y04 383:P94S05 385:V90A08
 386:T57P26S04Q03I02V02A01L01 387:V36A20L16F06M03D03T03I02S02G01R01 388:I62V32L03
 389:S84T07L02A02V01 391:R41C39H07G03S02K02Q01Y01 392:C88Y05V04 393:T93A02I01S01
 394:Q73E22K02 396:I68V22T04M03 397:V56K21A03T03L02G02E02M01Q01P01S01 398:L96M01V01
 399:P98R01 400:D93G04 401:G94S02D02 402:R95L01K01 403:V75I20T03 404:I95V03 406:K96Q02
 408:V39I30N24S02T01A01 409:I77T08V08D01A01 411:L62V16I07H02M02S02T01R01 412:I71V21L05M01
 413:S82N14D03 414:I87V11L01 415:F61Y26I06L03T01 416:G95A04 417:T66I19V10L01M01 419:H93Y06
 422:S37T31A21L02E02D01Y01 423:V96I02 425:P92T03Q01R01 426:D86N08E04 427:P83S15A01
 428:E76K16H03Q02D01 429:V96E02 430:Y91F08 431:D65N34 433:F65Y22L06H01S01M01
 436:D89E04S01N01Y01 437:P90Q03S01A01L01 438:E75D15T02K01N01A01 439:N89T03K03A01
 440:I35P30S18T05V02L02A02 441:K52Q42E02 442:E28K24Q17G16D08S02N01 443:R94Q02I01 444:S97P01
 445:P92S07 446:L88H05M02V01 447:A96S02 448:F87Y12 449:I76V20M02 453:A92S03V03 455:P97S01
 462:T49S21A15N07K04 465:M95L04 466:A58T24N09S06 468:M91L05I02 469:K80R19 470:V94T03I01
 471:V69A27I02 472:L75V23 473:A96G03 475:T94M04 477:L94R01Y01 478:R90H08 480:R93A01V01
 481:V56L23I12F07 482:L71S15R05T04F01 483:P75V16L04C01 484:D88G06T02 485:H24D19R16E14K04-
 04P03A02G02L01N01S01 486:T45E16K14A07S05R03H01P01 487:E71R17K03G02P02 488:P75K17V02T01
 489:-74V24 490:R92C03L01 492:K86L05Q04T02 493:P95S02 494:E94Q04 495:L94I04V01 496:I80V18
 497:L95M04 499:A79T18S01 501:G70N19D07S01 503:L83I16 506:R67N12Q11K04H01L01 507:V86L09M04
 509:P93L03E01 510:L97V01 511:S54P15N12G07K01R01L01 512:A32P18-15T14S04G03V02E01Q01R01
 513:G38-19R15S04P04Q04N04D02E01V01L01 514:A26-22P18Q11L06S06T03G01 515:Q45-
 41S02P02R01A01L01

(ii) N4

1:L74F20P01M01 2:G68R22W03S01 3:P64L14S05Q04V02A02T02H01I01 4:V58Y17L08G04E03M03T01
 5:A83V05T04L02S02 6:A64V19T06S04L01I01G01 7:S97F01 8:P73A12L03G02V02S01T01M01
 9:W75L19G02I01 10:L86H07Q03 11:L95I02 12:L72S13F04G03V02P01A01 13:L89M03F02V01P01

14:L95V02F01 15:V52F19A11I06G05L02T01 16:G69F14V05A03L03I01S01 17:A57L14G08V07T04F03S02
18:S72F19T05A01 19:W77R17C01H01L01 20:L82I11F03 21:L97V01 22:A75L16V03M01
23:R68Q17H07C02Y02K01 24:V49I28F15L02C01G01 25:L96F02 26:A63R14T10Q02V01M01K01S01
27:W68L14Q06F02R02I01 28:T54C17I16S04A02V02 29:Y74W13H04R02F01C01Q01
30:T38A30R11S09H03D01K01G01V01 31:F81L05S04Y02V01A01I01 32:Y87H04C02R02
33:D47I14E12N11V03T02G02R01H01A01S01 34:N69T19K05I03Y01 35:C69S19Y05V01
36:R68C14Q04H03S03L02A01 37:R90H07Q01 39:R75Q18S03C01 40:C89G08 42:P95L02R01 43:Q96E02
44:P96S01A01 46:K70R20G02S01L01 47:R79Q10P02H02K01W01 48:N86S08H04 50:F70L27I01
51:L54W39M02F01 54:L79Q09M06V04 55:G91S02D02A01 56:L52M40Q02T01I01V01
57:V35I32Y20A05M03S01 58:T23Q20L18P14K10H05S01R01 59:P61S31N04G01 60:T46N35S16
62:E55Q22T05K03S03A03M01R01D01 63:G97D01 64:L66M31V01 65:R34Q25K18L14S03I02
66:D19Y17L13V11E10N08K07M03F02T01R01G01 67:L29V19E18T11I09F04M03S01A01
68:T50Q16K14E10I02A02S01 69:Q39K21E12D08S06G06H02R01 70:L69V18M08I02 71:V43L18G16A13S08
72:A39D17H13S06R05C04T03K02N02Q01G01 73:T57N19Y08S03H02K02D01A01 74:Y49F31M16
75:P35H20R20G12S09 76:Q36D35H19R02K01E01 77:G43V41I05A04M03 78:F39C15H14I12Y07L03V03Q02
79:L45C15K12M10V06R05T03 80:W27V26I13T08C05M04L04R02S02F02A01 81:W98C01
82:M41L21V17I11F06A01 84:P97A01 85:I34V23F15W14T05L02M01A01
86:L21I20F15Y13H12T05V03Q02S01C01 87:P86A12 88:L33I29V25F07M03 89:I39L38V21
90:R33V27T12I11H04S04N03K01 91:L71I15F11 92:C44V31F16I02Y01 93:H94D03L01 94:P98S01
95:D61T14K08N06A05S02 96:Y26F22I19T09M07L06C06V01 97:I75V19L03A01 98:R44K35A17
99:P60S28T06I01N01 100:V55L26I16F01 101:L55T15I11V09A07 102:N34G16Q15S13F11L04H02 103:A96T03
104:S70P29 105:A94D02V02 106:A79T10L03S02N01 107:I59V34L03A01T01 108:A82V08T04I04
109:P89L04D02 111:D89E05N04 112:M35D19K15V15E05A02I02T02 113:V28L27F14I14T09D01
114:F92S03L02 115:Y90I05L02 116:S35G35R12N05K03D03E02T01 117:F89T03M01V01L01P01 118:L97M01
119:K88E07R03 120:P97L02 124:D91E06 126:L94I05 127:L95F03 128:L89V06M01I01
130:A57K18G10S05T01N01R01V01D01 132:D91E05N02 135:S91R05N01 136:R66H17S11Q01W01
137:H97R01 139:R93H05 140:M59L40 146:H98R01 148:N59D31E06K01 152:P92S05 154:M56V33I09
155:K97T01 156:I96V01 158:N83T12S03 159:K40Q22D17E15G01 160:S80C18 161:T35V35A27
162:N61D29T03E02K02G01 163:I89V07T02 165:H93L06 166:A81D11G02V01T01 169:Q64R18K11E02L01H01
170:R72H12L10C03 171:L97Q01 172:A65I11V10T05C02G01S01 173:S52E13L09T09A07K02Q01I01
174:E61G25K05Q05 175:G80S15P01A01 176:S64V14H11N03E01T01 177:A45T31V13S07I01N01
178:R60S19H15C03 179:L97F02 180:D93E04N02 181:M98V01 182:F98S01 184:H92N06 185:I79V17L02
188:M95L04 189:T98A01 192:S94T02I01 195:K98R01 197:V79I15L03 199:S95G04 200:F67Y27I01H01
201:D71N21E06 203:N68H23D05K01 207:K76S09R08N03H01 208:P78M17S02N01 210:E72D21K02A01
213:A71S22T03D01 214:A88T09S01 216:L77I18M02 217:E97D01 220:A86S10T01 221:L98F01
222:V80I14A03S01 223:V34A30E10S09T09M01I01 224:K78R19 225:R98K01
226:H39Q22N16S08Y06T01I01A01 227:Q58Y18H07E06R04N01L01 228:Q60R19H08K04E03
229:I48L37F05P04V02 230:F39L37H19S01P01 231:L68H18Q07M02V01 232:H57Y37F02Q01

233:M35I19L18V09T04K03P03W02A01F01 234:D98N01 235:F85L08S04 236:L77I18V02F01
 238:Y74H11F06R02N02Q01 239:L86R11 240:T94S05 241:P48A24H08S07Q04C02R01
 242:D88N05C02E02Q01 244:R57Q28W06M05H01 245:R96C01H01 247:R83H05L03Y02S02C01
 248:R59K22Q15E01 251:R57D31N05H03E01 252:L75T14I05M02V01 255:D61N14H08R07K02S02E01
 257:T98S01 258:D76T18G02 259:A77E17D01 260:V95I03A01 262:Q87R12 263:E92K02D02A01 265:R97H02
 266:R82H05Q04C03L01 267:T73A19I03S01 269:P51R10S10A05H04T04I04N04C01V01
 270:S44Q17T12D09K07N03E02 271:Q81E09H02L02K01G01 272:G85D04S04N03
 273:V39I23A18S07T02G02L02 274:D68E23H04Q01G01 275:D67A20E09 276:F71W18V04L02
 277:L94F01I01V01 278:K77Q18R01E01 279:A73S09D07N03T02G02 280:K98R01 281:A67-
 18T05E02V01G01R01 282:K78Q19R01 283:S45G20T18A12V01 286:L96M02 291:V98I01 294:L97M02
 295:S40A39T18 296:K86R11E01 298:E94K05 299:D80H09N07E02 301:K96N01R01
 302:E57G15A09K08Q04R01P01 304:S97T02 305:D97N02 306:E96K02 308:I98V01 309:R98Q01
 318:E65G22A10R01 324:A81S17 326:G94A05 327:L96I03 330:V71I20A04T01M01 332:Y81F18 333:N83H16
 336:K61R34Q03 337:H82Y17 338:P97Q02 340:Y95H02 342:E95D03 343:R77K18H02 346:Q78E17K03
 348:V77I20 349:Q84R12 350:E91D05Q01 351:L80V16I02 352:L82M16 353:K54R42G01 354:D69G27N02
 356:E85D09Q02 357:P66L17S11T02 358:K45E37Q07D02T02I02V01 359:E96D01N01 360:I82L16 361:E96D02
 363:D94E05 366:A76T18S01V01 367:Q95H01L01 368:L95M04 371:L81T15I02 373:M98L01
 375:I86L09V02M01 381:L82Q16 382:H79F16Y04 383:P98S01 385:V89A09 386:T57P29S04I03V02A01L01
 387:V40L18A12F07M04D03T03I03S02G01R01 388:I67V26L03 389:S88T02L02A02V01
 391:C43R38H08G03S02Q01Y01 392:C92V05Y01 393:T94A02I01 394:Q77E18K02 396:I71V22T05
 397:V62K18L03G02A02M02Q01T01E01S01 401:G97S02 403:V77I21 408:V40I33N23S01T01
 409:I77T09V08D01A01 411:L58V18I08H03M02S02T02R01F01 412:I74V19L05 413:S80N15D03 414:I87V12
 415:F67Y18I06L03T01V01 416:G94A05 417:T63I21V11L01M01 419:H93Y06 422:S41T32A19L02Y01
 423:V98I01 425:P94Q01R01 426:D94N04 427:P81S16A01 428:E81K18 430:Y95F04 431:D67N32
 433:F73Y22L02S01 436:D91E03N01Y01 437:P90Q03S02A01L01 438:E77D17K02N02 439:N89T04K03A01
 440:I38P33S14T04V02A02L01 441:K52Q44E01 442:E30K27Q18G13D09 443:R97I01 444:S98P01 445:P98S01
 446:L95M02V01 447:A98S01 448:F85Y14 449:I79V18M01 453:A95V04 455:P97S01 462:T54S22A17N03
 465:M97L02 466:A54T26N10S07 468:M96I02 469:K82R17 470:V94T04 471:V67A29I03 472:L80V19
 473:A96G02 475:T94M04L01 478:R90H08 481:V57L20I13F08 482:L79S17F01 483:P79V18C01
 484:D92T02G02A01 485:H27D21R18E12-05K05A01G01L01N01S01 486:T49E18K16A07R03H01L01
 487:E78R16K01P01 488:P79K17V01 489:-81V18 490:R92C04L01 492:K90Q04T02L01 493:P96S02
 495:L93I04V01 496:I82V15T01 497:L94M05 499:A78T20 501:G73N17D06S02 503:L82I17
 506:R74N14K04Q04 507:V91M04L03 509:P95L03 511:S60P17N09G07L01R01 512:A34P18-17T15S04V02G02
 513:G43-19R16N04Q04S03D03P02L01 514:A28-21P19Q11L07S05T03G01 515:Q50-38S02P02R01A01H01K01

(iii) N9

1:L93F05 2:G86R07W02S02 3:P84L07Q04T01H01S01 4:V77L07E06M05G02 5:A88S03V03T02E01
 6:A77T10V06S04 7:S97F01 8:P96A02L01 9:W91G06L02 10:L94Q03T01 11:L98T01 12:L92F03P02V02
 13:L85M08F02V02 14:L92V05F01 15:V79A08I07L02T01 16:G87V08L02A01 17:A66G17V07T05L01

18:S92F02L01T01 19:W98R01 20:L85I12F02 22:A94L01T01V01 23:R82H11C04Q01 24:V66I26C03L02F01
26:A78T12M03R01V01I01S01 27:W86Q10F02 28:T80I12S03A01V01 29:Y93F02H02C01 30:T68A23R03S02I01
31:F77S10L07A02I01 32:Y95R01H01L01 33:D55N24E06G04H02R02I01A01S01 34:N86K06T04I02
35:C56S25Y10F01V01R01N01 36:R84C05H04Q02L02 37:R81H15L01 39:R61Q33C03 40:C82G15D01
42:P94L04 45:P98R01 46:K94R02M02 47:R67Q21H04P02L02W01 48:N92S05H02 50:F92L07
51:L48W46M02F01 52:G97A01S01 53:H98Q01 54:L70Q15M08V04 55:G93D02N01Y01 56:L69M22Q05V01
57:V59I27Y04S03A02 58:T48P31Q05K05N02S02A01G01R01 59:P86S12N01 60:T94S04 62:E51Q45K02
64:L55M41V02 65:R44K35S07I04L04Q03 66:V25E19K16N14Y08D05T04G02Q01F01
67:L58V17F10S04T04M03 68:T89Q04I03D01 69:Q80E07K04G03R02 70:L85M08I04 71:V74S13A10
72:A83T06S04G01R01V01 73:T76N17K04 74:Y96F02H01 75:P72S19G04R02T01 76:Q76H05R05D04K02P01
77:G91A03V02S01 78:F79Y13C04 79:K25M22L15R12V12T07C03 80:I28V20T18M07W07L06R05F03K01
81:W96C02 82:M57L29F07V02I02 85:I66T10V07F03W03M03A03 86:I33F29T10V07L07H03Y02S02M01
87:P94A04 88:I32L29F16V13M07 89:I66V18L14 90:T23I23V19R12S09N07H03 91:L69F25I04 92:C89F05Y04
94:P96S03 95:D87N07T04 96:I40T19M15L14C03Y02F02V01 97:I73V17L07 98:R91K07Q01
99:S61P16T12I03N02A01F01 100:V65I30F03 101:T31L24I23A16V03 102:N71S21F04L01 103:A93T06
104:S94P05 105:A91D06V01 106:A88T07N01S01E01 107:I60V29L04A02T02 108:A82T08V08
109:P82L07D06V01 111:D87N07E03 112:M29V27K15D10A05I04E03-01L01
113:V33I28L22F08D01H01Q01T01 114:F91S05L01 115:Y85I11T01 116:S34R17G16K08D07N07E03T02
117:F83T07M04V03I01 119:K92E05R01 124:D85E14 126:L86I13 127:L97I01 128:L88V11 129:S97T01
130:A69G20N03V02D01 131:G96A01V01 132:D97E02 135:S89R07N02 136:R61H20S16Q01 137:H98R01
139:R93H04S01 140:M91L07 146:H96R03 148:N96D02 152:P93S04H01 154:M53V24I21 155:K95T02R01
158:N73T22S04 159:K52D25E17Q02H01 161:V40A34T24 162:N66D20T06E04K01 163:I93V06 165:H86L13
166:A74D21T02G01V01 169:Q79K08E06L03R02 170:R65H20L12 172:A60I20V16T02
173:S66T17L05K03I02A02M02 174:E82G11Q04 176:S72H23N01T01 177:T48A33S15N01D01
178:R66H26C04S01N01 180:D97N02 181:M97V02 182:F97S02 184:H91N07 185:I91L04V04 188:M93L06
189:T97A02 192:S95T03 193:L98V01 194:Q98L01 195:K97R02 197:V74I24T01 199:S98N01
200:F79Y15I03L01 201:D88E06N04 203:N61H34R02D01K01 207:K84R15 208:P94S05 210:E89D06K03
213:A92S04T03 214:A78T20G01 215:I98V01 216:L93M05 218:L98I01 220:A94S02E01T01 221:L96F03
222:V87I11 223:A37E22S15V14T07D01R01 224:K96R01E01 226:H37N29S13Y08Q03V02T01D01
227:Q75H10E07L02R01N01 228:Q69H13E06K03R03D02Y01 229:I65L17F09P04V02 230:L55F39S02P02
231:L77Q14M02V02H01R01 232:H65Y31F01N01 233:M51I17K07T06L05V04P03F01 235:F81L11S05W01
236:L94V03I01 238:Y67H11F10R05Q03N01 240:T95S04 241:P66H11Q09S08L01 242:D86C05N03E03
244:R49Q31W09M08 245:R96C02H01 247:R78H10L06Y03 248:R75K21N01 249:A98V01
251:R88H04D02N02K01 252:L97I01 255:D87N07E02H01K01 258:D91G05A02 259:A93V02D01S01
260:V95I02A01 261:I98V01 262:Q94R05 263:E93D03K01R01 265:R94H04 266:R86H05C04Q02N01
267:T95A02S01 269:P87T03S02A01N01L01R01 270:S44T24K12D11Q02E01-01 271:Q69E21H04K02D01
272:G79D09N06S02H01 273:I43V40L05G04T02A02E01 274:D92E05G02 275:D96A01E01
276:F88V06L02W01 277:L94I03F02 278:K77Q21 279:A72D14N06S03T01 281:A87E05T02V02-01

282:K95E01Q01R01 283:S58T30A05V02G02 286:L97M01 288:F98I01 295:S59T35A03I01 296:K97E01
 298:E93K06 299:D93N06 301:K97N01R01 302:E42G24A15K09Q03R02P01 308:I98V01 312:A98V01
 318:E68A15G13R03 327:L98I01 330:V75I23 333:N75H24 336:K59R37Q03 338:P98Q01 340:Y97H02
 343:R94H01Q01C01 346:Q95K01E01 348:V95I01A01E01 349:Q86R10H01K01 350:E90D07Q01
 353:K57R40G01 354:D93G05 355:R97C01 356:E84D13K01 357:P74S22T02A01 358:K69E12T05I04Q03V03L01
 359:E95N03 363:D96E03 366:A95N02S01 367:Q96K01 371:L98T01 375:I77L15V05M01 382:H95Y04
 385:V82A16I01 386:P49T45S02A01V01 387:V49F16A14T05S04M03G03I02 388:I81V15F02
 389:S92T05A01F01 390:R98H01 391:C44R34H12G05S01Y01 392:C89V06Y02 393:T95A03 394:Q98E01
 395:D98N01 396:I74V13T10 397:V74G04L03M03E03T03S02K02A01 400:D97N01 401:G94S05 402:R98W01
 403:V91I06T01 408:V60I27N11 409:I71V13T13A01 411:L61V14I10S05H03M02F01N01 412:I92L05V01
 413:S60N31D07 414:I85V14 415:F74I15L04T02V02Y01 416:G88A11 417:T65I17V11M03L02 419:H96Y03
 422:S42T35A17Y02L01 425:P92Q03R02 426:D97N02 427:P98A01 430:Y96F03 431:D92N07
 433:F86L05Y05S01 436:D86E06Y03K02H01 437:P90Q07L01 438:E95K02D01 439:N97K02
 440:I68S20T04V03A02P01 441:K85Q14 442:E48G23D13K11A01 443:R98S01 445:P97S02 446:L89M06V03
 447:A98S01 449:I93V06 453:A96V02 462:T55A31S07N02V02K01 465:M98L01 466:A52T34N10S02
 468:M97I02 470:V89T09A01 471:V80A12I06 472:L97V02 473:A96G03 475:T87M10L02 478:R82H17
 480:R97L01 481:V60I19F17L02 482:L98R01 483:P98C01 484:D87T05G03A01V01 485:H44D16E12-
 09K09G01N01P01 486:T43E26K15R06A03L02D01P01 487:E97R01 489:-98V01 490:R87C09H01
 492:K88T06Q03L01 493:P97R01 495:L92I06V01 496:I78V19T02 497:L89M10 499:A92T06 501:G91D06N01
 506:R92Q04H01 507:V90M06L02 509:P93L05 511:S65N17G13R01K01 512:A42-22T18V06P04S03G01
 513:G54-22N07Q06S05P02 514:-25Q22P19L14A07S06T01G01 515:Q66-28S02K01R01

(iv) N10

1:L87F10 2:G85R06S04W03 3:P78L12Q05T03 4:V60L14E12M07G03 5:A80S07V06T03E01 6:A87S07T03V01
 7:S95F03 8:P94A03L01S01 9:W96L03 10:L91Q05T01 11:L98T01 12:L85F06V03P03 13:L85F04V04M03
 14:L89V07F03 15:V70A12I08L04T03F01 16:G94L03 17:A85V08L02T01 18:S87F05L03T03A01 19:W96R03
 20:L72I22F03A01 22:A92L03T02V01 23:R79H16Q03 24:V60I27C06L03F01 26:A71T19R03I01S01V01
 27:W75Q19F03R01 28:T68I19S06V01C01L01 29:Y88F05H03C01 30:T75A10R05S04I02
 31:F60S18L11A04I01Y01 32:Y93H01L01R01 33:N39D29E10G08R04I03A01S01 34:N75K10T08I04
 35:S41C35Y16V03F02A01 36:R75C08H05Q05L03S01 37:R77H18L03 39:R67Q23C07 40:C75G20D01
 42:P91L07 46:K91R04M02 47:R76H08P05Q03L01W01C01 48:N91S06 50:F87L12 51:L63W28M05F03
 52:G94A03S01 53:H98Q01 54:L73M15V08Q01 55:G88D05N03Y03 56:L57M32Q08T01 57:V57I22Y08S07A01
 58:P56T25Q10R02S01K01 59:P83S14N01 60:T91S07 62:Q71E23K04 64:L60M38 65:R37K26S13I07L07Q05T01
 66:E29K21Y15D09V08G04Q02T02F01N01 67:L39V29F13T07M05S03 68:T85Q08D01I01A01S01
 69:Q64E13K08G07R03D01 70:L88M09 71:V78A19M01 72:A72S08T08G02R01V01K01N01 73:T57N31K08I01
 74:Y95F04 75:P73S11G08R05T01 76:Q69D08H07R07K03N01S01 77:G86A07V05 78:F62Y25C08L01S01
 79:M33L28R13V10C07K06 80:T33I28M13W13V06L03 81:W94C04 82:M50L26F14V05I03
 85:I62W07F06M06V06T05A04 86:I26T15V14L12F10H07Y05M02S02R01 87:P90A08 88:I43L30M13V07F03
 89:I67V30L01 90:T32I30V14R10H05S03N01 91:L55F35I07 92:C87F10V01 94:P93S05 95:D90T07

96:I30M29L21C05Y04F03T03V01 97:I67V17L13 98:R83K13Q02 99:S42T23P17I07N04A01F01 100:V76I16F05
101:L43A30T17V06I01 102:N64S23F07L01G01 104:S90P09 105:A97V01 106:A88T04S02E01N01
107:I54V39A04T01 108:A96T02 109:P82L13V01S01 111:D77N14E05G01 112:V45M35A07K03-02L01D01E01
113:I43V32L08D03F03H03Q03T01 114:F96L02 116:S39G15D14N14E07T04K03R01 117:F80T08V07I01
119:K97R02 124:D98E01 128:L78V21 130:A88G03N03D01K01 132:D95E03N01 135:S94N03 136:R64S31H03
139:R90H07S01 140:M86L12 148:N93D05S01 152:P92S03H01 154:M58V37I03 155:K96R03 158:N57T41
159:K44D42E05Q03H01G01 161:T42A35V22 162:N51D37E08K01 163:I87V11 166:A94T03
169:Q62K16E12L05R03 170:R84H14 171:L98M01 172:I37V30A28T02 173:S51T32K07I04A03
174:E73G15Q08D01K01 176:S51H43N01T01 177:T76A16N02D01S01 178:H48R43C03S03N01 180:D98N01
181:M98V01 184:H85N14 185:I89V07L03 188:M87L12 192:S91T07 194:Q98L01 197:V94I04T01
200:F69Y28L01 201:D89N08 203:N92H03D01K01 207:K97R01 208:P93S05 209:S98N01 210:E82D11K05
213:A87S07T05 214:A91T06G01 215:I97V02 216:L98Y01 220:A92E03S01T01 222:V96A01
223:A59S15V14T08R01 224:K94R02E01 226:H41N25Y16Q07V03D01E01S01 227:Q74E14H07R03D01
228:Q89E07R01Y01 229:I62L27P07V02 230:F51L40S05P01 231:L89M04H03V02 232:H78Y16N02F01
233:M64I08L08V07T03F01K01 235:F66L20S09W02 236:L96I03 238:Y55H17R09F07Q05N02 240:T97S02
241:P75S16H03L03A01 242:D92N04E02 243:G98W01 244:R44Q21M16W16K01 245:R93C04H01
247:R77H11Y06L01 248:R58K37N03E01 249:A96V02 251:R85N05D04K02H01 252:L96I03
255:D80N09E03H01K01R01 258:D84G09A03S01 259:A89V03D03S03 260:V92I03A03 261:I97V02
262:Q94R04 263:E89D05K01R01 265:R89H08 266:R77H08C07Q03N01 267:T91A04S01
269:P88S04N03L02A01 270:S42K22D21Q03E03-02T01 271:Q44E39H08K05D01 272:G66D14N11S03H03
273:I36V34L10G07T04A03E01 274:D90E05G03 275:D93A03E02 276:F79V11L04W02I01 277:L92I07
279:A88S07T02 281:A77E10V03T03-02R01 282:K91E03Q02R02 283:T54S26A09V04G03 285:T98V01
286:L96M03 288:F98I01 295:T65S25A06I02 298:E98K01 301:K98N01 302:G44E42Q07R03A01 312:A98V01
318:E85R06A05G02 327:L97I02 330:V56I41A01 333:N97H02 336:K73R26 338:P96Q03 340:Y96H03
343:R97H01K01 346:Q93E02K02 348:V96I03 349:Q82R13H01 350:E83D14Q02 353:R72K23G01Q01
354:D89G09 356:E92D04 357:P54S42T03 358:K59E20T09Q07L01 359:E91N07D01 363:D96E03
366:A91N03S03T01 368:L98M01 371:L97T02 375:I98L01 379:L98M01 384:P97-01S01 385:V98A01
386:T83P05S05A02V01 387:V69S08A06M06G05I03 388:I83V14 389:S96F01A01 390:R98H01
391:R48C46S03Y01 392:C94Y04 393:T96A01S01 394:Q96E03 395:D98N01 396:I73T16V09
397:V56G07L07M07T05S05K03E03A01 400:D95N03 402:R98W01 403:V91I05T01 404:I98V01
408:V92N04I03 409:I74V14T09N01 411:L76I13V05F02 412:I94L02V02 413:S69N16D14 415:F92V03Y03
416:G92A07 417:T91I07 422:S65T14A12Y05L01 425:P88Q05R05 426:D96N03 427:P98A01 430:Y92F07
431:D87N12 433:F82L10Y03S02 436:D82E11K03H01 437:P93L03Q03 440:I82S07V03T03P01 441:K86Q12
442:G40D24E24K05A01N01Q01 443:R98S01 445:P96S03 446:L92V06H01 447:A97S02 449:I87V12
453:A94V05 462:T89S06N03 465:M98L01 466:T64N18A12S04 468:M98I01 471:V65A22I12 472:L95V04
478:R98H01 480:R98L01 481:V78I13L05F03 482:L97R01 483:P98C01 484:D89G05A03V01 485:D31E23K17-
16G03N02P01H01 486:E48K28T14A05D01 487:E96R02K01 488:P98V01 489:-97V02 490:R82C12H02L01
492:K92Q05 493:P96R03 494:E98Q01 495:L97I01 496:I98V01 497:L96M03 499:A90T08S01 501:G95N03D01

506:R91Q08 507:V85M11L03 509:P89L10 511:S94N02G01 512:A51T29P07S05G03 513:G70Q11S09P03-01R01 514:Q41P30A14-06T03L01 515:Q80-09S03K03R01H01

(v) N105

1:L85F14 2:G79R14S02T02 3:P85T11S02 4:V97L02 5:A97T02 6:A85S08V05 8:P79A14L02S02 9:W82L17
10:L97Q02 12:L97P02 13:L94V05 15:V82A17 16:G82L17 17:A47G32L11S02T02V02 18:S85F14 19:W85R14
20:L94A05 22:A85L14 23:R79Q11H08 24:V82L17 26:A73R14T11 27:W82F17 28:T79V08C05A02L02
29:Y79H14C02L02 30:T70R17A11 31:F97Y02 32:Y88R08A02 33:D79I14G02R02 35:C94A05 36:R94C02H02
37:R58H41 38:L97I02 39:Q55R41K02 40:C97G02 42:P97A02 46:K82R17 47:Q52R38L08 48:N91S08 50:F82L17
51:W70L29 54:Q61L35M02 56:L88M08Q02 57:V58I26A08L02M02 58:T76Q17K05 59:P91N08 60:T97N02
64:M52L26V20 65:K64Q17R17 66:K41E32T20A02L02 67:L38V35F26 68:T73I17D08 69:Q97E02 70:L97M02
72:A76T17K05 74:Y82F17 75:P76R23 76:Q73H14D08K02 77:G67S11V11A08 78:F91C08 79:K70L23M02S02
80:L35F26W23V14 82:M55L44 85:T58F23I11A05 86:F76Y14L08 87:P97S02 88:L52I38F08 89:L70I23V05
90:I38T38R23 92:C85F08V05 96:I41T35Y17F05 97:I82V17 98:R82K17 99:P79S20 100:I64V35 101:T64L29I05
102:S76N17L05 104:S94P05 106:A88T08S02 107:V61I38 108:A97T02 109:P94L05 112:M79K11E05V02
113:I35L26V20F17 116:G82S11R05 119:K91R08 124:D94E05 130:G50A32N11K05 132:D94E05 136:R97H02
139:R97H02 140:M82L17 148:N79D20 152:P97I02 154:M85V14 155:K94A02Q02 159:K79Q17E02
161:V79T20 162:N79D17S02 166:D58A41 169:Q82R17 170:R94C05 172:A94T02V02 173:S82A17 176:S94T05
177:A73T26 178:R85S14 182:F97S02 185:I70L20V08 193:L91V08 194:Q94L05 197:V94T05 199:S91N08
200:F82Y17 201:D50E50 203:N97H02 210:E94D02K02 214:A94T05 216:L94Y05 220:A88S08T02
221:L73F23H02 222:V73I26 223:E64V20A11S02 224:K88R11 226:N64H20Q08E05 227:Q79H20
228:Q58H20R08Y08E02 229:I73L17V05T02 230:L94P05 231:L76H14V08 232:H76Y23
233:T32P23M20L14F05S02 235:F85W11C02 236:L82I14V02 238:Y76H17R02W02 239:L97R02 240:T88S11
241:P82S17 242:D94E02N02 243:G97R02 244:Q50R44W05 245:R97H02 247:R94H02K02 248:R97K02
251:R50H29D20 252:L85I14 255:D85H08R05 258:D85A14 259:A85D14 260:V97I02 261:I88V11 262:Q97R02
263:E85R08K02Q02 266:R79Q14A02H02 267:T85A11Q02 269:P70N14R08A05 270:T61Q17S17A02
271:Q97H02 273:I61A17V17T02 274:D82E17 275:D82A14S02 276:F85W11Y02 277:L97F02 278:K94R05
279:N50A35S08D02R02 281:A82-11R05 282:K88Q11 283:S76G17T05 285:T94V05 286:L82M14T02
295:S88A11 297:D97N02 301:K88N08R02 302:E94G05 304:S97T02 307:D97E02 309:R97K02 318:E88G11
327:L94I05 332:Y97H02 333:H70N29 335:A97S02 336:K50Q26R23 340:Y94F02H02 343:R76Q14K05C02
346:Q85E11A02 348:V73I14A11 349:Q64R29N02T02 350:E94D02K02 352:L97M02 353:K79R14Q05
354:D79G20 355:R91C08 356:E88D08K02 357:P85T14 358:I32V26E20K17T02 361:E97G02 363:D97E02
366:A88S11 367:Q91K02N02V02 371:L88T11 375:I97V02 386:P70T29 387:V52A47 388:I58V41 389:S94T05
391:C79R20 392:C94V02Y02 393:T97S02 394:Q85E14 396:I91F02M02V02 397:V82K17 398:L97V02
400:D97G02 402:R97W02 403:V73I26 408:I50V29N20 409:I64V20T11A02 411:L73I26 412:I97V02
413:S85N14 414:I97V02 415:F61I23Y14 417:I61T35L02 419:H76Y23 422:T61A32E02N02 428:E97D02
431:D82N17 433:F82Y17 436:D70Y26N02 437:P50Q50 439:N97K02 440:I76S14P08 441:K79Q20
442:E79G08K05Q05 443:R97M02 445:P94S05 446:L94H05 448:F97L02 449:I85V14 462:A55N17T11V11M02
466:A97T02 469:K97R02 471:V97A02 472:L91V08 477:L94H02R02 478:R76H23 480:R97L02 481:I52V47

482:L88R08T02 484:D50T50 485:H61D11E08P08A02C02Y02 486:T73L17P08 487:E85R11K02 488:P94V05 489:-88V11 490:R73C23G02 495:L97V02 496:I76V23 497:L91M08 499:A79T20 501:G85N14 506:R85Q11H02 507:V85L14 509:P97S02 511:G58S29N11 512:A41V29P17-08S02 513:N55G17P17-08 514:S50P35-08Q05 515:Q73S14-11
(vi) N129
1:L90F09 2:G74R24S01 3:P77T07H05Q05L03 4:V98L01 5:A94T03V01 6:T46A38S05V05E01I01 8:P87A11S01 9:W53G35L11 11:L98F01 13:L59M35V03P01 15:V77A20I01 16:V44G40L11A03 17:G62A22L07V03S01T01 18:S88F09Y01 19:W90R09 20:L96A03 22:A88L09T01 23:R90Q07H01 24:V77I12L09 25:L98P01 26:A88R09V01 27:W88F11 28:T87V05C03I01L01 29:Y88H09L01 30:A66T22R11 31:F92L05Y01 32:Y94R03A01 33:D68N14I09H05R01 34:N96K03 35:C81Y09R05A03 36:R94C01H01W01 37:R94Q03W01 39:Q68R31 42:P98A01 43:Q98E01 46:K88R11 47:R74Q25 48:N88H09S01 50:F90L09 51:W79L20 56:L85V09M05 57:I85V12M01 58:T66Q11A09G09K03 59:P94N05 62:E98Q01 64:L88M09F01 65:K72R16Q11 66:N70E24A01D01V01 67:L70V14S12M01 68:T94D05 69:Q98E01 70:L59I25M14 71:S72V27 72:A96K03 74:Y83F11H05 75:S70P14R14 76:Q64H20P09D05 77:G85V07A05S01 78:F94C05 79:T40M24L14K09R09S01 80:I66V14W14M01T01 82:M66L31I01 85:I85F14 86:I75F09Y09L05 87:P98S01 88:F72I25V01 89:I81V12L05 90:V62R16T11I07F01 91:L98F01 92:C90F05V03 95:D98N01 96:T62I20Y11F03L01 97:I94V05 98:R88K11 99:S83P16 100:I72V27 101:T72L18I09 102:N87S09L03 104:S96P03 106:A98S01 107:I90T09 108:A87V11T01 109:P94L05 112:D53M14E12K09A07N01 113:L83V16 114:F68S31 115:I61Y27T09V01 116:R77G12S09 119:K96R03 124:E72D27 126:I68L31 127:L88I09V01 129:S88T07A01R01 130:G57A20N16K03D01 131:G85A07V07 132:D96E03 133:K98R01 135:S98G01 136:H55R44 137:H90R09 140:M88L11 148:N87D12 152:P85S12I01 154:I66M16V16 155:K87T12 156:I98T01 159:K70E16Q12 161:A55V31T12 162:N51T37D11 163:I98S01 164:M98L01 165:L72H27 166:D72A25V01 167:K98R01 168:W98R01 169:Q88R11 170:H64R35 172:A98V01 173:S88A11 176:S96T03 177:S74A14T11 178:R90S09 180:D92N07 181:M98V01 182:F88S11 185:I96V03 194:Q96L03 195:K90R09 197:I75V18T05 200:F88Y11 203:H64N24R11 207:R74K25 208:P90S09 214:T74A25 216:L96Y03 220:A88S05T03G01 221:L98F01 222:V90I09 223:E70V12D09A07 224:K94R05 226:S62H11T09N07Q05E03 227:Q75H12L11 228:H50R18Q16D11Y03 229:I79L20 230:L83F12P03 231:Q74L16H09 232:H77Y22 233:M83L07F03K01T01V01 235:F92W07 236:L74V16I09 238:Y98W01 239:L98R01 240:T81S18 241:Q50H24P14S11 242:D98E01 244:R96Q03 247:R83H14K01 248:R98K01 251:R87D12 252:L90I09 255:D79N09H05R03S01 258:D90A09 259:A90D09 260:V98I01 261:I92V07 262:Q87R12 263:E92R05Q01 266:R88Q07A01C01 267:T90A07Q01 269:P87N09A03 270:T79Q11S09 272:G90D09 273:I79A11V09 274:D88E11 275:D88A09S01 276:F90W07Y01 277:L92F07 279:D74A18S05R01 280:K98R01 281:A88-07R03 282:K92Q07 283:S85G11T03 285:T96V03 286:L88M09T01 295:S92A07 297:D98N01 301:K92N05R01 302:A66E20P07G03V01 304:S96A01T01 305:D98N01 307:D98E01 308:I90V09 309:R98K01 318:A62E22G14 323:T98M01 327:L96I03 330:V94I05 333:N94H05 335:A98S01 336:R88K11 339:E98Q01 343:R90H03K03C01 346:Q90E07A01 348:V85I09E05 349:Q90K05N01T01 350:E98D01 353:K88R07Q03 354:D88G11 355:R98C01 356:D59E38H01 357:P87T07A05 358:K85E12I01 363:D92E07 366:A92S07 367:Q96K01N01 369:P98S01 371:L92T07 375:L46I27V25 378:S98A01 379:L98C01 380:R98G01 381:L98Y01 382:H98I01 384:P98T01 385:A74V25 386:P81T18 387:F75A12V11 388:I87V12 389:S96T03

391:R40H31C27 392:C98Y01 393:T85A12S01 394:Q90E09 396:I79T09V07L01M01 397:V88K11
 400:D96E01G01 407:G96C01D01 408:I64N22V12 409:I88T09A01 411:V57L31M09I01 412:I98V01
 413:N74S24D01 415:I61F16T12Y09 416:G92A07 417:V57T20I14L07 419:H98Y01 422:T75A18S05 425:P98A01
 426:D98N01 428:E98D01 431:D85N14 433:F70Y29 439:N96K03 440:S83I11P05 441:K81Q18
 442:E68G14K12Q03 445:P96S03 446:L96H03 449:I88V11 453:A98G01 455:P98S01 459:I98M01
 462:A70T14N11V03 464:A98P01 466:A98V01 469:K98R01 470:T50V48A01 472:L94V05 475:M53T35L11
 477:L96H01R01 478:H72R27 480:R96L03 481:F74V25 482:L90R07T01 485:H79D07E05P05C01 486:T94R05
 487:E90R07K01 488:P96V03 489:-92V07 493:P98L01 495:L98V01 496:I88T11 497:L61M38 501:G90N09
 506:R88Q07H01W01 507:V92L07 509:P98S01 511:N74S24G01 512:A61T12V12P11-01 513:G83P11-
 01N01S01 514:L72P22Q03-01 515:Q87S09-03

(vii) N151

1:L92F06P01 2:G80W12R05E01S01 3:P80Q07H05T04S03 4:V68L08A06G06T05M04S01 5:A83T10S03V02P01
 6:A78V15P03S03 7:S98C01 8:P86L07A05S01 9:W93L06 10:L97H01Q01 11:L75I19F05 12:L80G19
 13:L92P05V02 15:V54A29I15T01 16:G86L06A02S02V02M01 17:A61V19T10L04G02F01S01 18:S80A07F06T06
 19:W83C11R05 20:L96A02I01 22:A88L05G03V03 23:R62Q15Y11H07C03 24:V52I36L06F04A01
 26:A58T25R05S04P03V03D01 27:W72Q11F06R06-02S01 28:T52I19S09V06A05M03C02G01L01
 29:Y92H06L01 30:A52T28R10S04K03G01V01 31:F73L09V09I03A01C01M01Y01
 32:Y87F05H02R02A01C01N01 33:D57E30I05A03N02R01V01 34:N80I10K08T01 35:C52S40A05F01N01
 36:R75C08H08G03L02S02Q01 37:R98H01 39:R84Q15 40:C87G09R03 42:P98A01 43:Q96E03 45:P98L01
 46:K75R16L02T02V02G01P01 48:N97S02 50:F57L34I08 51:L68W25F03V03 54:L78Q15V05I01 56:L64M35
 57:I95G02M01V01 58:Q55H34P05K03R02 59:S83P10A03N03 60:S86T13 62:E90Q05D02G02
 65:L79Q14K04R02 66:Y84E10D02H02A01 67:T59I26V11A01L01M01 68:Q86T08D03A02
 69:S44G31D08Q08K03E02N02 70:L98P01 71:A53V43S03 72:C28R28S25A06G05D04K02N01 73:T98S01
 74:F64Y34A01 75:G69R23S04K01P01 76:D86H05Q03R02T02K01 77:V62M25A06G04L01S01
 78:C84F09G05L01 79:C85L08I02K01S01V01Y01 80:W94S02L01M01T01 82:V83M10L03I02G01
 85:W79F08C04I04L04 86:H61Q19Y06L03S03F02I02N02 87:A69P27V02S01 88:V56I41L02 89:V51I45L03
 90:R85H10T03N01 91:I82L15V02 92:F90C07V02 93:H90L08Y01 95:T60S15D12A11 96:Y37C32F26I02L01T01
 97:I94V05 98:K93R06 99:P95A02T02 100:V98I01 101:L94I04V01 102:F65L23S06N04 103:A98T01 104:P88S11
 106:A75S11T10N02L01 107:I67V21L10 108:A77V18T04 109:P82L09I03S03H01M01 111:D98N01
 112:K41M25V12T08S06R03E02F01 113:V69F16L13 116:S65R15G14E02N01Q01 118:L98M01 119:K67E18R13
 124:D96E03 125:G98S01 128:L91M08 130:A83T06N04K02D01E01G01S01 131:G98S01 132:D94E05
 135:S96G01N01R01 136:R83S13Q03 137:H96R03 139:R90H09 140:M92L07 148:N92D07
 152:P93S03A01I01L01 154:M52V47 155:K98Q01 156:I98V01 158:N81T16K01S01
 159:E46D35G06Q06K03A01N01 160:S98T01 161:V47T41A06M04 162:N83K09D06S01 163:I71V23T03L01
 164:M98L01 165:H96L03 169:Q82K10R06H01 170:R58L33C05H01N01P01 171:L96V03 172:A69I16V13
 173:S89A06T03L01 174:E55Q20G10K09W03D01 175:G98S01 176:S88H03N03T02G01K01R01
 177:A72T26N01 178:R80H08C05S05Y01 180:D94N05 183:E98D01 184:H95L03Y01 185:I97V02 186:S96N03
 193:L98F01 194:Q97L02 197:V97T02 199:S98G01 200:F92Y06L01 201:D75E19N05 202:S98T01

203:N56H42Q01 206:E96D03 209:S98I01 210:E93K04A01G01 213:A89T06E03V01 214:A98T01 216:L97Y02
 217:E93D03Q03 220:A94S03T02 222:V96I03 223:A64S18V09T06E01 224:K85R14 226:H91Q06E02
 227:Q85H11R03 228:Q78R06E05K05S03Y02 229:I47L42F09 230:L58F30H05P03W03 231:L85H05V04-
 02M02Q01 232:H72Y26Q01 233:I33M18V12L11P07T07F05K02R01W01 234:D98G01 235:F81L11W04S03
 236:L81F10I05V03 238:Y58H40W01 239:L97F01R01 240:T93S06 241:P45H17C16R11S07T01 242:D98E01
 244:Q67R12M10H07K01T01 245:R98C01 247:R98K01 248:R77K19T03 251:R91D08 252:L84I06V06Q03
 255:D86N08H03R02 258:D93A05N01 259:A94D05 260:V93A04I02 261:I95V04 262:Q87R12 263:E94R03Q02
 266:R82C07H04Q04A01S01 267:T88A04S03I02N01Q01 269:P67S19N05K03A02L01T01
 270:S39D25N21E07Q06 271:Q95H03E01 272:G97A01V01 273:V58I13A09D06G06T06 274:D85E13G01
 275:D92A05E01S01 276:F80V08W04A03S03Y01 278:K56Q37E05M01 279:A94S03R01V01 280:K98E01
 281:A91-04R02T02 282:K87R07Q05 283:S50A29T13G06N01 285:T97V02 286:L93M05T01 294:L88M11
 295:S80T11A05N03 296:K96E03 298:E87K12 299:D82H11E03N03 301:K87E03N03R03T03
 302:E50K25A12Q06G05R01 304:S98T01 306:E97K02 307:D97E02 308:I96V03 309:R98K01 313:D95N04
 314:T98N01 315:F95V03I01 318:E58G33A08 320:H98N01 322:T98S01 323:T98A01 326:G98S01 327:L94I05
 330:V87I08A04 333:N63H36 336:K76R23 342:E97D01V01 343:R94K02C01H01Q01 346:Q89E05K03A01H01
 348:V94I05 349:Q73R21E01L01N01T01 350:E95D02A01N01 351:L93V06 353:R52K43Q02E01S01
 354:D71G27N01 356:E86R06D04G01K01Q01 357:P93T05S01 358:E48K42Q07D01 359:E93D06 360:I97M02
 361:E98G01 363:D91E08 365:L98M01 366:A90S04T04V01 367:Q91H07N01 368:L96M03 371:L95T04
 375:I93M06 379:L98M01 381:L97I01M01 382:H97Y02 384:P97S02 385:V90A09
 386:T47P37S07L03I02G01M01 387:V52A36I07T02G01S01 388:I67V28A04 389:S97A01T01
 391:C73H16R06S03 392:C83V15Y01 393:T96S03 394:Q91E05R03 396:I89V08T02 397:V86K06M03E02I01R01
 398:L96F03 400:D98G01 403:V90I09 408:V72I19N07 409:I87T11V01 410:C97S02 411:L77H11R11
 412:I84L09V06 413:S98N01 414:I66V33 415:F83L11Y05 416:G97A01E01 417:T90L06I03 422:A66S19T12V01
 426:D87N12 427:P97L01S01 428:E98D01 430:Y98F01 431:D73N26 433:F92Y06S01 436:D95N04
 437:P79A11S07L02 438:E83D11K05 439:N97H01S01 440:I47S26T10A06G03P03V03 441:K81Q16E02
 442:E47G20D16K12Q02 444:S96P03 445:P94S05 446:L97H02 449:I93V05L01 461:Q98K01
 462:T70A15N09S03I01 465:M96L03 466:A50T37S12 468:M93I06 469:K98R01 470:V98A01 471:V83A16
 472:L96V03 473:A92G07 474:L96M03 477:L94Q03H01R01 478:R96H03 480:R98C01 481:V92I03L03F01
 482:L95R03T01 483:P98L01 484:D95G02H01N01 485:D35H34E12A09K03P03R01S01
 486:T71E11K11A03D01V01 487:E93R04K02 488:P97V02 489:-95V04 490:R91L06K01Q01 492:K94Q02S02L01
 495:L98I01 496:I62V37 497:L98M01 499:A98T01 501:G94N05 504:W98R01 506:R86Q11G01K01 507:V87L12
 509:P94L03A01Q01 510:L98V01 511:S86G06N06R01 512:-39A38T07P06E04S03G01 513:-
 45G30D07P06R04Q03S02A01 514:-45P25A23Q02S02L01 515:-55Q20R06P05S05H04A03

(viii) N195

1:L78P07F04M04-01R01 2:G82R07S03-01T01 3:P62S18Q05A03T03-01L01 4:V73L20-01G01
 5:A74L12V06T04S01 6:A84T06S03E02V02 7:S96F01 8:P78S07L07A03T02 9:W95L04 10:L54H33Q11
 12:L95P04 13:L96Q01V01 14:L93F02M02V01 15:V37G29A17L07F05M01 16:G80A13L04V01
 17:A86T04L03V03 18:S86T06F03-01 19:W89L06R03 20:L62I19F11V03A01 21:L91V08 22:A90L03V03

23:R91Q03Y02H01K01 24:I48V44L03M02 26:A89R03T03S01 27:W85F04K03R03
28:T44I39S06A02F02V02C01 29:Y88H06C01F01 30:A47S25T14R05V04 31:F87M03Y03L02I01
32:Y81C12H03R01 33:D67E22I03S02 34:N88K05Y05 35:C81S08Y04A02V01 36:C49R22S14A05L04Q02
39:R96Q02 42:P91R03Q03 43:Q97E01 44:P84S09A05 46:K76R14S08 47:R85P08C02 48:N73S18H08
50:F90L09 51:W73L24 54:L90M06V02 55:G79S07A07D03 56:L48M35T07I06Q02 57:V33I27A20M16L01
58:Q51K38S03T03R01 59:S62N19G07P06T02L01 60:N84T10D04 62:E91D03Q03 63:G88D07S02 64:M62L37
65:R54Q39K06 66:L65M15E07F07V02 67:V55I24M08L06A05 68:E50T35A08D02S02
69:E44D33H10Q06R03N01 70:L74M22 71:G81V09S07 72:H67K12Q07A05R02T02
73:Y41T25H13N04C03Q03I02D01S01 74:F93Y05 75:R75H14P05Q02 76:D90H03Q03 77:V80I11A04G01
78:H70Q14F07Y03C02 80:W57C28S06F02L02T01 82:L34M32F14I11V06 84:P92A07 85:F55V32I05L05
86:Y60I18F08H03C03L02D01 88:V48I47A03 89:L91I03V03 90:R83H07K05T02I01 91:L96I03
92:V70I14T04C02F02S02W02 93:H81D18 95:K44A16N14T14D08 96:F88Y05V03T02 97:V50I41A07
98:A88K04R03G02 99:P95S02 100:L68V29I02 102:Q79H10N03L03S03 104:P71S28 105:A92V07
106:A48T23L17-03E02V02 107:V70I26A03 108:A70I17V08T03 109:P96L01 111:D79E18 112:M88T04K03E01
113:T44F22V11I07L04S03Y03D02 114:F83L09S04 115:Y85L13 116:G55S27R08N06 117:F85L07P06
118:L92M05V01 119:K93R06 120:P90L09 124:D94E02T02 127:L81F18 128:L84I07V06M02 129:S96K02
130:A64S24N03T03D01G01K01 132:D84E08N04G02 133:K97N02 135:S85R09N03K01
136:H40R38S09W07L02Q01 137:H93Q04R01 139:R90H08 140:L92M07 148:D58E31K07N03 152:P85S10L03
154:V66M30L02 156:I87V06N03T03 158:N98S01 159:K77Q10E03T03D01N01R01 161:V44A39T15
162:N60D32G05 163:I97T01 166:A85D06V03G02 169:Q66K25R07 170:R82H08C07K01
172:A70T18S03V03C03 173:S37L35A21T05 174:E75K18G03Q02 176:S85N10T03 177:A71T25
178:R81H08C06S03 180:D80E18 183:E97A01 184:H84N15 185:I96V03 192:S92I06 194:Q98L01
197:V66L18I10A03T01 199:S80G19 200:F85Y12L01 201:D96N02 203:N85H07K03D02
207:S44K29N15H06Y03 208:P96N01 210:E95K03D01 213:A85D07S07 214:A98T01 216:L95Q02Y01
217:E96D03 219:S96T02 220:A54S44T01 222:V55I42 223:V50T23M09A07I07L01 224:K97R02 225:R93K06
226:H37S11Q10Y10N07I07A05T05D02E01 227:Q48R18H15E14 228:Q79H09K04R03Y01
229:I48L35P07V04M02 230:F85L10I02P01 231:L87Q05H03M03 232:H44Y41Q07F04R01
233:M42V25L18A07S03F01 235:F96W03 236:L95I03 238:Y81F10N06 239:L88R05F02H02 240:T97S02
241:P54A34S10 242:D81N16E02 244:R74Q16W08 247:R83C06H03Y03-01L01 248:R55K44 249:A96T02
251:D66N18R08E06 252:L80I14M03V02 255:N49D33K05S04E02H02R02 258:D92A03G02
259:A91D03N02T02 260:V88I11 261:I96V03 262:Q61R37 263:E86K09R02 266:R81H09Q03S03C02
267:T79A09I05L02-01 269:S25I21A16N13T12V05Q02 270:S88Q04H03T03 271:Q93G05 272:G77S17N03D01
273:V60S29A05H02 274:D62H21Q08E04-01N01 275:D44E44A09 276:F84L08W03I02 277:L91V07
278:K85Q13 279:A67S18T10V01 280:K96R02 281:A66T22-03S03V02R01 282:K96Q03 283:S55A26T10G04L02
284:K97R02 285:T97V01 286:L92M06 291:V98I01 294:L95M04 295:A92S07 297:D96G03 299:D40H37N22
301:K95N03E01 302:E73G18Q03R02K01 304:S97P01 305:D96N03 306:E96S02 307:D96S02 318:G53E34A11
323:T97A02 326:G74A25 327:L98I01 330:V48I40T07A03 336:R73K25 339:E95K03 340:Y91W04C02H01
342:E96D02 343:R92H05K01 346:Q95E03 348:V96I03 349:Q78R17W02 350:E93Q05 353:R73K19G05Q01

354:D74G16N07 355:R96L02 356:E81D17 357:P86L04T03S03 358:E44K32Q22 359:E97D01 363:D92E07
 364:D98E01 366:A88T03V03S03 367:Q97R01 369:P97T01 371:L96T03 373:M97T02 375:I88L11 383:P92S07
 385:V95A03G01 386:T63I13S07A06V03P03L02 387:V47D18A08M07R07I03L03S03 388:I74L18V05M02
 389:S66L13A05V05Q03H03 391:C57R30G04S03L02 393:T85I07A03S01 394:Q89E03K03R02 396:V62I37
 397:V73L07A06G05K05T01 403:V97I01 406:K96R03 408:N85S07T06 409:I63V09D08T07A05M03
 411:V60I16T10L06M03A01 412:I90V09 414:I98V01 415:F92Y03T02 417:I61V31T07 422:S91A07 423:V91I08
 425:P94L02 426:D96E02 428:E96K02 430:Y93F06 431:D62N37 433:F93Y04S01 436:D95N03 437:P98S01
 438:E96D03 439:N74T14A05S03 440:P78L09S06R02I01 441:Q92L02-01K01 442:K92G03E02Q01 445:P96S02
 446:L98H01 447:A96S03 449:I96V03 453:A86V13 455:P91S05N02 462:T90N04A03 464:A97G02
 466:A35N29T24S10 468:M95I03 471:V50A48 472:L93V06 481:V77I18L03F01 482:L95R03 483:P93C05
 484:D95G02A01 485:D41E25H07L07Q03-03N03P02G01 486:K37A25E23T11 487:E95R03 488:P96A02V01
 489:-96V03 492:K82Q14L02 493:P90S07L02 495:L88I05V05 496:I95V03 501:G85D07N06 506:R90Q08
 507:V87M08L03 509:P97L01 510:L97Q02 511:S86N08R01T01 512:A42T30S09-04P04G01K01R01
 513:G66D10-07N07P04V01 514:P37A28-14T07Q07L03S01 515:Q82S04-03P03K01R01

(ix) N261

3:L57V15T10I06A04M01 4:Y90V03C02G01W01 5:A95T02 6:V76L09I05G04S02 7:S96T02
 8:A62G14T07M06V04S01 9:L91I06F01 10:L95V02F01 12:S71F12L08A03G02T02 13:L95V02G01 15:F94A04
 16:F76L09I06S05V01 17:L77F19 18:F96C03 19:R93H06 20:L90F04Q02A01 22:L84M07V04I02 23:Q71R20K04
 24:F72L14V10 25:L85F13 26:R75Q13K07G03 27:L76I09F08V04R02 28:C93S02V01 29:W71R11H09Q04L03
 30:R42H17S12A07D07G05K04 31:F96C02 32:Y70H17R10 33:I63V16T12R04 34:T89I04N04L01 35:C98A01
 36:R85C06Q05H01 37:R97Q02 39:R82S16 42:P95R04 43:Q92E07 46:R86G12 47:R94K04 48:N80S09H08
 51:L94M05 54:L88V07M04 55:G92S06 56:M98L01 57:Y95I03 58:L95Q02K01 59:P97N02 60:N95T04
 62:T29S17A15K14M09R07E04 65:Q85R14 66:D85N08E03A01 67:E95V04 68:K77T09M04D02N02S02
 69:K95Q03 70:V93L05 71:L95V04 72:D85N06E03A02K01 73:N52T18S12D07A04K01 74:M85L04N04Y02F01
 75:H90R09 76:H90D05Y02 77:V76I11A10 78:I64V15L14C02F01 80:V86A08W04 82:M40I37V09A05L05
 85:V71F17I10 86:L97Y01 87:P98S01 88:L94I04 89:L73V25 90:V95R04 92:V91M04F02 100:L57V37I04
 101:L57V38M03 102:G82S13A01L01 107:I85V14 109:P98L01 112:D71E22K06 113:L84F15 116:G85S14
 119:K92T04R03 124:D98E01 130:K89R07N03 132:D78E12N08 140:L92M07 154:M96V03 157:F95Y04
 160:C95S04 161:T87A10S01 162:D74N23 163:I86T09V04 166:A85G06D02N01S01 169:R83Q10H04W01
 170:R94C03G01 171:L92Q05 172:A78G08V04S04T04 173:E71A10Q09N04G01K01 174:G90E04N03K02
 175:S75P09A05G04K04 176:V74E09T05M04D02S02 177:V66A19I07T06 179:L85F14 183:E97K01 185:V78I21
 188:M90L09 192:S92T04C02 194:Q98L01 197:V98T01 200:Y93H04 201:N93D04S01 203:N80D19 207:K90R08
 208:M88N04P04Q02 210:D95E04 213:S90T04A04 214:A94S05 216:I95L02Y01 220:A93S04 222:V76A19S04
 224:R86K09Q04 226:Q98E01 227:Y95H04 228:R94H01S01Y01 229:L91I04V03 230:H95L03P01 232:H52Y47
 233:L65I31F02 234:D94N04 235:F90W03C02L02 236:I96V02 238:Y97H01 239:R57L41 240:T82S17
 241:A90E04S04V01 242:D98E01 247:R92K04Q01 248:Q77R11E05K04 252:T73I15M09
 255:H44R38S06K05G02 258:T94A04 259:E93D06 261:I96V03 263:E90K02R02Q01 266:R68Q20L05W02
 267:A94V02 269:R52H23N11C07S03 270:Q86K07E02R01 271:Q90L09 273:A89S04M02P01 274:E96K01

275:A91M04 277:L97F02 278:K97Q01 279:A65S22G10 280:K96R03 284:K98R01 285:T95A02V01
 286:L95M03 289:I95M04 295:A98S01 296:R57K38Q04 299:D90E09 301:K95N04 302:E90Q04G04
 303:L97M02 304:S89T10 305:D95N04 324:S94A05 327:L97I02 330:V85A08M04 331:L97F02 332:F95Y04
 334:L95M04 336:K90R09 337:Y88H11 342:E94D05 343:K96R03 346:E91K06 348:I97V02 349:Q96R01
 350:E87D10 351:V83I11L04 352:M86L13 353:K94R03Q02 354:G97N02 356:E96D03 357:L84T07V04M01P01
 358:E85D12K01 360:L87I11 361:E85D14 363:D95E04 366:T88A06S03P01 367:Q90L05R02 368:L94M05
 371:T83I14L01 373:M94L05 381:Q85L11K02 382:F84Y10H04 387:L94A04 388:V75I24 389:S97T02
 391:R90Q08C01 394:E96Q03 396:I88V11 397:K95R02A01 398:L95M04 403:I80V19 408:I92N04V02
 411:L95M04 412:V86L07I05 413:S95N04 414:I98V01 419:H71Y28 422:T72L13A05S04 427:S87P05A04Y02
 428:K94E04 430:Y92F07 431:N97D02 438:D75E20L03 439:N84K06T06I01 440:P88S08T02 441:Q95E02
 442:Q95E02G02 445:P97S01 446:L98H01 448:Y73F26 449:V85M07I05L01 462:S94N04 465:M95L04
 466:A93S06 469:R89K10 471:A59V40 472:V96L03 481:L95V04 482:S90T04R02L01 483:V95P04
 485:R94P03E01 487:R87K06H04E01 488:K94P03V01 489:V98-01 499:T91A07 501:N83S09D04G01
 503:I93L06 506:N75K18Q03R02 507:V97L02 511:P89S07N01 512:P90G04A02R01 513:R83L05Q04P04
 514:A80G06T04P03Q02V01 515:-89A04P03S03

(x) N337

1:V48L27F15A03M03T03 2:L39F27S27G03T03 3:S66P24L06V03 4:W66L27R03S03
 5:T45A21S18C03L03N03Q03V03 6:G60S30L06T03 7:L66I15G12S03V03
 8:S63C06G06I06A03F03L03R03W03Y03 9:L33Q18F15S15V09P06A03 10:L60V33A06 11:L87F03G03M03W03
 12:Q48L15A09Y09G06V06F03S03 13:V51L36I09G03 14:V27L24M15S12F09-06A03T03
 15:G48A30S09C03I03Q03R03 16:T33L27A21-06G03I03N03S03 17:G48A15V15T12-06L03 18:L69F12-
 06C03G03P03V03 19:L36V27-06A06G06I06C03F03K03R03 20:A75L12T09V03 21:V54L39A03I03
 22:V60L33A03T03 23:A42G21R15S12L06T03 24:V42L36F15A03I03 25:W69L12R12A03I03
 26:T75V09R06I03M03S03 27:A42V27L12-06F06S03T03 28:R51K27C09-06L06 29:L84-06W06I03 30:R75S09-
 06C03H03V03 31:H81Y09-06V03 32:A87-06S03V03 33:W69R15Q09-06 34:Y66F15N15R03
 35:T75R12A09N03 36:H69R24N03Q03 37:R87K09A03 38:L87M09V03 39:S69R21A03G03K03 40:C96R03
 42:S57N30A12 43:K78Q15L03R03 45:P60Q15H09-06R06T03 46:T54A21M09-06K03L03R03 47:R57H21Q09-
 06D03N03 48:S69N27C03 50:L90F06I03 51:L60I21M18 54:L93M06 56:Q60L15E12K09I03 58:Q66K15R15G03
 59:S90N06H03 60:T87S09N03 65:Q66L27K06 66:Q57A27R12E03 68:D96E03 69:E69D21Q06R03 70:L96M03
 72:Q63R24K06C03H03 73:T78M15K06 74:Y90F09 75:K63T15R12E03G03S03 76:H90Y09 77:S90C09
 79:S69C27A03 81:F93W06 82:L63F18I18 87:H69S24N06 88:L72M18I06F03 89:V93I03L03 91:L63V33I03
 97:V69I30 98:K96R03 99:P96S03 100:L93V06 102:M66L24T06F03 104:P48S48A03 105:A93G03S03
 106:S69N27A03 107:I96L03 108:T93P03S03 109:V60M18L12I03W03Y03 110:K96T03 111:D96V03
 112:E93D03R03 113:L81F15I03 114:I48F33V15S03 115:Y96L03 116:G84H09D03S03 117:H66F27L03N03
 118:L93M06 119:R84Q09K03L03 120:P96I03 121:W96C03 122:L96R03 123:G96A03 124:Q57N18R12E09H03
 125:S78G12-06C03 126:L87V09I03 128:L51I48 129:S90C03I03Q03 130:N93S06 131:G96K03 132:E93D03Q03
 133:E66V12A06K06D03Q03T03 135:S90A03F03L03 137:K51R30H18 151:K96R03 152:N75I12S09K03
 154:V66I33 155:A39K21V21T06E03H03L03N03 156:T39I30K21V09 159:S42T24Q15H12A03N03

161:T78S12A09 162:N81D09K09 163:T66I30V03 164:M93L06 165:H96L03 166:D45N27A24S03 167:K96E03
169:R60H24C09Q03S03 170:R90H06Q03 171:L96V03 172:V78L18A03 173:A90S06V03 174:E78G15K03N03
176:T60E21K09P03Q03S03 177:T81S12H03N03 178:N60S21C06H06A03R03 179:L48I27V18F03Q03
180:E69D30 181:M84L06V06A03 183:D57E30S09Q03 184:H84Q12D03 185:V69I24F03L03 186:T63S33I03
187:L93M03S03 188:M93L06 195:K96R03 197:A69T30 200:Y96C03 201:D39N39Q21 202:S96T03
203:N81D12H03Q03 204:C96S03 206:E69R18Q12 207:S78K18N03 208:S66T18P09N03V03 209:S93D03R03
210:E81Q18 212:V60I30A09 213:S75A18L03T03 215:I96V03 216:V51M15F12Y12L06I03 217:E90D03K03Q03
219:S96G03 220:D69T21I03N03R03 222:I54V30L15 223:I81V15Q03 224:D48E33K12N03Q03 226:R72E15Q12
227:F27Q27H18G09K09R03T03Y03 228:R42K30Y15N09H03 229:I81L18 230:L81P15W03 231:H96Y03
232:H84Q15 233:W93F06 235:W87C06F06 236:I69L21F03V03W03 239:R54K45 240:T75S24
241:Q42E24P21R06A03S03 242:Q72E27 244:K66R27E03Q03 245:R93E03Q03 247:K87Q06R06
248:Q57K24R18 250:L69C30 251:S48D24N18G06A03 252:V57I30T09L03 254:H96Q03
255:R75G09K09Q03S03 258:R78A18M03 259:D66E21T09S03 260:V81I18 261:V96I03 262:Q90E09
263:K51E21M15R12 264:R96H03 265:R93H03L03 266:A78T18E03 267:L66Q27E03K03 268:I57L42
269:N33S24D21L09A03G03H03R03 270:Q87H09E03 271:Q84K09L03R03 272:R54G36K03S03T03
273:T51P18A09E06V06I03K03S03 274:E60Q15L09-06D03G03M03 275:S42T39A12-06 276:D24H21-
12E12S09L06Q06Y06N03 277:L36M18T12-09I09F06A03E03P03 278:T48G15-09A09K09E06N03
279:T42R21P12E09-06A06L03 280:A45E18-12T12G03K03P03Y03 281:-78R12K09 282:P33K24A18Q15R06E03
283:Q63K21G06R06H03 284:K69R27G03 285:K60V27R09N03 286:K66T21A06R03V03 288:F96L03
289:V69I30 291:I54L33V12 292:I57L42 295:S84T12A03 298:E93A03D03 299:D84E09H03K03 300:G96E03
301:Q69K12N09E03H03R03 304:T96S03 305:D96N03 306:E96K03 307:E96D03 308:I78M09V09L03
309:Q69K30 311:E90D03H03Q03 313:N69D30 314:T96M03 318:A84E12G03 323:T96A03 326:A72G27
327:I96L03 328:C63S36 330:T60V27S09I03 331:L96F03 335:A87S12 336:R75Q12H03L03M03S03
337:H87N06Q03Y03 338:P36D21E18Q18N03S03 339:H66D21E12 340:Y93H06 342:E84D12H03
343:K69R24N03Q03 346:Q66A27D03K03 349:M66N27R03T03 350:D66E27A03S03 351:L96V03
352:M66L30I03 353:Q75E21A03 354:G87D12 356:D84E09Q03S03 357:G54T30V09E03R03
358:H51E24Q15D09 359:E75D09A06Q06T03 360:I93L03V03 361:E75K06Q06D03G03L03N03
363:E90D06N03 366:S87T06A03N03 367:N84S12Q03 368:L96M03 369:P93S03T03 371:T96I03 376:K72R27
382:H96Y03 383:S81P15A03 386:Q66S18L06T06A03 388:V93I03L03 389:T96S03 391:K45R36S09A03T03Y03
392:Y96F03 393:T72S18I06L03 394:Q66E21K06R03V03 395:D96N03 396:M63V24I09K03
397:T36A21E15K12V09D03N03 398:L72V21M03T03 400:G96E03 401:D45G30N12E09H03
402:R63L27C06H03 403:T66V27A03S03 404:V69I30 406:Q51K27A12E06H03 408:A33V24S21T09N06C03I03
409:I96L03 410:C96S03 412:V87I06A03L03 414:I72L27 417:T93I03V03 419:H96R03 422:T36E30A27K03Q03
423:V93I06 425:T63P30Q03S03 426:N66D33 428:H69D24E03L03 429:E60V30D09 430:F60Y39
431:D66N30R03 433:L57M21Q12Y06T03 436:D81E18 437:P96A03 438:T48E27A09S09H03K03
439:N93H03R03 440:T42S30K12Q09A03I03 441:K48E24Q21A03D03 442:G48S45D06 443:R72L12Q09H06
444:S84T09A03P03 445:S93P06 446:H93Y06 447:A75G21S03 449:I87V12 453:S81A18 462:K81N18
465:M72L27 466:A96V03 467:E96Q03 468:L72M27 469:R96K03 471:V96A03 472:V96L03 477:L69R27A03

478:R93K06 480:R90H03K03Q03 481:L90V06I03 482:T87L06S06 483:P90L06S03 484:G93D03K03
485:P54G18-06S06A03N03R03T03V03 486:S60P18V09C03E03F03T03 487:G54E27S09K06A03
488:K30V27G18R15E03P03T03 489:V78-21 492:L93K06 493:P93Y06 494:Q90D03E03T03 495:L96V03
496:V87I12 497:L96M03 498:R93G03K03 503:L96M03 504:W90I03Q03R03 505:L96M03 506:Q90H03R03T03
507:L72V21F03I03 508:E96Q03 509:P69D15T12E03 510:L87V09I03 511:N66D15T12E03K03
512:P27Q27E24T12K03M03S03 513:P42S21E15-12H03Q03T03 514:Q24-21S18E12N12T09C03 515:-
39L24F15S12D06E03

Table 4. Variable residues $X_1 - X_n$, and amino acid variation at each residue, of engineered ancestral CYP4ABXZ sequences corresponding to nodes (i) – (iv). For each of the ancestral sequences corresponding to nodes (i) – (iv), variable residues $X_1 - X_n$ are given in sequential order. For example, for (i) N2, 411 variable residues are given: $X_1 - X_{411}$. For each variable residue, the format of the data is as follows: [amino acid position]:[first amino acid variant][percent frequency of first amino acid variant]...[last amino acid variant][percent frequency of last amino acid variant]. Position is given relative to the corresponding A0 CYP4ABXZ sequence, as described herein. Frequency is relative to all sequences used to construct the A0 CYP4ABXZ sequence. Note that ‘-’ represents a ‘gap’ or amino acid deletion. For example, X_8 of (i) is given as 8:A52V22L20F01, which sets forth that:

the amino acid position of the variant relative CYP4ABXZ_N2_A0 is ‘8’;

the first amino acid variant is a ‘A’;

the frequency of the first amino acid variant relative to all sequences used to construct CYP4ABXZ_N2_A0 is 52%;

the second amino acid variant is ‘V’;

the frequency of the second amino acid variant is 22%;

the third amino acid variant is ‘L’;

the frequency of the third amino acid is 20%;

the last amino acid variant is ‘F’;

the frequency of the last amino acid variant is 1%

Only amino acid variants with frequency of 1% of greater are listed. Where the combined frequency of all listed amino acid variants is less than 100%, this is due to the presence of one or more additional variants with frequency of less than 1%.

(i) N2

1:L81V12-01F01I01M01 2:V25A21L20I17T09F02S01-01 3:L68F13C05A04I02V02-01Y01
 4:L35V33G25A02I01 5:L77F12V06I01A01 6:L74F12I06Y03M01 7:K77Q21 8:A52V22L20F01
 9:A34I33V13T08L08S01 10:Q55K19R11S03H02V01C01F01 11:L73F24I01 12:Y72L20F03C01H01
 13:L66Q09R05W05H04A03I02V01 14:R49H24E11K08Q03T01 15:R96K02 16:Q68K19R08H02L01
 17:W30K27R23E05M04A02Q01S01T01 18:L94V02I01 19:L64A14I14V01F01M01 20:K52R45
 21:A70D17T03S02V02I01 22:L65M14F08V08T02 23:Q31E23D16R16H04A02S01C01K01
 24:Q28S20A18P11N04L03D03C02E02K02H01R01 26:P98S01 27:G52S22A12C10T01 28:P91H04T02A01
 29:P97S01 30:T34S30K13A11F02P02R01G01I01 31:H98N01 33:L79F20 34:F48Y38L05H04W01T01
 36:H95N04 37:Q17N16A16V12K11S10I07-01H01F01Y01 38:H22K22L19R13Q12-01E01W01N01D01
 39:E52L20F10Q09K04-01M01 40:F35I32L21V04Y02M01 41:Q59T09K09R05L04P04H01G01S01Y01
 42:Q28K22E12D10T08S03R02N02A02G01V01L01P01I01 43:D42G19E17T13K02N01 44:Q23E19G17K14-
 09T06N04S02D01 45:E43S14K10D09I06V06G02M02N02F01 46:L78M15F04I01
 47:Q29D25E21N11P02H02S01 48:K47Q28R07L03P02E02D02T01V01N01
 49:L28I28V22M07F04T03A02Y01 50:V31L29E19Q06M03D02N01A01R01
 51:S34K32E18T06I02L01A01V01 52:W69L09R08I07F02C01 53:V43A31G15T03I02S02M01

54:E66H12Q08K07N02D01 55:K48Q19E17T06N04S01 56:Y57F41 57:P94L01S01Q01
58:Y39C25S23R04H02K01 59:A97C01G01 60:F48C26H19S02V01 61:P89A02Q02S01L01T01V01
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 450:T62C33I02 452:L82K11N02Q02 453:R88H05K04 454:F86Y13 455:E87Q06K02H01V01 456:L64F33
 457:S42C17A12I10L06Y02F02R02H01 458:P61L22E07V03Q02 459:D93N04E02 460:P92L04H01
 461:S54A15T13L08D05N01 462:K42R30Q10N05L04T02H02 463:P61L20K07I04T04V01
 465:I55T15K14L03C03A01V01 466:K43L23P15M10I05 467:I58M20L08V04T03Q02
 468:P82L05A04T04Q02 469:Q79R19 470:L61I33V03 471:V59I38T01 473:R87K11 475:K51S26L11R04Q02
 476:N93T03S02 478:I95F02V02 479:H96Y02 480:L83I11V04 481:H62K13Y09R05F03N02L01 482:L86I12
 483:K92R05 484:K53P33S07R03L01 485:L46I34V15A02 486:G23H20R14Q07E06D05P05C04F02-
 02S02N01T01

(iii) N122

2:L54V27A09F07I01 4:L94V04 5:L97I01V01 6:L50F32I12V01 7:K98Q01 8:A85V09T01G01 9:A74V21I02
 10:Q98H01 11:L63F33H01 12:Y98F01 13:L93Q02I01V01 14:H67R21K03C02Q01 16:Q97R01
 17:W89R08C01 19:L97F01V01 20:K83R15 21:A83T07V04D02 22:L57V20F15T05 23:Q90H07E01
 24:Q79E06H04K04S02L01N01 27:S66C25G05 28:P87T08A03S01 30:S85F08A03T01 33:L74F25
 34:F63Y25L05W04 36:H96D01N01 37:K32S30I09N05-05H04F02M02Y02V01Q01 38:R40Q26K12L08-
 04W03H01 39:E65Q19K11-03 40:F67L10I08V07Y02H01 41:Q77P07G03K02L02S01R01
 42:K47Q14E12G03N03I03P02R02V02D01M01S01T01 43:D69E18G07N03K01
 44:Q67S08E06K05N04G01T01D01 45:E96D02G01 46:L98I01 47:Q82P08E03R01H01
 48:Q47R11P08E07K07D05L05H02V02 49:I51L29V07T05F02M02 50:L74Q13R05M03A01V01
 51:K72T16S05E03 52:W65R27C04L01 53:V76A16I03T01M01 54:E83K13Q01 55:K64N12E09T09
 56:F76Y22 58:S64C25R04K03T01 59:A97G01 60:C76F16S04Y02 61:P78A07L05S04V03
 62:R69H12Q10L03Y02 64:L69F23M03I01V01 65:W83S09G03R01 66:G98P01 67:S56T26G07F04N04
 68:K67R14E03M03N03S02C01 69:V45A41L06P01T01I01 70:R28H23L10F09S07T05Y05Q03M01E01I01
 71:L40V40F12I05 72:L38Q21M13I10V07T03S03N01 73:V54L22I21 74:Y98H01 77:D96E03
 79:M83I07V04A01L01 81:V80M09L06T01A01 82:I80V18 84:G93S03A01 85:R97K02 86:S92R04P01
 87:D98E01 90:A49S39P05D01N01V01 91:H57N10S09D04P03R03Q03I01K01
 92:G64D10S06V05R04A02I01E01K01 93:S48T21I12V05A05F01L01N01P01 94:Y94H03S01
 95:R78K12S02G01Q01T01 96:F69L26Y03 97:L83V06M05F01I01 98:A69I08S08T05V03K01N01 99:P96S02
 101:I97L01 103:Y80T07K05C02N02 107:L92V05M01 109:N84E10D03 111:Q74K07P07E06S03
 112:T63K16P14M02A01E01 115:Q94E04 116:H97R02 119:M93L05 123:A98G01 126:Y93F02S02H01
 127:D94G01N01S01 131:P94A03S01 133:V97L01 134:G60A12R12E07K05N01 135:L51I29T07V07F01N01
 136:M93V03I01T01 137:A90V07D01 138:D84N13K01 140:V93I03A01 141:R63Q21N07H03K01
 142:V82I05L05T03A01G01 145:D96N01 146:K94R05 147:W96L02 148:E96Q01

149:E41Q38K14R01D01N01 150:L90I05F01 151:I40V26L13A07D05S05T01
152:S47G33T06D04R03A01N01 153:Q91E02L01H01K01 154:D80N14G01Q01S01
155:S83H03N02P02T02A01 156:P39H25S25T05 157:L86V07I04 158:E96D03 159:I85V14
160:F90L04S01V01 161:Q52E21G19H04R01 162:H83P05Y05D03S01 163:V67I31 164:S98T01
165:L94S03M02 169:D96E03 170:T83S16 171:I85V09L05 178:H70Y27Q01 179:Q85K06E05H01
180:G87S10D01T01 181:S78N15C04 182:V60I16H07A05C05T01 184:L41T25V12A08M06F03S01
185:D94E01N01G01 186:R74G11E06S03K02 187:N71S08K07D04H01I01 188:S85Y10I01
189:Q70R10H07K05N04 190:S87P03T03A02 192:I85T07L06V01 193:Q85K12H01 195:I74V23T01
196:G29R21E19S10D02H02I01K01Q01W01Y01M01T01 197:D89N05E04 198:L92M03I01V01
199:N67S14K12T02G01A01 200:N70H07Y06D05S04K03T01 201:L96M01R01
202:F34V31T12I09L05A02M01S01 203:F77Y05H04V04S03L01I01 204:S74F10A03H03Y02C01T01
206:V58L17I14M05A03 207:R94K02 208:N89S09T01 209:V41A36I12F03L01M01 210:F94L05
211:H56Y39L02Q01 212:Q85H08K03E01 213:N81S09K05D01 214:D91N08 215:T50I32L09F04H01
216:I90L03V03F02 218:R37S33G10N09W05K03 219:L87M06F05 220:T53S45 221:S48P44T04R01
222:E44N26A12D08Q03S01T01 224:R89H06Q02 225:W42L25R18Q07K04S01 226:N28T20F18A17S13C01
227:H56N13K12R05Y03Q02I01S01L01 228:R67Q11H07S05K04Y02 229:A96N01 230:C88Y04A02S02
231:Q83K07R04E01H01 232:L78I14V03R01 233:A96I01T01V01 235:Q47E40D10 236:H94Y05 238:D98E01
239:Q41R36A09G09K02E01 242:K60Q29R10 243:L52Q20E10M06S05R01K01 245:K97R01
246:A81S05D05Q02E01 247:Q67H27S01R01 249:Q90K05E01R01 250:D32K29E19N09Q07-01
251:E92Q03A01 252:G82E07R05K01N01 253:E94D01G01 254:L92M05Q01 256:K93N03A01T01
257:V68I28A01L01 258:R55K36S04Q03 259:K41R34S12Q04G02N02 260:K91R07 262:H68R29C01
268:I94V05 271:F76L16C05R01 272:A95S03 273:K51R45Q02 274:M85T07S01R01V01 275:E96K01
276:N81D14S01 277:G98E01 278:S70N12D09K03E01R01 279:S81I08G05R01N01 280:L95F03 281:S97T01
282:D92N05Y01 283:K65E18T06Q05A01V01 284:D96E03 285:L97I01 295:E94A03G01 302:S98T01
303:G98A01 304:I92V06L01 305:S98C01 307:I87L04T04V03 308:L66F33 309:Y97H02 310:A96C01
311:L98M01 313:T62S20A09M06 314:H94N05 315:P98S01 316:E74K22D01 317:H98Y01
319:Q84E07H06K01 320:R84K14 323:E96K02 325:I56V40L03 326:Q84H07R05L01 327:S76G20N01
328:L88I08V03 330:G96A02 331:D96N01 332:G95E03 333:A66T18S09D02G01 334:S95P03A01
335:I92V05L02 336:T93S05 338:D68E16N10H01G01 339:H96D01L01 340:L98M01 341:D92G05N01
342:Q90K07 343:M96I01L01 344:P98S01 346:T98M01 353:A93S05 354:L89M10 356:L93I05 360:V94I05
362:G39S33A10V09N02R01T01 363:V49I49 364:G46S40V09A01 366:E83D09Q03K01M01 367:L97M01
368:S87N08K02 369:K61T29S05E03 370:P95S01T01 371:V49I49 372:T96I02 374:P98S01 377:R97K01
378:S96I01 380:P98T01 381:K74A20E01R01 382:G98D01 383:I76F09V06T03N01M01
384:I32T23S12L11M09P03Q02H01V01 385:V87L06I05 386:S45T23L12V06A04M03F01I01 387:L92I05
388:S90N05H01 389:I63F35L01 390:Y98H01 391:G53A40T05 394:H98Y01 396:P98S01
397:K66R09N07T07D02Q01S01E01 398:V92F05L02 400:P96E02 403:E92K04Q02 404:V94E04 405:F95Y04
406:D98N01 408:S76F13L05T03 411:A91S07T01 412:P93L01V01A01 413:G51D32E09A01S01 414:N52-47
415:L49-47S01 416:S85A07T04V01 417:A41S25T18P05D03L01R01N01 418:R74Q23Y01 421:H97Y01
422:A72S27 423:F97Y02 424:L98M01 428:G89A10 430:S67A25P05 436:K93Q06 437:Q94H03K01
441:N92S02I01K01 443:L63M34I01 446:A90V05I01 447:V87T07L04 450:T96I03 452:L98V01 453:R97L01

455:E98K01 457:L59A29S07K01E01 460:P94S01T01A01 461:T58S30F05M02 462:R90K08Q01
 463:V49I42P05T01 465:I44V35L08F03D01N01Q01T01 466:P92L05
 467:I45M14T13V09L05S05W01F01K01 468:P56A26S05L03Q03 469:R73K08Q06V04E01G01N01T01
 470:I47L37V08M03A01S01 471:V95T01L01 473:K78R11M07E01N01 475:K83E07S03T02N01Q01
 476:N94D02E01 479:H84Y13 480:L98V01 481:H49R27Q09Y05K03C01W01 482:L97M01 483:R69K29
 484:K85R12 485:L92I05 486:H25P22Q16L13S07K05R05-01

(iv) N198

1:L93M04 2:A80S07L05T05 4:G57V19L18A02 6:L88I04M04F01 7:Q92K07 8:A79V17 9:I86V10A01
 10:K86Q06R06 12:Y94F02H01 13:L91Q07 14:R84Q08H04K01 16:Q85R08L04 17:R84W05Q04G02
 19:L93I03Q02 20:R93K05 21:D79A16E01V01 23:R75C07H07Q06 24:P53L16C09A05Q04R03H01
 27:A58G23T07C04S04 29:P94S05 30:T57A27P06S04 33:F54L44 34:Y50H22F10L10T04 36:H97N02
 37:Q80K05I04N01S01V01 38:K82Q06E05R04 39:F51L35E09V01 40:L60F22I07Y07
 41:Q77P07R05K03Y02 42:D48E34Q07L02V02N01 43:D53G28K07E06N01 44:E49-43Q04K02
 45:K49E34N08D05 46:M70F14L10I02 47:E87Q09K01 48:K78R04Q03I02S02N01T01V01 49:L75F10I06Y06
 50:E69D10N06Q04G01H01L01 51:E86K09V01 52:L40I37F09W06T03V01 53:V86I07M04
 54:E84K10A01G01 55:K91T04N01 56:Y95F04 58:C80R11S05 59:A97G02 60:F87V05C04
 62:C50R17L14H05A04F04 64:V63I28L04F01 65:G95W04 66:P91G04A02 67:F95G04
 68:Q78T05E04K04M02 69:A76V16M06 70:F88L04R04 71:F81L13V04 72:Y60F16Q09I06N04
 73:I90L04V03 74:Y93H03C02 77:D89E09 79:A92M04V01 80:K93Q04 81:T65I18V07M05A01
 82:F75L15I06V01 84:S67N19G10K01 86:T80K06R05S05 88:P94L02S01 90:S79T15I02
 91:Q60K17T08H07N02R01 92:Y60F16I06G04L03V02C01H01 93:L52P21S13V06G02
 94:Y56H18N10Q05C03S02 95:K67R23Q07 96:F90I06L01 97:L59M29I05T01
 98:T38I28S11A05E05V03M02P01 99:P84S12A01 100:C59W18L10S04T01 101:I46L40V09T01
 103:K62R12Q10E06Y04 106:L59V37 107:N54S24T07A04L04V01 109:D72N11E08H04S01
 111:P78S06I04Q04K02 112:K77R13T06 114:F83S07Q03Y02K01 115:Q96K01 118:R62H15C11Q07
 119:L87I06M05 120:L84V08I05 121:T89K07M01 123:G74A23V01 124:F92L06 125:H67N20S05Q04
 126:F49C12L11I06V06Y04H02S01 127:N62D24S12 128:I84T12 130:K97T01 131:T30S28P26I06A05L01
 132:Y76F10C06H05 133:V70I17T05A04 134:E59D07T07G05A04K04S04H02 135:V72M12L08A01I01
 136:M98I01 137:A71V10S05N03T03I02 138:H62Q15D10E06C01 141:N72R14K06C02
 142:T65V17I08M03R02 145:D67G22A04N03 146:K97T01 149:K86E10R01 150:I66L18M10H01V01
 151:C62L15I09W04S02R01 152:S36G35I10T09A05 153:T62Q18S08A07P01 154:D67E14H10N06
 155:T72S17P05A02 156:T42V10S08I07L07A06H05P05 157:V70L26I02 158:E92D07 159:V81I14L02
 160:F59Y28S03C02 161:E87Q06K02 162:H87D08P02 163:I91V08 164:N54S32D06R03 165:L98M01
 167:T56A32S10 170:I67S11T11V07 171:I54L45 172:M86L12 173:K92Q05 175:A85I07T05
 177:S78T09G08N02 178:Q63H13K08W05R03V02 179:E80Q16K01 180:T87G11 181:N83S14D01
 182:C84I10S02 184:I68T23V04L01 185:N67D19S09E02 186:S65G27R06 187:T74S10N08F02
 188:H44Y17S12N09L07C01F01 189:D79E06Q04N02T01 190:P50S15L14Y06N04H03
 192:V62L15I12E02M02T01 193:K84E05Q04S02N01 194:A86T07G04 195:T47M19I15V13L02
 196:F62S17C04L04T04V01Y01 197:E78D09N07K02 198:L64A15G10V02M01S01 199:S57G24N10A01D01
 200:K66E12N11R04Y01 201:I80L17 202:I63V14L07T07S02 203:F77S09Y06I02M02

204:Y51H16S12Q11N03 205:R93H04 206:L65M15V13F01 207:Y74R06F05N05H04 208:N53S44
209:F83Y07A04 210:L69W19F10 211:H68Y19D04N01 212:H94Q04 213:H58N22S06Y06C01
215:I62L24T05V02M01 217:F87Y12 218:K76N12S04R02W01 219:F73L22W02 220:S93T06 221:P80S19
222:Q41E19K18L06A05M04N01 223:G91K04S02 224:H69R12Q11Y05 225:R71C06I05H04W04E02L01
226:F63L29T04 227:Q77R07S05H04 228:E60K31R04A02 229:L57I15M07A06F05V02
230:S49N15C10V08G06I03R02 231:Q50K40N04E01R01 232:V62I23L06N03M01 233:L81A09I05T01
234:H87Q03Y03N02R01 235:Q93H03 236:Y75H15C05F01 237:T92A04I01 238:E72D26
239:K79Q11T04N02 240:I57V39L01 241:I82V14L02 242:Q88K05R03 243:D77E13L04N03 245:K83R14
246:K71E09N08A04D01 247:S66A08L07F06Q04 248:L95I02 249:K70Q22E01R01
250:D50A21N11K04S02T02E01 251:E58G32D03 252:K24M19R16V13L06G04N04S02T01
253:K76E17N02R01 254:Q81H11L04 255:D66G16E07A02T02 256:N56K16T12D07S02 257:T82I11A01V01
258:Q84K04G03R02D01 259:K83R05N04-03E01 260:R63K18-11Q04 261:K75R15E02N02T02
262:Y80H08S04F03C01 263:Q79L09R08 264:D98N01 265:F93L05 268:I92V05 269:V52L28I16
271:S82C04G04L04A01 272:A97V02 273:Q75K22R01 274:A68S12D10M04 276:N78H06D05S05I01
277:G59E24R04-02D02A01S01 278:D52N13S10E07K07R03G02 279:S70I07D06G06A04 280:F89L10
281:S92T04P02 282:D89E07N01 283:T47A36E06K04I01 284:D95E04 285:L84V13I01
286:R34Q28W14H07E03L03Y02M01 287:S72A27 289:V95M02 290:N72S12K07D06 291:T96M03
293:M73I11L09V04 294:L60F20V08W08 295:A86E06G03 297:H90Q08 298:D91E02S02N01
299:T72A15S11 300:T48S18V14M13L04 301:A82S10G03 302:A39G37S19V01 303:S50G39A09 304:I69L30
305:S95A02T01 307:L79I16V02 308:L95F04 309:Y97H02 310:C66H18A04F03Y03 311:L90M09
313:L69Q09K06M06T04 314:N72H13Y12 316:E93K04 319:E61Q25D08H03 320:R89K07Q02
323:E85D07T06 325:I92V06 326:R89H04K02M02 327:G42S35D08A06E05 328:I79L11T06V01 330:G94K02
331:D87E04N03S01 333:S83D07A05P01 334:S94T02A01 335:I96T01 336:T79I08H04S03N01
338:D84E09N05 339:Q60H38 341:G51D28S14N01 342:E79Q18 343:M97L02 344:S71P19T05
346:T95S02I01 347:T97E01 351:K94S02Q01 353:S35A22T20M13C06 354:L72F25C01 356:L95I01M01
357:I50A22Y21C02 358:P98S01 359:P86T07A05 360:V67I19A08E01 361:P80V04F03I03L02
362:S85G04T04N01 363:I93L03V02 364:S88A06G04 366:E78Q07D05L05 368:S90N06D01
369:K89T04Q03E01 371:I52L40V05 373:F91L08 377:R74H14C09 378:S91T05 381:A90K04T04
383:M55I37V03T02 384:T68N18I05M04 385:V97L01 386:V80F06L06T03 387:L98I01 388:S80N19
390:W92Y06 391:G86A13 397:A78T11K04D01Y01 398:V56I40F01 400:E56K31N05P04 401:N72D12S11
403:K68Q21E09 404:V98I01 406:D90N09 408:L87F05S02Q01 411:S76T18A04 412:Q40K29P24R02L01
413:E89D04G04 414:N94-04 415:S83-07Y02Q01 416:D76N06E04S04M02T01 417:Q70K21A04R02
418:R93Q04I01 420:P68S29 421:H57Y35C06 422:A76S23 423:F87Y12 424:L93I06 425:P93T03A02
428:A79S10G05T03 430:P79S19 432:N87D10S01 436:Q93K04E01 437:Q66H25N06 438:F94L03
440:M92I07 441:I41V22L21A04N04T03 442:E86Q11 443:L82C07I05M02 445:V97M01 446:A87I04T03G02
447:I60V17L11T05M03 449:L95M04 450:I81T16 453:R73H24 455:K41E30R17Q10 456:V69L19M05I04
457:T52A22S10L05R02V02 458:P86V05L02A01S01 459:D92E04A02 460:P70L19H05S02
461:T84S07E02P02 462:R85K11T02 463:P94I04 464:P54L41V02 465:I31V24A21T12S03Q02L01
466:F59L18P16I02 467:S49L18I13V10M06 468:P42N28S10R07A04H04 469:H42Q41R07K05
470:I55V18L08F05T05M02 471:V68I16F06L05A01 472:L92I04 473:K87R10 474:P63S30A05 475:K95Q03

476:N71H13D09K04 478:I57V20M12L08 479:H73Y26 480:L93V06 481:H55C12R07F06Y06S04
 482:L97V02 483:K89R05E03 484:K91R04P02 485:L77I19V01 486:P59S23H07C05T02

Table 5. Thermostability of extant and engineered ancestral P450s. Data presented represents the mean $^{10}T_{50}$ and $^{60}T_{50} \pm$ standard deviation of independent experiments on three to four biological replicates. Ancestral forms are shown in bold for clarity.

P450	$^{10}T_{50}^a$	$^{60}T_{50}^a$
CYP2a5	44.0 $\pm$ 1.0	37.0 $\pm$ 1.9
CYP2A6	44.0 $\pm$ 1.5	42.0 $\pm$ 1.2
CYP2A13	40.6 $\pm$ 0.3	38.0 $\pm$ 1.8
CYP2_N312 (CYP2A)^b	52.7 $\pm$ 0.9	45.0 $\pm$ 0.6
CYP2B1	54.1 $\pm$ 0.2	47.8 $\pm$ 2.0
CYP2B6	44.9 $\pm$ 1.1	42.0 $\pm$ 1.0
CYP2_N157 (CYP2B)	56.1 $\pm$ 2.2	53.7 $\pm$ 1.4
CYP2C8	43.2 $\pm$ 1.0	40.0 $\pm$ 3.1
CYP2C9	45.3 $\pm$ 0.4	39.2 $\pm$ 1.5
CYP2C11	44.3 $\pm$ 0.4	40.5 $\pm$ 1.5
CYP2C19	54.1 $\pm$ 0.4	44.1 $\pm$ 1.2
CYP2_N133 (CYP2C)	52.3 $\pm$ 0.8	49.5 $\pm$ 0.9
CYP2E1	45.3 $\pm$ 1.1	43.9 $\pm$ 0.2
CYP2_N170 (CYP2E)	48.5 $\pm$ 0.8	46.9 $\pm$ 0.6
CYP2F3	45.0 $\pm$ 1.5	41.5 $\pm$ 0.5
CYP2_N77 (CYP2F)	48.1 $\pm$ 0.6	43.5 $\pm$ 0.8
CYP2S1	52.9 $\pm$ 0.7	48.8 $\pm$ 2.0
CYP2_N196 (CYP2S)	55.6 $\pm$ 0.5	49.2 $\pm$ 0.4
CYP2_N117 (CYP2BS)	58.0 $\pm$ 1.5	55.0 $\pm$ 0.7
CYP2_N82 (CYP2ABGS)	56.9 $\pm$ 1.3	54.1 $\pm$ 1.8
CYP2_N69 (CYP2CE)	54.5 $\pm$ 1.9	50.7 $\pm$ 1.7
CYP2_N23 (CYP2CEH)	55.0 $\pm$ 3.3	53.5 $\pm$ 1.2
CYP2_N24 (CYP2ABGSFT)	68.0 $\pm$ 1.5	62.9 $\pm$ 1.5
CYP2_N13 (CYP2ABGSFTCEH)	67.3 $\pm$ 1.9	64.7 $\pm$ 1.9

Table 6. Dissociation constants (Kd) for binding of selected CYP2B substrates by ancestors of the CYP2B subfamily.

	CYP2_N157 (CYP2B)	CYP2_N117 (CYP2BS)	CYP2_N82 (CYP2ABGS)	CYP2_N24 (CYP2ABGSFT)	CYP2_N13 (CYP2ABGSFTCEH)
Clopidogrel	0.088	0.036	1.0	1.3	0.96
Ticlopidine	3.6	6.4	16.6	22.3	Weak binding
Ritonavir	3.6	1.8	7.3	15.3	1.7

Table 7. Expression levels (nmol/L) of CYP2 engineered ancestral enzymes cultured in 50 ml baffled flasks.

P450	nmol/L
CYP2_N312 (CYP2A)	320 ± 30
CYP2_N157 (CYP2B)	420 ± 20
CYP2_N133 (CYP2C)	300 ± 50
CYP2_N170 (CYP2E)	210 ± 40
CYP2_N77 (CYP2F)	400 ± 10
CYP2_N196 (CYP2S)	430 ± 20
CYP2_N117 (CYP2BS)	560 ± 10
CYP2_N82 (CYP2ABGS)	550 ± 60
CYP2_N69 (CYP2CE)	600 ± 50
CYP2_N23 (CYP2CEH)	500 ± 30
CYP2_N24 (CYP2ABGSFT)	200 ± 60
CYP2_N13 (CYP2ABGSFTCEH)	170 ± 40

Table 8. Identified ligands of selected CYP2 engineered ancestral enzymes.

P450	Type 1 Ligands	Type 2 Ligands
CYP2_N312 (CYP2A)	Celecoxib, chlorzoxazone, clopidogrel, ethinylestradiol	Donepezil, tacrine
CYP2_N133 (CYP2C)	Celecoxib, ethinylestradiol	Fluoxetine, rosiglitazone, tacrine, midazolam
CYP2_N77 (CYP2F)		Tacrine, rosiglitazone, ritonavir, pioglitazone, nevirapine, verapamil
CYP2_N69 (CYP2CE)	Atorvastatin, celecoxib, clopidogrel, ticlopidine	Ritonavir, tacrine
CYP2_N23 (CYP2CEH)		Celecoxib, donepezil, midazolam, ritonavir, tacrine

Table 9. Metabolite (M) peaks identified from chromatograms following incubations of CYP2 engineered ancestral enzymes with testosterone.

P450	Metabolites (identified according to HPLC retention time)
CYP2_N23 (CYP2CEH)	M 4.5, M 5.5, M 7.25, M 9.5, M 10.25, M 11.0, M 11.5, M 11.75
CYP2_N82 (CYP2ABGS)	M 4.5, M 6.0, M 10.25, M 11.0, M 11.5
CYP2_N24 (CYP2ABGSFT)	M 4.5, M 6.0, M 9.5, M 10.25, M 11.0, M 11.5, M11.75
CYP2_N13 (CYP2ABGSFTCEH)	M 6.0, M 6.75, M 9.5, M 11.0, M 11.5, M 11.75

Table 10. Identified substrates of selected CYP2 engineered ancestral enzymes.

P450	Substrates
CYP2_N69 (CYP2CE)	Aminopyrine, amlodipine, amodiaquine, atorvastatin, carbamazepine, celecoxib, Clopidogrel, clozapine, dextromethorphan, diclofenac, Diltiazem, donepezil, imipramine, levofloxacin, metoprolol,
CYP2_N117 (CYP2BS)	Aminopyrine, amlodipine, amodiaquine, atorvastatin, Clopidogrel, clozapine, dextromethorphan, diclofenac, Diltiazem, donepezil, levofloxacin, metoprolol,
CYP2_N82 (CYP2ABGS)	Aminopyrine, amlodipine, amodiaquine, atorvastatin, Clopidogrel, clozapine, dextromethorphan, Clopidogrel, clozapine, dextromethorphan, Diltiazem, donepezil, levofloxacin, metoprolol, omeprazole

Table 11. Expression levels (nmol/L) of engineered ancestral CYP1 proteins and selected extant CYP1 proteins cultured in 1 mL microplate cultures.

P450	nmol/L
Human CYP1A1	<50
CYP1_N98	230 +/- 70
Human CYP1A2	74 +/- 12
CYP1_N127	8 +/-16
Turkey CYP1A5	90 +/-14
Human CYP1B1	134 +/- 22
CYP1_N17	205 +/-15
CYP1_N18	450 +/- 120

Table 12. Relationship between CYP1 A2 sequences, and CYP1 A0 and A1 sequences.

Node	Ancestor grouping
N9	1ADBC
N13	1AD
N18	1D
N14	1BC
N27	1B Actinopterygii
N20	1B
N207	-
N72	-
N98	1B Mammal
N25	1C Actinopterygii
N58	1D Mammalia
N53	-
N52	1A Actinopterygii
N17	1A
N21	1A Mammalia & 1A Reptile & 1A Amphibia
N134	-
N223	1A5 Aves
N224	1A4 Aves
N29	
N46	
N45	
N128	1A1 Mammalia
N127	1A2 Mammalia

Table 13. Relationship between CYP2 A2 sequences, and CYP1 A0 and A1 sequences.

A0/A1	A2
N3	-
N8	-
N13	-
N24	-
N38	-
N54	-
N81	-
N82	2BSAG
N118	2AG
N159	-
N200	-
N312	2A_Mammal
N117	2BS
N157	2B_Mammal
N196	2S_Mammal
N37	2FT
N77	2F_Mammal
N112	-
N23	-
N35	-
N47	2CEH
N69	2CE_Mammal & 2C_Reptile & 2C_Aves
N70	2H
N140	-
N98	-
N218	2C_Aves
N133	2C1_Mammal
N134	-
N169	2C2_Mammal
N170	2E_Mammal
N97	2CE_Mammal

REFERENCES

1. Yip, S.S.M. & Coulombe, R.A. Molecular cloning and expression of a novel cytochrome P450 from turkey liver with aflatoxin B₁ oxidizing activity. *Chem. Res. Toxicol.* **19**, 30-37 (2006).
2. Kinobe, R.T., Parkinson, O.T., Mitchell, D.J. & Gillam, E.M. P450 2C18 catalyzes the metabolic bioactivation of phenytoin. *Chem. Res. Toxicol.* **18**, 1868-1875 (2005).
3. Shukla, A. in School of Chemistry and Molecular Biosciences, Vol. Ph.D. (The University of Queensland, 2006).
4. Behrendorff, J.B.Y.H. in School of Chemistry and Molecular Biosciences, Vol. Ph.D. (The University of Queensland, 2011).
5. Gillam, E.M.J., Guo, Z. & Guengerich, F.P. Expression of modified human cytochrome P450 2E1 in *Escherichia coli*, purification, and spectral and catalytic properties. *Arch. Biochem. Biophys.* **312**, 59-66 (1994).
6. Guo, Z., Gillam, E.M.J., Ohmori, S., Tukey, R.H. & Guengerich, F.P. Expression of modified human cytochrome P450 1A1 in *Escherichia coli*: effects of 5' substitution, stabilization, purification, spectral characterization, and catalytic properties. *Arch. Biochem. Biophys.* **312**, 436-446 (1994).
7. Parikh, A., Gillam, E.M.J. & Guengerich, F.P. Drug metabolism by *Escherichia coli* expressing human cytochromes P450. *Nat. Biotech.* **15**, 784-788 (1997).
8. Shimada, T. et al. Recombinant human cytochrome P450 1B1 expression in *Escherichia coli*. *Arch. Biochem. Biophys.* **357**, 111-120 (1998).
9. Gillam, E.M.J., Notley, L.M., Cai, H.L., De Voss, J.J. & Guengerich, F.P. Oxidation of indole by cytochrome P450 enzymes. *Biochemistry* **39**, 13817-13824 (2000).
10. Soucek, P. Expression of cytochrome P450 2A6 in *Escherichia coli*: Purification, spectral and catalytic characterization, and preparation of polyclonal antibodies. *Arch. Biochem. Biophys.* **370**, 190-200 (1999).
11. Wu, Z.L., Sohl, C.D., Shimada, T. & Guengerich, F.P. Recombinant enzymes overexpressed in bacteria show broad catalytic specificity of human cytochrome P450 2W1 and limited activity of human cytochrome P450 2S1. *Mol. Pharmacol.* **69**, 2007-2014 (2006).
12. Nishihara, K., Kanemori, M., Kitagawa, M., Yanagi, H. & Yura, T. Chaperone coexpression plasmids: Differential and synergistic roles of DnaK-DnaJ-GrpE and GroEL-GroES in assisting folding of an allergen of Japanese Cedar pollen, Cryj2, in *Escherichia coli*. *Appl. Environ. Microbiol.* **64**, 1694-1699 (1998).
13. Katoh, K., Misawa, K., Kuma, K. & Miyata, T. MAFFT: a novel method for rapid multiple sequence alignment based on fast Fourier transform. *Nucl. Acids Res.* **30**, 3059-3066 (2002).
14. Jones, D.T., Taylor, W.R. & Thornton, J.M. The rapid generation of mutation data matrices from protein sequences. *Comput Appl Biosci* **8**, 275-282 (1992).
15. Tamura, K., Stecher, G., Peterson, D., Filipski, A. & Kumar, S. MEGA6: Molecular Evolutionary Genetics Analysis Version 6.0. *Mol Biol Evol* **30**, 2725-2729 (2013).
16. Gascuel, O. BIONJ: An improved version of the NJ algorithm based on a simple model of sequence data. *Mol Biol Evol* **14**, 685-695 (1997).

17. Fitch, W.M. Toward Defining Course of Evolution - Minimum Change for a Specific Tree Topology. *Syst Zool* **20**, 406-& (1971).
18. Barnes, H.J., Arlotto, M.P. & Waterman, M.R. Expression and enzymatic activity of recombinant cytochrome P450 17a-hydroxylase in *Escherichia coli*. *Proc. Natl. Acad. Sci. USA* **88**, 5597-5601 (1991).
19. Cosme, J. & Johnson, E.F. Engineering microsomal cytochrome P450 2C5 to be a soluble, monomeric enzyme. Mutations that alter aggregation, phospholipid dependence of catalysis and membrane binding. *J. Biol. Chem.* **275**, 2545-2553 (2000).
20. Muchmore, D.C., McIntosh, L.P., Russell, C.B., Anderson, D.E. & Dahlquist, F.W. Expression and N-15 labeling of proteins for proton and N-15 nuclear magnetic resonance. *Methods Enzymol.* **177**, 44-73 (1989).
21. Gibson, D.G. et al. Enzymatic assembly of DNA molecules up to several hundred kilobases. *Nat Methods* **6**, 343-345 (2009).
22. Notley, L.M., de Wolf, C.J.F., Wunsch, R.M., Lancaster, R.G. & Gillam, E.M.J. Bioactivation of tamoxifen by recombinant human cytochrome P450 enzymes. *Chem. Res. Toxicol.* **15**, 614-622 (2002).
23. Sambrook, J., Fritsch, E.F. & Maniatis, T. Molecular cloning : a laboratory manual, Edn. 2nd. (Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y.; 1989).
24. Bauer, S. & Shiloach, J. Maximal exponential growth rate and yield of *E.coli* obtainable in a bench-scale fermentor. *Biotechnol. Bioeng.* **16**, 933-941 (1974).
25. Johnston, W.A., Huang, W., Hayes, M.A., De Voss, J.J. & Gillam, E.M.J. Quantitative whole cell cytochrome P450 measurement suitable for high throughput application. *J. Biomol. Screen.* **13**, 135-141 (2008).
26. Gillam, E.M.J., Baba, T., Kim, B.-R., Ohmori, S. & Guengerich, F.P. Expression of modified human cytochrome P450 3A4 in *Escherichia coli* and purification and reconstitution of the enzyme. *Arch. Biochem. Biophys.* **305**, 123-131 (1993).
27. Hunter, D.J.B. et al. Facile production of minor metabolites for drug development using a CYP3A shuffled library. *Metab. Eng.* **13**, 682-693 (2011).
28. Isin, E.M. & Guengerich, F.P. Substrate binding to cytochromes P450. *Analytical and Bioanalytical Chemistry* **392**, 1019-1030 (2008).
29. Isin, E.M. & Guengerich, F.P. Kinetics and thermodynamics of ligand binding by cytochrome P450 3A4. *J. Biol. Chem.* **281**, 9127-9136 (2006).
30. Guengerich, F.P. in Principles and Methods of Toxicology, Edn. 3. (ed. A.W. Hayes) 1259-1313 (Raven Press, Ltd., New York; 1994).

CLAIMS

1. An isolated protein comprising the amino acid sequence set forth in any one of SEQ ID NOS:1-159, or an amino acid sequence at least 80% similar to said sequence, or a fragment or derivative thereof.
2. An isolated protein comprising the amino acid sequence set forth in any one of SEQ ID NOS:1-23, any one of SEQ ID NOS:64-94, any one of SEQ ID NOS:142-151, or any one of SEQ ID NOS:152-155, or an amino acid sequence 80% similar to any one of these, or a fragment or derivative thereof, wherein each amino acid sequence comprises residues $X_1 - X_n$, as defined with reference to Tables 1-4..
3. The isolated protein of claim 2, wherein one or more of the residues $X_1 - X_n$ is selected from the respective group of variable amino acids as set forth in:
Table 1 with respect to SEQ ID NOS:1-23;
Table 2 with respect to SEQ ID NOS:55-85;
Table 3 with respect to SEQ ID NOS:134-144; or
Table 4 with respect to SEQ ID NOS:145-148.
4. The isolated protein of claim 3, wherein each of the residues $X_1 - X_n$ is selected from the respective group of variable amino acids as set forth in:
Table 1 with respect to SEQ ID NOS:1-23;
Table 2 with respect to SEQ ID NOS:55-85;
Table 3 with respect to SEQ ID NOS:134-144; or
Table 4 with respect to SEQ ID NOS:145-148.
5. The isolated protein of any of the preceding claims, wherein said isolated protein has P450 activity.
6. A method of producing or constructing an isolated protein, said method including the step of producing or constructing an engineered ancestral amino acid sequence of at least a fragment of a P450 protein from one or more P450 proteins comprising amino acid sequences that are different to the engineered ancestral amino acid sequence, wherein the P450 protein is a CYP1, CYP2, CYP4 or CYP4F P450 protein.
7. The method of claim 6, wherein the engineered ancestral P450 protein produced according to the method displays or possesses one or more increased or enhanced properties compared to at least one of the one or more P450 proteins comprising amino acid sequences that are different to the engineered ancestral amino acid sequence.
8. The method claim 6 or claim 7, wherein the engineered ancestral protein comprises an amino acid sequence set forth in any one of SEQ ID NOS:1-159.

9. A method of producing or constructing a modified engineered ancestral P450 protein, said method including the step of introducing one or more amino acid substitutions in an amino acid sequence of the engineered ancestral P450 protein to thereby produce or construct the modified engineered ancestral P450 protein, wherein the engineered ancestral P450 protein is a CYP1, CYP2, CYP4 or CYP4F engineered ancestral protein.
10. The method of claim 9, wherein the one or more amino acid substitutions is introduced into any one of the amino acid sequences set forth in SEQ ID NOS:1-159.
11. The method of claim 10, wherein the one or more amino acid substitutions is introduced into any one of the amino acid sequences set forth in SEQ ID NOS:1-23, SEQ ID NOS:64-94, SEQ ID NOS:142-151, or SEQ ID NOS:152-155.
12. The method of claim 11, wherein the amino acid substitutions are at one or more of the residues $X_1 - X_n$, with reference to Tables 1-4.
13. The method of claim 10, wherein the one or more amino acid substitutions is introduced into any one of the amino acid sequences set forth in SEQ ID NOS:24-63, SEQ ID NOS:95-141, or SEQ ID NOS:156-159.
14. The method of claim 13, wherein the amino acid substitutions are at one or more residues corresponding to $X_1 - X_n$ of a respective sequence set forth in SEQ ID NOS:1-23, SEQ ID NOS:47-63, or SEQ ID NOS:152-155.
15. An isolated nucleic acid encoding an isolated protein, fragment or derivative of the protein according to any one of claims 1-5, or produced according to the method of any one of claims 6-14. .
16. A genetic construct comprising the isolated nucleic acid of claim 15.
17. A host cell comprising the genetic construct of claim 15.
18. An antibody or antibody fragment which binds and/or is raised against an isolated protein, fragment or derivative of any one of claims 1-5, or produced according to any one of Claims 6-14.
19. The antibody of Claim 18, which does not bind, or binds with substantially reduced affinity, an extant CYP1, CYP2, CYP4 or CYP4F P450 protein.
20. A composition for performing a chemical reaction, said composition comprising one or more isolated proteins, fragments or derivatives of any one of claims 1-5, or produced according to any one of

Claims 6-14., and one or more buffers, solvents and/or other reagents suitable for performing the chemical reaction.

21. A method of performing a chemical reaction, said method including the step of exposing one or
5 more substrate molecules to one or more isolated proteins fragment or derivative of any one of Claims 1-5, or produced according to any one of claims 6-14, or the composition of Claim 20. to thereby perform the chemical reaction.

22. A reaction product produced according to the method of claim 21.
10

23. Use of the isolated protein fragment or derivative of any one of claims 1-5, or produced according to any one of Claims 6-14, or the composition of Claim 20 for biocatalysis, preferably for structure-activity relationship analysis; pharmacological testing; bioremediation; or biosensor technology.

CYP1_A0

>N9 (SEQ ID NO:1)

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DFAGRPDFYSFQFISNGKSMAFS--NYGERWKLHRKIAQNALRTFSTGESKTSTCSCLEE
HVCAEAQELVKVLELS SKGQAFDPTRQITVAVANVICALCFGKRYDHDDKEFLNLINLN
DEFGKTAGAGSLVDFIPWLRYPSPV--SLQTFKQLNQRLNDFIQKKVKEHRRTYDPGVI
-RDITDAFIAHVQEKKTD DNGESNPALSDEHIVSTVTDIFGAGFDTISTALQWVLLYLVK
YPEIQKKIQEEIDRVIGRDLRPFEDRANLPYTEAFIHEIFRHSSFPFTIPHSTTKDTV
LNGYFIPKDTVVFVNQWSVNHDPSLWPDPAFNPERFLDENGTELNKTLDKVMIFGVGK
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>N13 (SEQ ID NO:2)

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DFAGRPDFYSFQFISNGKSMTFSTNYGESWKLHRKIAQNALRTFSTSESKTSTCSCLEE
HVCAEAQELVKVLMELSSKKGAFDPTRQITVTVANVICALCFGKRYDHDDKEFLNIINLN
DEFGKAAASGNLADFIPIILRYLPSP---SLKAFKQLNQRLNNFIQKNVKEHYRTFDKNHI
-RDITDALIAHCQDKKVDDN---NPALSDEQIVSTVNDIFGAGFDTITTALQWSLLYLVK
YPEIQKKIQEEIDEVIGRDLRPFEDRPNLPYTEAFIHEIFRHSSFPFTIPHCTTKDTV
LNGYFIPKDTCTVFNQWQVNHDPTLWKDPDAFNPERFLDENGTELNKTLTEKVMIFGMGK
RRCIGEDIARMEMFLFLTLLQQLKFNENSPGQELDLTPTYGLTMKPKPYEHLQAKPR

>N18 (SEQ ID NO:3)

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NFAGRPDFYTFSFISNGKSMTFSENYGESWKLHKKIAKNALRTFSKSEAKSSTCSCLEE
HVCAEASELVKVLMELSSKKGAFDPTGPIVTVANVICALCFGKRYDHNDKEFLNIININ
DEFMKAASGNLADFIPIFRYLPSP---SLKALKQFIQRLNNFIAKNVQEHYTTFDKNHI
-RDITDALIALCQDKKVDDN---NPALSDEQIVSTVNDIFGAGFDTITTALQWSLLYLIK
YPEIQTKIQEEIDEKIGSNRLRPFEDRPNLPYTEAFINEIFRHTSFVPFTIPHCTTKDTI
LNGYFIPKDTCTVINQYQVNHDET LWKDPDLFRPERFLDENG-ELNKSLETEKVMIFGMGK
RRCLGEDIARMEMFIFLTLLQQKLKLENSPGQELDLTPTYGLTMKPKPY-HLQAKPR

>N14 (SEQ ID NO:4)

--TMMNMD--FGVKGSQSLQEASRSSLSQALLVSLVVLVALHLCLWLQRQRLRRRRRRPP
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DFAGRPDFYSSQFVSNGKSMAFG--NYSRWKVRKIAQSTLRAFSTGNSQTKK---LFEQ
HVVAEAQELIRVFLRLSAEQYFDPARELTVAVANVICALCFGKRYSHDDAEFQALLGRN
DQFGKTVGAGSLVDVMPWLQYFPNPVRSVFQNFQQLNREFYDFIQDKVVQHRRTYDPGVI
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IDGYHIPKDTVVFVNQWSVNHDPPQKWPDPDAFDP SRF LDENG-ALNKDLTSSVMIFSVGK
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>N27 (SEQ ID NO:5)

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DFAGRPDFYTSFQFVSNGKSMAFG--NYSRWKVRKIAQSTVRAFSTGNPQTKK---VFEQ
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DQFTKTVGAGSIVDVMPWLQYFPNP IRTIFGNFKQLNREFYDFIQDKVVQHRSTIKPGTI
-RDMTDAFISALDQGLTGSN---GVSLDKEYVPSTVTDIFGASQDTLSTALQWIIILLVVR
YPDQKRLQEEVDKVVGRSRLPSIEDQPHLPYVMAFIYEAMRFSFPVPTIPHSTTTDTS
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>N20 (SEQ ID NO:6)

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DQFGKTVGAGSLVDVMPWLQYFPNPVRTVFQNFQQLNREFYDFIQDKVVQHRSTIKPGTI
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YPDIQKKLQEEIDRVVGRDRLPSIEDQPHLPYVMAFIYESMRFSFVPVTIPHSTTTDTS
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>N207 (SEQ ID NO:7)

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EQFGRAVGAGSLVDALPWLQRFPSPVRAAYRAFRDLNRDFYGFVRGKFLQHQRSLRPGAA
PRDMMDAFIRLQREQ-----PRLQLEHVPATVTDIFGASQDTLSTALQWLLIFLIR
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RRCIGEELSKMQLFLFTSILVHQCNFTANPNEDPKMDFTYGLTIKPKPF-TLNVTLR

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>N98 (SEQ ID NO:9)

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EKFGRTVGAGSLVDVLPWLQRFPNPVRTAFRDFQQLNRDFYSFVLDKFLRHRSSLRPGAA
PRDMMDAFIHTVGKEEAEGNGDSGPRLDLEYVPATVTDIFGASQDTLSTALQWLLILFTR
YPEVQARVQEELDRVVGRDRLPCMDDQPHLPYVMAFLYEAMRFSFVPVTIPHATTADTS
IMGYHIPKDTVVFVNQWSVNHDPVKWPNPEDFNPARFLDKNG-FINKDLASSVMIFSVGK
RRCIGEELSKMQLFLFISILAHQCNFRANPEDSKMDFSGLTIKPKSF-TINVTLR

>N25 (SEQ ID NO:10)

---MALMDTEFGVKGSSSIIREWSGQVQPALVASFVFLFCLEACLWVRNLRL---KRRLP
GPFAPWVVGNAQLGQMPHITFSKLAKKYGNVYQIRLGCSDIVVLNGDAAIRQALIQHST
EFAGRPNFVSFQMVSGGKSMTFT-NYSKQWKMRHKIAQSTIRAFSSANSQTKK---AFEQ
HVVAEAMELVQVFLRLSAEGQYFNPAHELTVAANVICALCFGKRYGHDDVEFRLLGRV
DKFGETVGAGSLVDVMPWLQSFPNPVRSVFQNFQKDLNKEFFAFVKDKVVQHRETYDPEVT
-RMSDAIIGVIEHGK-----DNGLTKDYVEGTVTDLIGAGQDTVSTALQWIIILLV
YPNIQTKLQEQIDKVVGRDRLPSIEDKSNLAYLDAFIYETMRFTSFVPVTIPHSTTSV
IEGLHIPKDTVVFVNQWSVNHDPQKWKDP HVFDP SRFLDENG-ALDKDLTNSVMIFSAGK
RRCIGDQIAKVEVFLFSAILLHQCFSFESNPSQDLSLDCSYGLTLKPLHY-TISAKLR

>N58 (SEQ ID NO:11)

-----ITPGEVTTSLVLVIVFISIRVLRNR-GKKHPSP
GPWSLPIIGNLLQLGEHPYLSFIEMRKKYGDVFLIKLGMVPVVVVNGMEMVKQVLLKDGE

NFAGRPNMHTFSFFANGKSLFSVNYGESWKLHKKIAINALRSFSKAEAKSSTCSCLEEE
HVCAEVSELVKIFTELSSKQGSFDPGRSITCAVANVVCALCFGKRYDHSDEEFLRIIKIN
DDFLKASSAVNPADFIPCFRYLPLR---VVNAPREFYHQLNQFIAQHVQEHYTTYDKNHL
-RDITDALISICHDKNSTGK---TPTLSDDKIISTVNDIFGAGFDTVSTCLNWSFLYLIN
YPEIQTKIQEEIDGNIGL-KPPRFEDRKNLPYTEAFINEIFRHTTFLPFTIPHCTTADTI
LNGYFIPQKTCVFINMYQVNHDETLWENPDLFRPERFLNENG-ELNKS LVEKVLIFGMGI
RKCLGEDVARNEIFIFITITLQQLKLEKCPGAQLDLTPVYGLSMKPKPY-HLQAEPR

>N53 (SEQ ID NO:12)

-RSVKMAV-----RMFLEESSFISLSDVTVVLCAFIVILLALRSRKA-RKDVNSPP
GPTPWPIIGNMLQMGDQPHLSLTKMRRKYGDVFQVKMGSLVVVLSGYDTIKQALVRQGE
SFAGRPDLTFSAVANGTSMTFSEKYGESWILHKKICKNALRTFSQTEAKNSTCSCLEEE
HICAEATEMVEVLMEQSEKEGGLDPVVPVIVSSVANVVCALCFGKRYDYNDEFLTIVHIN
NEVLRVFAAGNLADFFPVFRYLPSP---SLRKL VQFIQRMNSFMARNIEEHLTTFDKNCI
-RDITDALIALCEDRQEDSE---NAVLSNKQIVNTVIDIFGAGFDTIIAGLQWSLLYLIQ
FPDIQAKIHQEI DDKIGSSRLPRFEDRPKMPYTEAFINEVFRHTSYVPFTIPHCTTENTI
LNGYFIPKDTCVFINQYQVNHDDALWKDPDKFRPERFLDESG-QLNKDLTEKVMIFGMGK
RRCLGDGFARLEMFIFLTTLHRLRIENVPQGELDLADYGLTMKPKPY-KITVSQR

>N52 (SEQ ID NO:13)

-----MA-----LMSLPFLGPISVSESLVAMATLCIVYLLLRLLRTEIPAGLRPP
GPKPLPIIGNVLELGGANPHLSLTKMSQRYGDVFQIQIGTRPVVLSGSETVRQALIKQGD
DFAGRPDLYSFQFISNGKSLTFSTDHAGVWRARRKLAQNALRSFSTVESSTSTYSCVLEE
HICKEAEYLVKRLSGIMEANGSFDPRHIVSVANVICAMCFGRRYSHDDQELLNLVNLS
DEFGRVVASGNPADFIPILRFLPNR---TMRAFIDINNRFNTFVQKIVTEHYRTFDKNNI
-RDITDSLIEHCQDKKVDEN--ANIQISDEKIVSIVNDLFGAGFDTISTALSWSLMYLV
YPDIQKKIHQELDENVGRERTPRLSDRPSLPYVEAFI LETFRHSSFLPFTIPHCTTKDTA
LNGYFIPKDTCVFVNQWQVNHDP SLWKDP SAFSPERFLNADGTTINKTESEKVMIFGMGK
RRCIGESIGRSEVFLFLAVLLQKLEFHSLPGQELDMTPQYGLTMKHKRC-QLRASLR

>N17 (SEQ ID NO:14)

---MMNMA-----LSVLESSTISISVTEILVALAVFCIVFLVIRSFRQKIPKGLKRPP
GPRSYPIIGNVLELGGKPNHLSLTKMSQKYGDVFQIQIGTRPVVLSGLETIKQALVKQGD
DFAGRPDLYSFQFISNGKSMTFSTDYGEVWRARRKLAQNALRTFSTSESKTSTYSCLEEE
HVCKEAEYLVKKLMELMKKKGSFDPYRYIVSVANVICAMCFGKRYDHDDQELLNIVNLS
DEFGKVAASGNPADFIPILRYLPSP---TMKAFKDINKRFNSFVQKIVKEHYRTFDKNHI
-RDITDSLIEHCQDKKVDEN--ANIQLSDEKIVSIVNDLFGAGFDTITTALSWSLMYLV
YPDIQKKIQEELDEVIGRERRPRLSDRPSLPYTEAFI LEMFRHSSFLPFTIPHCTTKDTV
LNGYFIPKDTCVFVNQWQVNHDPKLWKDP SAFNPERFLNADGTTINKTESEKVMIFGMGK
RRCIGESIGRMEVFLFLTTLQQLFENSPPGQELDMTPQYGLTMKHKRCCEHLQAKPR

>N21 (SEQ ID NO:15)

---MMNMA-----LSVLGSSTISISVTEILVASAVFCIVFLVIRSFRQKIPKGLKRPP
GPRSYPIIGNVLELGGKPNHLSLTRMSQKYGDVFQIQIGTRPVVLVLSGLETIKQALVKQGD
DFAGRPDLYSFQFIGDGQSMTFSTDGSEVWRARRKLAQNALKTFSTSPSPTSSSSCLEE
HVSKEAEYLVKKFMELMKKKGSFDPYRYVVSVANVICAMCFGKRYDHDDQELLNIVNLS
DEFGEVAASGNPADFIPILQYLPSP---TMKAFKDINKRFNSFVQKIVKEHYRTFDKNHI
-RDITDSLIEHCQDKKVDEN--ANIQLSDEKIVNIVNDLFGAGFDTITTALSWSLMYLV
YPDIQKKIQEELDQVIGRERRPRLSDRQLPYTEAFI LEMFRHSSFLPFTIPHCTTKDTV
LNGYFIPKDTCVFVNQWQVNHDPKLWKDP SAFNPERFLNADGTTINKTESEKVMIFGLGK
RRCIGESIGRMEVFLFLTTLQQLFENSPPGKELDMTPQYGLTMKHKRCCEHLQAKPR

>N134 (SEQ ID NO:16)

---MMEAA-----MSLVGSQGIISVTEVLIASAVFCLIFMVIRSFRQQIPKGLKRLP
GPRGYPLIGNVLELGGKPNHLSLTRMSQKYGDVQMIRIGTRPVVLVLSGLDTIKQALVKQGE
DFMGRPDLYSFRHIADGQSLTFSTDGSEVWRARRKLAQNALKTF SVSPSPTSSSTCLEE
HVSKEADYLVTKFLQLMEEKKRFDPYRYVVSVANVICAMCFGKRYDHDDQELLSIVNLN
NEFGEVAASGNPADFIPVLQYLPSP---TMKIFKDFNKRFSFVQKIVKEHYTSFDKDH

-RDITDSLIEHCQEKKEVEN--ANIQLSKEKIVNLVNDLFGAGFDTVTTALSWSLMYLVT
YPDIOKKIQEELDQTIGRERRPRLSDRPMLPYTEAFIEMFRHSSFLPFTIPHCTTKDTV
LNGYYIPKDLFCVFNQWQVNHDEKLWKDPSTFNPERFLNADGTEVNRAESEKVMTFGLGK
RRCIGESIARWEVFLFLTTLLQQLEFSVCDGEKVDMPQYGLTMKHKRCEHFQVKQR

>N223 (SEQ ID NO:17)

--MMKAA-----MSLVGSQGIVSATEVLIAAAVFCLVFLLIQSFRQHVPKGLKSP
GPRGYPIGNVLELRKDPHLVLTRLSSQKYGDVMEVRI GTRPVLVLSGLDTIKQALVKQGE
DFMGRPDLYSFRYITDQSLTFSPDSGEVWKARRKLAQNALKTF SIAPSPTSSTCLLEE
HVSKEADYLVTKFLQLMEEEEKSFDPYRYLVVSVANVICAMCFGKRYDHNDQELLSIVNLS
EEFVDVAASGNPADFIPVLQYLPSR---AMDLFKDFNKRFIHF LQKIVKEHYETFDKNNI
-RDITDSLIEHCQEKKEVEN--TATQIPKEKIVNLVNDLFGAGFDTVTTALSWSLMYLVT
YPDIOKKIQEELDQTIGQERRPRLSDRGTLPYTEAFIEMFRHSSFLPFTIPHSTTRDTV
LNGYYIPKDRFCVFNQWQVNHDEKLWKDPLTFNPERFLNADGTEVNKVDKVMTFGLGK
RRCIGETIARWQVFLFLSTLLQQLEFSVCDGKKVDMPLYGLSMKHKRCEHFQVKQR

>N224 (SEQ ID NO:18)

-----VSATEVLIAAAVFCLVFLLIQSFRQHVPKGLKSP
GPRGYPIGNVLELRKDPHLVLTRLSSQKYGDVMEVRI GTRPVLVLSGLDTIKQALVKQGE
DFMGRPDLYHSFYISNGQSLAFSPDSGEVWKARRKLAQNALKTF SIAPSPTSSTCLLEE
HVSKEADYLVTKFLQLMEEEEKSFDPYRYLVVSVANVICAMCFGKRYDHNDQELLSIVNLN
NEFGDVAASGNPADFIPVLQYLPSR---TMDLFKDLNRRFNSFVQKIVQEHYTSFDKEHI
-RDITDSLIEHCQEKKEVEN--ANVPLSNEKIINIVNDLFGAGFDTVTTALSWSLMYLAL
YPDIOKKIQEELDQTIGQERRPRLSDRGTLPYTEAFIEMFRHSSFLPFTIPHSTTKDTV
LNGYYIPKDRFCVFNQWQVNHDEKLWKDPLTFNPERFLNADG-EVNRTESDKVMTFGLGK
RRCIGESIGRWEVFLFLSTLLQQLEFSCLD--EVDITPQYGLTMKYKKCECFQVKKR

>N29 (SEQ ID NO:19)

---MMNMA-----LSVLGSSTSISVTEILIASAVFCLVFLVIRSFRQKIPKGLKRPP
GPRGYPLIGNVLELGKNPHLSLTRMSQKYGDVMQIQIGTRPVLVLSGLETIKQALVKQGD
DFMGRPDLYSFQFIGDGQSMTFSTDSGEVWRARRKLAQNALKTF SI SPSPSSSSCLLEE
HVSKEAEYLVTKFQELMKKKGSFDPYRYVVVSVANVICAMCFGKRYDHDDQELLSIVNLS
NEFGEVAASGNPADFIPILQYLPSR---TMKAFKDLNKRFSFVQKIVKEHYRTFDKNHI
-RDITDSLIEHCQDKKVDEN--ANIQLSDEKIVNIVNDLFGAGFDTVTTALSWSLMYLVT
YPDIOKKIQEELDQVIGRERRPRLSDRPQLPYTEAFIEMFRHSSFLPFTIPHCTTKDTV
LNGYYIPKDTFCVFNQWQVNHDPKLWKDPSAFNPERFLNADGTTINKAESEKVMIFGLGK
RRCIGESIARWEVFLFLTTLLQQLEFSVSPGEKVDMPQYGLTMKHKRCEHFQVKPR

>N46 (SEQ ID NO:20)

-----MA-----LSLLGSQTIIISVTEILIASAVFCLIFMVIRSFRQQIPKGLKRLP
GPRGYPLIGNVLELGKNPHLSLTRMSQKYGDVMQIRIGTRPVLVLSGLETIKQALVKQGE
DFMGRPDLYSFQFIGDGQSLTFSTDSGEVWRARRKLAQNALKTF SI SPSP-SSSTCLLEE
HVSKEADYLVTKFQELMKKKGSFDPYRYVVVSVANVICAMCFGKRYDHDDQELLSIVNLN
NEFGEVAASGNPADFIPILQYLPSR---TMKIFKDLNKRFSFVQKIVKEHYTTFDKNHI
-RDITDSLIEHCQDKKVDEN--ANIQLSDEKIVNIVNDLFGAGFDTVTTALSWSLMYLVT
YPDIOKKIQEELDQTIGRERRPRLSDRPMLPYTEAFIEMFRHSSFLPFTIPHCTTKDTV
LNGYYIPKDTFCVFNQWQVNHDPKLWKDPSAFNPERFLNADGTEINRAESEKVMIFGLGK
RRCIGESIARWEVFLFLTTLLQQLEFSVSPGEKVDMPQYGLTMKHKRCEHFQVKPR

>N45 (SEQ ID NO:21)

----MTIA-----LSVLGFSTSISVTEILLASAI FCLVFWVIRSFQKVPKGLKSP
GPWGWP LIGNVLELGKNPHLALTRMSQKYGDVMQIQIGTTPVLVLSGLETIRQALVKQGD
DFMGRPDLYSFQLIGDGQSMTFSTDSGEVWAARRKLAQNALKTF SIASSP-SSSSCYLEE
HVSKEAEYLI SKFQELMKKKGSFDPYRYVVVSVANVICAMCFGKRYDHDDQELLSIVNLS
NEFGEVAASGNPADFIPILRYLPNP---AMKAFKDLNKKFVSFLQKMOVKEHYRTFEKNHI
-RDITDSLIEHCQDKKLDEN--ANIQLSDEKIVNVVLDLFGAGFDTVTTALSWSLMYLVT
YPEVQKKIQEELDTVIGRARRPRLSDRPQLPYTEAFILETFRHSSFLPFTIPHSTTRDTT
LNGYYIPKGRCVFNQWQVNHDPKLWEDPSAFRPERFLTADGTTINKALSEKVMIFGLGK

RKCIGETIARWEVFLFLTILLQQIEFSVPPGVKVDMTPIYGLTMKHARCEHFQVKPR

>N128 (SEQ ID NO:22)

-----FSIPISATELLLLASAI FCLVFWVVRWQPRVPKGLKSP
GPWGWPLLGHVLTTLGKNPHLALSRLSQR YGDVLQIRIGSTPVLVLSGLDTIRQALVRQGD
DFKGRPDLYSFTLISDGQSMTFNPD SGPVWAARRRLAQNALKSFSIASDPASSSSCYLEE
HVSKEAEYLISKFQELMAGVGHFDPYRYVVVS VANVICAMCFGQRYDHDDQELLSLVNLS
NEFGEVAASGNPADFIPILRYLPNP---ALDAFKDLNKKFY SFLQKMVKEHYKTFEKGHI
-RDITDSLIEHCQDKKLDEN--ANIQLSDEKIVNVVLDLFGAGFDTVTTAISWSLMYLV
NPSVQKKIQEELDTVIGRARRPRLSDRPQLPYMEAFI LETFRHSSFPFTIPHSTTRDTS
LNGFYIPKGRCVFVNQWQINHDPKLWGD PSEFRPERFLTPDG-TINKALSEKVILFGLGK
RKCIGETIARWEVFLFLAILLQQIEFSVPPGVKVDMTPIYGLTMKHARCEHFQVQMR

>N127 (SEQ ID NO:23)

-----ELLLASAI FCLVFWVVRWQPRVPKGLKSP
GPWGWPLLGHVLTTLGKNPHLALSRLSQR YGDVLQIRIGSTPVVLSGLDTIRQALVRQGD
DFKGRPDLYSFTLITDGQSMTFNPD SGPVWAARRRLAQNALKTFSIASDP-SSSSCYLEE
HVSKEAEHLISKFQELMAGVGHFDPYRHVVVS VANVISAMCFGQRYDHSNQELLSLVNNS
HEFVETASSGNPVDFFPILRYLPNP---ALQRFKDFNQRF LRF LQKTVKEHYKTFDKNNI
-QDITGALFKHSQDKSLANN---SSLIPEEKIVNLVNDIFGAGFDTVTTAISWSLMYLV
NPEVQKKIQEELDTVIGRARRPRLSDRPQLPYMEAFI LETFRHSSFPFTIPHSTTRDTT
LNGFYIPKGRCVFVNQWQINHDPKLWGD PSEFRPERFLTADG-TINKALSEKVILFGLGK
RRCIGETIARWEVFLFLAILLQQIEFSVPPGVKVDMTPIYGLTMKHARCEHFQARPR

Figure 1

CYP1_A1

>N9_A1 (SEQ ID NO:24)

MAKKTSSKKRRPPGPFPPWPVIGNLLQLGKQPHLSLTKMRKKYGDVFQIKLGSRQVVVLNGYEAIKQALVKQG
EDFAGRPDFFYSFQFISNGKSMAFSNYGERWKLHRKIAQNALRTFSTGESKTSTCSCLEEHVCAEAQELVKVL
LELSSKGQAFDPTRQITVAVANVICALCFGKRYDHHKEFLNINLNDEFGKTAGAGSLVDFIPWLRYPSPV
SLQTFKQLNQRLNDFIQKKVKEHRRTYDPGVIRIDTDAFIAHVQEKKTDDNGESNPALSDEHIVSTVTDIFGA
GFDTISTALQWVLLYLKYPEIQKKIQEEIDRVIGRDRLPRFEDRANLPYTEAFIHEIFRHSSFPFTIPHST
TKDITVLNGYFIPKDTVVFVNQWSVNHDPSLWPDPAFNPFRFLDENGTELNKTLDKVMIFGVGKRRRCIGEEL
ARMEMFLFLATLLQQCKFESSPKEELTLDSTYGLTMKPKPFEHLSVTPR

>N13_A1 (SEQ ID NO:25)

MAKKTSSKKRRPPGPRSWPIIGNLLQLGKHPHLSLTKMRKKYGDVFQIKLGTRPVVVLSGLETIKQALVKQG
EDFAGRPDFFYSFQFISNGKSMTFSTNYGESWKLHRKIAQNALRTFSTSESKTSTCSCLEEHVCAEAQELVKV
LMELSSKKGAFDPTRQITVTVANVICALCFGKRYDHHKEFLNINLNDEFGKAAAAGNLADFIPIILRYLPSP
SLKAFKQLNQRLNFIQKNVKEHYRTFDKNHIRDITDALIAHCQDKKVDNPNALSDEQIVSTVNDIFGAGFD
TITTALQWSLLYLKYPEIQKKIQEEIDEVIGRDRLPRFEDRPNLPYTEAFIHEIFRHSSFPFTIPHCTTKD
TVLNGYFIPKDTCVFVNQWQVNHDPDLWKDPDAFNPERFLDENGTELNKTLDKVMIFGMGKRRRCIGEDIARM
EMFLFLTLLQQLKFENSPGQELDLTPTYGLTMKPKPYEHLQAKPR

>N18_A1 (SEQ ID NO:26)

MAKKTSSKKRKSPGPRSWPIIGNLLQLGEHPHLSLTKMRKKYGDVFQIKLGMVPVVVLSGLETIKQALVKQG
ENFAGRPDFFYTSFISNGKSMTFSENYGESWKLHKKIAKNALRTFSKSEAKSSTCSCLEEHVCAEASELVKV
LMELSSKKGAFDPTGPIITVTVANVICALCFGKRYDHNDKEFLNININDEFMKAAGNLADFIPIFRYLPSP
SLKALKQFIQRLNFIQKNVQEHYTTFDKNHIRDITDALIALCQDKKVDNPNALSDEQIVSTVNDIFGAGFD
TITTALQWSLLYLKYPEIQTKIQEEIDEKIGSNRLPRFEDRPNLPYTEAFINEIFRHTSFVPFTIPHCTTKD
TILNGYFIPKDTCVFINQYQVNHDETLWKDPDLFRPERFLDENGELNKSLETEKVMIFGMGKRRCLGEDIARME
MFIFLTLTLLQQLKLENSPGQELDLTPTYGLTMKPKPYHLQAKPR

>N14_A1 (SEQ ID NO:27)

MAKKTSSRRRRRPPGPFPPWPVIGNAMQLGQLPHLSFSKMAKKYGDVFQIKLGSRDVVVLNGDEAIRQALVKQG
ADFAGRPDFFSSQFVSGGKSMAFGNYSERWKVHRKIAQSTLRAFSTGNSQTKKLFQHVVAEAQELIRVFLRL
SAEGQYFDPARELTAVANVICALCFGKRYSHDDAEFQALLGRNDQFGKTVGAGSLVDVMPWLQYFPNPVRSV
FQNFQQLNREFYDFIQDKVVQHRRTYDPGVIPRDMTDAFISHIEQGKTGGESGHSLSKEYVESTVTDIFGAGQ
DTISTALQWILLLLVKYPDIQKKLQEEIDRVVGRDRLPSIEDKAHLPYVEAFIYETMRSSFPVPTIPHSTTT
DTVIDGYHIPKDTVVFVNQWSVNHDPPQKWPDPDAFDP SRFLDENGALNKDLTSSVMIFSVGKRRRCIGEELSKM
QIFLFTAILLHQCTFEANPKEDLTLDCTYGLTLKPKPFTISVTLR

>N27_A1 (SEQ ID NO:28)

MAKKTSSRRNRGPPGPFPPWPVIGNAAQLGNAPHLYSRMARKYGDVFQIKLGSRTVVVLNGEAIQALVKKGA
DFAGRPDFTSFQFVSGGKSMAFGNYSRWKVHRKIAQSTVRAFSTGNPQTKKVFEQHVVAEVRELLHLFLRKS
KEEKYFQPARYLTVATANVMSAVCFGKRYSYDDAEFQAVVGRNDQFTKTVGAGSIVDVMPWLQYFPNPVRTIF
GNFKQLNREFYDFIQDKVVQHRSTIKPGTIRDMTDAFISALDQGLTGSNGVSLDKEYVPSTVTDIFGASQDTL
STALQWIILLLVRYPDIQKRLQEEVDKVVGRSRLPSIEDQPHLPYVMAFIYEAMRFSFPVPTIPHSTTTDTS
IMGYHIPKDTVIFVNQWSVNHDPPQKWPDPDAFDP SRFLDENGALNKDLTSSVLIFSLGKRRRCIGEELSKMQLF
LFTSLLVHQCFTANPNEPLTLDYTYGLTLKPKPFTISVTLR

>N20_A1 (SEQ ID NO:29)

MAKKTSSRRRRRPPGPFPPWPVIGNAAQLGNAPHLYSRMARKYGDVFQIKLGSRTVVVLNGEEAIRQALVKKG
ADFAGRPDFTSFQFVSGGKSMAFGNYSRWKVHRKIAQSTVRAFSTGNPQTKKVFEQHVVAEVRELIRLFLRK
SKEGKYFDPARNLTAVANVMSALCFGKRYSHDDAEFQALLGRNDQFGKTVGAGSLVDVMPWLQYFPNPVRTV
FQNFQQLNREFYDFIQDKVVQHRSTIKPGTIRDMTDAFISIIDQGTGSNGGHSOLDKEYVPSTVTDIFGASQD
TLSTALQWIILLLVRYPDIQKRLQEEIDRVVGRDRLPSIEDQPHLPYVMAFIYESMRFSFPVPTIPHSTTTD
TSIMGYHIPKDTVVFVNQWSVNHDPPQKWPDPDAFDP SRFLDENGALNKDLTSSVMIFSVGKRRRCIGEELSKMQ
LFLFTSILVHQCFTANPNEDLTLDYTYGLTLKPKPFTINVTLR

>N207_A1 (SEQ ID NO:30)

MAKKTSSRQRRAPPGFPWPFLIGNAAQLGSAPHL SFARLAGTYGAVFQLRLGRWPVVVLNGERAIRQALVRQG
AAFAGRPPFPSPFQLVSGGLSLAFGGYSELWKLHRRAAHATVRAFSTGSPATRRLLERHLLGEARALVALLVRG
SAGGAFLDPSRVLVVAVANVMSALCFGRRYSHGDGEFLRLVGRNEQFGRVAGAGSLVDALPWLQRFSPVRAA
YRAFRDLNRDFYGFVVRGKFLQHQRSLRPGAAPRDMMDAFIRLQREQPRLQLEHVPATVTDIFGASQDTLSTAL
QWLLIFLIRYPKVQAKMQEEVDRIVGRDRLPCAEDQPHLPYIMAFLYESMRFSFVPVTIPHATTNTFIMGY
LIPKDTVIFVNQWSVNHDPKWSNPEDFDPTRFLDENGFINKDLTSSVMIFSLGKRRCIGEELSKMQFLFIS
ILVHQCNFTANPNEDPKMDFTYGLTIKPKPFTLNVTLR

>N72_A1 (SEQ ID NO:31)

MAKKTSSRRRSRPPGFPWPFLIGNAAQLGSAPHL SFARLARRYGDVFQIRLGSWPVVVLNGERAIRQALVRQG
AAFAGRPPFPSPFQLVSGGRSLAFGGYSERWKVQRRVAHSTVRAFSTGNPRTRRVLEQHVLGEARELVRLVVRG
SAGGAFLDPARSLVVAVANVMSALCFGRRYSHDDAEFRGLLGRNEQFGRTVGAGSLVDVLPWLQRFNPVVRTA
FRDFQQLNRDFYGFVRDKFLQHRSSLRPGAAPRDMMDAFIHIVGEEPRLDLEYVPATVTDIFGASQDTLSTAL
QWLLIFLIRYPEVQAKLQEEIDRVVGRDRLPCMEDQPHLPYVMAFLYESMRFSFVPVTIPHATTADTSIMGY
HIPKDTVVFVNQWSVNHDPVKWPNPEDFNPARFLDENGFINKDLTSSVMIFSVGKRRCIGEELSKMQFLFIS
ILVHQCNFTANPNEDSKMDFTYGLTIKPKPFTINVTLR

>N98_A1 (SEQ ID NO:32)

MAKKTSSQPGSRPPGFPWPFLIGNAAEVGSAPHL SFARLARRYGDVFQIRLGSCPVVVLNGERAIRQALVQQG
AAFAGRPPFPSPFQVVS GGRSLAFGRYSERWKVQRRVAHSTVRAFSTGQPRSRVLEQHVLGEARELVRLVVRG
SAGGAFLDPAPLTVVAVANVMSAVCFGRYSHDDAEFRGLLSHNEKFGRTVGAGSLVDVLPWLQRFNPVVRTA
FRDFQQLNRDFYSFVLDKFLRHRSSLRPGAAPRDMMDAFIHTVGKEEAEGNGDSGPRLDLEYVPATVTDIFGA
SQDTLSTALQWLLILFTRYPEVQARVQEEIDRVVGRDRLPCMDQPHLPYVMAFLYEAMRFSFVPVTIPHAT
TADTSIMGYHIPKDTVVFVNQWSVNHDPVKWPNPEDFNPARFLDKNGFINKDLASSVMIFSVGKRRCIGEELS
KMQLFLFISILAHQCNFRANPEDESKMDFSYGLTIKPKSFTINVTLR

>N25_A1 (SEQ ID NO:33)

MAKKTSSRLKRRLPGFPFAWPVVGNAQLGQMPHITFSKLAKKYGNVYQIRLGCS DIVVLNGDAAIRQALIQHS
TEFAGRPNFVVSFQMVSGGKSMFTTNYSKQWKMRKIAQSTIRAFSSANSQTKKAFEQHVVAEAMELVQVFLRL
SAEQGYFNPAHELTVAANVICALCFGKRYGHDDVEFRLLGRVDKFGGETVGAGSLVDVMPWLQSFNPVRSV
FQNFKDLNKEFFAFVKDKVVQHRETYDPEVTRDMSDAIIGVIEHGKDNGLTKDYVEGTVTDLIGAGQDTVSTA
LQWILLLLVKYPNIQTKLQEQIDKVVGRDRLPSIEDKSNLAYLDAFIYETMRFTSFVPVTIPHSTTS DVTIEG
LHIPKDTVVFINQWSVNHDPQKWDPHFVDP SRFLDENGALDKDLTNSVMIFSAGKRRCIGDQIAKVEVFLFS
AILLHQCFSFESNPSQDLSLDCSYGLTLKPLHYTISAKLR

>N58_A1 (SEQ ID NO:34)

MAKKTSSKKHPSPPGPWSLP IIGNLLQLGEHPYLSFIEMRKKYGDVFLIKLGMVPVVVNGMEMVKQVLLKDG
ENFAGRPNMHTFSFFANGKSLSFSVNYGESWKLHKKIAINALRSFSKAEAKSSTCSCLLEEHVCAEVSELVKI
FTELSSKQGSFDPGRSITCAVANVVCALCFGKRYDHSDEEFLRIIKINDDFLKASSAVNPADFI PCFRYLPLR
VVNAPREFYHQLNQFIAQHVQEHYTTYDKNHLR DITDALISICHDKNSTGKTPTLSDDKIIISTVNDIFGAGFD
TVSTCLNWSFLYLINYPEIQTKIQEEIDGNIGLKPPRFEDRKNLPYTEAFINEIFRHTTFLPFTIPHCTTADT
ILNGYFIPKDTCVFINMYQVNHDET LWENPD LFRPERFLNENGELNKS LVEKVLIFGMGIRKCLGEDVARNEI
FIFITITLQQLKLEKCPGAQLDLTPVYGLSMKPKPYHLQAEPR

>N53_A1 (SEQ ID NO:35)

MAKKTSSKDVNSPPGPTPWP IIGNMLQMGDQPHLSLTKMRRKYGDVFQVKMGSLLVVLSGYDTIKQALVRQG
ESFAGRPD LFTFS AVANGTSMTFSEKYGESWILHKKICKNALRTFSQTEAKNSTCSCLLEEHICAEATEMVEV
LMEQSEKEGGLDPVVP I VSSVANVVCALCFGKRYDYNDKEFLTIVHINNEVLRVFAAGNLADFFPVFRYLPSP
SLRKLQVFIQRMNSFMARNIEEHLTTFDKNCIRDITDALIALCEDRQEDSENAVLSNKQIVNTVIDIFGAGFD
TIIAGLQWSLLYLIQFPDIQAKIHQEI DDKIGSSRLPRFEDRKPMPYTEAFINEVFRHTSYVPFTIPHCTTEN
TILNGYFIPKDTCVFINQYQVNHDDALWKDPDKFRPERFLDESGQLNKDLTEKVMIFGMGKRRC LGDGFARLE
MFIFLTLLHRLRIENVPGQELDLSADYGLTMKPKPYKITVSQR

>N52_A1 (SEQ ID NO:36)

MAKKTSSAGLRRPPGPKPLP IIGNVLELGANPHLSLTKMSQRYGDVFQIQIGTRPVVLSGSETVRQALIKQG
DDFAGRPDLYSFQFISNGKSLTFSTDHAGVWRARRKLAQNALRSFSTVESSTSTYSCVLEEHICKEAEYLVKR
LSGIMEANGSFDPFRHIVSVANVICAMCFGRRYSHDDQELNLNLNLSDEFGRVVASGNPADFIPI LRFLPNR

TMRAFIIDINNRFNTFVQKIVTEHYRTFDKNNIRDITDSLIEHCQDKKVDENANIQISDEKIVSIVNDLFGAGF
DTISTALSWSLMYLVSYDPDIQKKIHQELDENVGRERTPRLSDRPSLPYVEAFIETFRHSSFLPFTIPHCTTK
DTALNGYFIPKDTCVFVNQWQVNHDPKSLWKDPSAFSPERFLNADGTTINKTESEKVMIFGMGKRRCIGESIGR
SEVFLFLAVLLQKLEFHSPLPGQELDMTPQYGLTMKHKRCQLRASLR

>N17_A1 (SEQ ID NO:37)

MAKKTSSKGLKRPPGPRSYPIIGNVLELGKNPHLSLTKMSQKYGDVFQIQIGTRPVVLSGLETIKQALVKQG
DDFAGRDPDLYSFQFISNGKSMTFSTDYGEVWRARRKLAQNALRTFSTSESKTSTYSCLEEHVCKEAEYLVKK
LMELMKKKGSFDPYRYIVVSVANVICAMCFGKRYDHDDQELLNIVNLSDEF GKVAASGNPADFIPILRYLPSP
TMKAFKDINKRFNSFVQKIVKEHYRTFDKNHIRDITDSLIEHCQDKKVDENANIQLSDEKIVSIVNDLFGAGF
DTITTALSWSLMYLVITYPDIQKKIQEELDEVIGRERRPRLSDRPSLPYTEAFIEMFRHSSFLPFTIPHCTTK
DTVLNGYFIPKDTCVFVNQWQVNHDPKSLWKDPSAFNPERFLNADGTTINKTESEKVMIFGMGKRRCIGESIGR
MEVFLFLTLLQQLFENSPPGQELDMTPQYGLTMKHKRCHEHLQAKPR

>N21_A1 (SEQ ID NO:38)

MAKKTSSKGLKRPPGPRSYPIIGNVLELGKNPHLSLTRMSQKYGDVFQIQIGTRPVLVLSGLETIKQALVKQG
DDFAGRDPDLYSFQFIGDGQSMFTSTDSGEVWRARRKLAQNALKTFSTSPSPTSSSSCLLEEHVSKEAEYLVKK
FMELMKKKGSFDPYRYVVVSVANVICAMCFGKRYDHDDQELLNIVNLSDEFGEVAASGNPADFIPILQYLPSP
TMKAFKDINKRFNSFVQKIVKEHYRTFDKNHIRDITDSLIEHCQDKKVDENANIQLSDEKIVNIVNDLFGAGF
DTITTALSWSLMYLVITYPDIQKKIQEELDQVIGRERRPRLSDRPQLPYTEAFIEMFRHSSFLPFTIPHCTTK
DTVLNGYFIPKDTCVFVNQWQVNHDPKSLWKDPSAFNPERFLNADGTTINKTESEKVMIFGLGKRRCIGESIGR
MEVFLFLTLLQQLFENSNSPGEKLDMPQYGLTMKHKRCHEHLQAKPR

>N134_A1 (SEQ ID NO:39)

MAKKTSSKGLKRLPGPRGYPLIGNVLELGKNPHLSLTRMSQKYGDVMQIRIGTRPVLVLSGLDTIKQALVKQG
EDFMGRPDLYSFRHIADGQSLTFSTDSGEVWRARRKLAQNALKTFSVSPSPTSSSTCLLEEHVSKEADYLVTK
FLQLMEEKKRFDPYRYVVVSVANVICAMCFGKRYDHDDQELLSIVNLNNEFGEVAASGNPADFIPVLQYLPSP
TMKIFKDFNKRNSFVQKIVKEHYTSFDKDHIRDITDSLIEHCQEKKVEENANIQLSKEKIVNLVNDLFGAGF
DTVTTALSWSLMYLVITYPDIQKKIQEELDQVIGRERRPRLSDRPMLPYTEAFIEMFRHSSFLPFTIPHCTTK
DTVLNGYIIPKDLFCVFNQWQVNHDEKLWKDPSTFNPERFLNADGTEVNRAESEKVMTFGLGKRRCIGESIAR
WEVFLFLTLLQQLFESVCDGEKVDMPQYGLTMKHKRCHEHFQVKQR

>N223_A1 (SEQ ID NO:40)

MAKKTSSKGLKSPPGPRGYPIIGNVLELRKDPHLVLTRLSSQKYGDVMEVRIIGTRPVLVLSGLDTIKQALVKQG
EDFMGRPDLYSFRYITDGQSLTFSPDSGEVWKARRKLAQNALKTFSIAPSPSSSTCLLEEHVSKEADYLVTK
FLQLMEEEEKSFDYRYLVVSVANVICAMCFGKRYDHNDQELLSIVNLNNEFVDVAASGNPADFIPVLQYLPSP
AMDLFKDFNKRFIHFLQKIVKEHYTSFDKDHIRDITDSLIEHCQEKKVEANTATQIPKEKIVNLVNDLFGAGF
DTVTTALSWSLMYLVITYPDIQKKIQEELDQVIGRERRPRLSDRGTLPYTEAFIEMFRHSSFLPFTIPHSTTR
DTVLNGYIIPKDRFCVFNQWQVNHDEKLWKDPLTFNPERFLNADGTEVNKVDKAEKVMTFGLGKRRCIGETIAR
WQVFLFLSTLLQQLFESVCDGKKVDMTPYGLSMKHKRCHEHFQVKQR

>N224_A1 (SEQ ID NO:41)

MAKKTSSKGLKSPPGPRGYPIIGNVLELRKDPHLVLTRLSSQKYGDVMEVRIIGTRPVLVLSGLDTIKQALVKQG
EDFMGRPDLYSFRYITDGQSLTFSPDSGEVWKARRKLAQNALKTFSIAPSPSSSTCLLEEHVSKEADYLVTK
FLQLMEEEEKSFDYRYLVVSVANVICAMCFGKRYDHNDQELLSIVNLNNEFGDVAASGNPADFIPVLQYLPSP
TMDLFKDINRRFNSFVQKIVQEHYTSFDKEHIRDITDSLIEHCQEKKVENANVPLSNEKIINIVNDLFGAGF
DTVTTALSWSLMYLALYPDIQKKIQEELDQVIGRERRPRLSDRGTLPYTEAFIEMFRHSSFLPFTIPHSTTK
DTVLNGYIIPKDRFCVFNQWQVNHDEKLWKDPLTFNPERFLNADGEVNRTESDKVMTFGLGKRRCIGESIGRW
EVFLFLSTLLQQLFESLDCDEVDITPQYGLTMKYKKCECFQVKKR

>N29_A1 (SEQ ID NO:42)

MAKKTSSKGLKRPPGPRGYPLIGNVLELGKNPHLSLTRMSQKYGDVMQIQIGTRPVLVLSGLETIKQALVKQG
DDFMGRPDLYSFQFIGDGQSMFTSTDSGEVWRARRKLAQNALKTFSIAPSPSSSTCLLEEHVSKEAEYLVTK
FQELMKKKGSFDPYRYVVVSVANVICAMCFGKRYDHDDQELLSIVNLSNEFGEVAASGNPADFIPILQYLPSP
TMKAFKDLNKRNSFVQKIVKEHYRTFDKNHIRDITDSLIEHCQDKKVDENANIQLSDEKIVNIVNDLFGAGF
DTVTTALSWSLMYLVITYPDIQKKIQEELDQVIGRERRPRLSDRPQLPYTEAFIEMFRHSSFLPFTIPHCTTK
DTVLNGYIIPKDTCVFVNQWQVNHDPKSLWKDPSAFNPERFLNADGTTINKAESEKVMIFGLGKRRCIGESIAR
WEVFLFLTLLQQLFESVSPGEKVDMPQYGLTMKHKRCHEHFQVKPR

>N46_A1 (SEQ ID NO:43)

MAKKTSSKGLKRLPGPRGYPLIGNVLELGKNPHLSLTRMSQKYGDVMQIRIGTRPVLVLSGLETIKQALVKQG
EDFMGRPDLYSFQFIGDGQSLTFSTDSGEVWRARRKLAQNALKTFSSISPSSSTCLLEEHVSKEADYLVTKF
QELMKEKKSFDPRYVYVVSVANVICAMCFGKRYDHHDDQELLSIVNLNNEFGEVAASGNPADFIPILQYLP SRT
MKIFKDLNKRFSFVQKIVKEHYTTFDKNHIRDITDSLIEHCQDKKVDENANIQLSDEKIVNIVNDLFGAGFD
TVTTALSWSLMLVLYPDQKQKIQEELDQTIGRERRPRLSDRPMLPYTEAF ILEMFRHSSFLPFTIPHCTTKD
TVLNGYYIPKDTCVFVNQWQVNHDPKLWKDPSAFNPERFLNADGTEINRAESEKVMIFGLGKRRCIGESIARW
EVFLFLTLLQQLEFSVSPGKVDMTPIYGLTMKHKRCEHFQVKPR

>N45_A1 (SEQ ID NO:44)

MAKKTSSKGLKSPGPWGWP LIGNVLELGKNPHLALTRMSQKYGDVMQIQIGTTPVLVLSGLETIRQALVKQG
DDFMGRPDLYSFQLIGDGQSMFTFSTDSGEVWAARRKLAQNALKTFSSIASPSSSSCYLEEHVSKEAEYLISK
QELMKKKGSFDPRYVYVVSVANVICAMCFGKRYDHHDDQELLSIVNLSNEFGEVAASGNPADFIPILRYLPNPA
MKAFKDLNKKFVSFLQKMVKEHYRTFEKNHIRDITDSLIEHCQDKKLDENANIQLSDEKIVNVVLDLFGAGFD
TVTTALSWSLMLVLYPEVQKQKIQEELDTVIGRARRPRLSDRPQLPYTEAF ILETFRHSSFLPFTIPHSTTRD
TTLNGYYIPKGRCVFVNQWQINHDPKLWEDPSAFRPERFLTADGTTINKALSEKVMIFGLGKRKCIGETIARW
EVFLFLTILLQQIEFSVPPGVKVDMTPIYGLTMKHARCEHFQVKPR

>N128_A1 (SEQ ID NO:45)

MAKKTSSKGLKSPGPWGWP LLGHVLT LGKNPHLALSRLSQR YGDVLQIRIGSTPVLVLSGLD TIRQALVRQG
DDFKGRPDLYSFTLISDGQSMFTFNPDSGPVWAARRRLAQNALKSFSIASDPASSSSCYLEEHVSKEAEYLISK
FQELMAGVGHFDPYRYVVSVANVICAMCFGQRYDHHDDQELLSLVNLSNEFGEVAASGNPADFIPILRYLPN
ALDAFKDLNKKFY SFLQKMVKEHYKTFEKGHIRDITDSLIEHCQDKKLDENANIQLSDEKIVNVVLDLFGAGF
DTVTTAISWSLMLVLTNP SVQKQKIQEELDTVIGRARRPRLSDRPQLPYMEAF ILETFRHSSFPFTIPHSTTR
DTSLNIFYIPKGRCVFVNQWQINHDPKLWGDPSSEFRPERFLTADGTINKALSEKVILFGLGKRKCIGETIARW
EVFLFLAILLQQIEFSVPPGVKVDMTPIYGLTMKHARCEHFQVQMR

>N127_A1 (SEQ ID NO:46)

MAKKTSSKGLKSPGPWGWP LLGHVLT LGKNPHLALSRLSQR YGDVLQIRIGSTPVVLSGLD TIRQALVRQG
DDFKGRPDLYSFTLITDGQSMFTFNPDSGPVWAARRRLAQNALKTFSSIASDPSSSSCYLEEHVSKEAEHLISK
QELMAGVGHFDPYRHVVSVANVISAMCFGQRYDHSNQELLSLVNNSHEFVETASSGNPVDFFPILRYLPNPA
LQRFKDFNQRFRLFLQKT VKEHYKTFDKNNIQDITGALFKHSQDKSLANNSSLIPEEKIVNLVNDIFGAGFDT
VTTAISWSLMLVLTNPEVQKQKIQEELDTVIGRARRPRLSDRPQLPYMEAF ILETFRHSSFPFTIPHSTTRDT
TLNGFYIPKGRCVFVNQWQINHDPKLWGDPSSEFRPERFLTADGTINKALSEKVILFGLGKRRCIGETIARWEV
FLFLAILLQQIEFSVPPGVKVDMTPIYGLTMKHARCEHFQARPR

CYP1_A2

>1A1_Mammalia (SEQ ID NO:47)

MAKKTSSKGLKSPPGPWGWLIGHVLTGKNPHLALARLSQRYGDVLQIRIGSTPVVLSGLDTIRQALVRQG
DDFKGRPDLYSFTFISDGQSMFTNPDSGPVWAARRRLAQNALKSFSIASDPASASSCYLEEHVSKEAEYLISK
FQELMAGVGHFDPYRYVVVSVANVICAMCFGQRYDHDNQELLSIVNLNNEFGEVAASGNPADFIPIILRYLPNS
ALDAFKDLNKKFYFSFMQKMKVKEHYKTFEKGHIRDITDSLIEHCQDKRLDENANIQLSDEKIINIVDLDFGAGF
DTVTTAISWSLMYLVTNPRVQRKIQEELDTVIGRERRPRLSDRPQLPYLEAFILETFRHSSFPFTIPHSTTR
DTSLNIFYIPKGRCVFVNQWQINHDQKLWGDPSFRPERFLTPDGTITDKALSEKVILFGLGKRKCIGETIGR
LEVFLFLAILLQQVEFSVSPGVKVDMPITYGLTMKHARCEHFQVQMR

>1A2_Mammalia (SEQ ID NO:48)

MAKKTSSKGLKSPPGPWGWLIGHMLTLGKNPHLALSRLSQRYGDVLQIRIGSTPVVLSGLDTIRQALVRQG
DDFKGRPDLYSFTLITDGQSMFTNPDSGPVWAARRRLAQDALKSFSIASDPASSSSCYLEEHVSKEAEHLISK
FQELMAGAGRFDYPNQVVVSVANVIGAMCFGQHFPQSSEEMLSLVKNSHEFVETASSGNPVDFPIILRYLPNP
ALQRFKDFNQRFRLRFLQKTQVEHYQDFDKNSVDITGALFKHSEKQGSRRANGGLIPQEKIVNLVNDIFGAGF
DTVTTAISWSLMYLVTKPEIQRKIQKELDTVIGRARQPRLSDRPQLPYMEAFILETFRHTSFVPFTIPHSTTR
DTTLNGFYIPKERCVFINQWQVNHDPKLWGDPPFEFRPERFLTADGTAINKTLSEKVMFLFGLGKRRCIGEVLAKE
WEVFLFLAILLQQLEFSVPPGVKVDLTPITYGLTMKHPRCEHVQARPR

>1B_Mammal (SEQ ID NO:49)

MAKKTSSQPGSAPPGPFAWPLIGNAAVGPAPHLSFARLARRYGDVFQIRLGSCPVVVLNGERAIRQALVQQG
AAAFADRPPFASFVRVSSGGRSLAFSGQYSERWKVQRRAAHSTMRAFSTRQPRSRRVLEGHVLGEARELVALLVRG
SAGGAFLDPRPLTVVAVANVMSAVCFGCYSHDDAEFRELSSHNEEFGRTVGAGSLVDVLPWLQRFNPVVRTA
FREFEQNLNRNFSNFVLDKFLRHRESLRPGAAPRDMMDAFILSAGKEAAEGSGDGGARLDLEYVPATVTDIFGA
SQDTLSTALQWLLILFTRYPEVQARVQAEQDQVVGDRDLPCMDQPNLPYVMAFLYEAMRFSFVPFTIPHAT
TANASVLGYHIPKDTVVVFVNQWSVNHDPVKWPNPEDFDPARFLDKDGFINKDLASSVMIFSVGKRRCIGEEELS
KMQLFLFISILAHQCNFRANPDEPSKMDFSYGLTIKPKSFKINVTLR

>1A4-Aves (SEQ ID NO:50)

MAKKTSSKGLKSPPGPRGLPILGNVLELRKDPHLVLTRLQSKYGDVMEVSI GTRPVLVLSGLDTIKQALVKQG
EDFMGRPDLYHSFYISNGQSLAFSPDSGEVWKARRKLAQNALKTFISIAPSPTSSTCLLEEHVSKEAEYLVTK
FLQLMEEEEKSFDPNQYLTVVSVANVICAMCFGKRYDHDNQELLSVNLNNEFGDVAASGNPADFIPLRLYLP SR
AMELFKDINRRFNSFVQKIVQEHYTSFDKEHIRDITDSLIEHCQEKKSAGEDAHVPLSNEKIIISIVNDLFGAGF
DTVTTALSWSLMYVALYPD IQKKIQEELDTIGRERRPRLSDRGTLPTYEAFIEMFRHSSFLPFTIPHSTTK
ATVLNGYYYIPKDTCVFINQWQVNHDEKLWKDPSAFNPERFLNAAGTEINRTESDKVLTFLGGLGKRRCIGESIGR
WEVFLFLTLLQQLEFSLRPGEEVDITPQYGLTMKYKKCECFQIKKR

>1A5-&_1A4-Aves (SEQ ID NO:51)

MAKKTSSKGLKSPPGPRGLPILGSVLELRKDPHLVLTRLQSKYGDVMEVSI GTRPVLVLSGLDTIKQALVKQG
EDFMGRPDLYHSFYVSNGQSLAFSPDSGEVWKARRKLAQNALKTFISIAPSPTSSTCLLEEHVSKEADYLVTK
FLQLMEEEEKSFDPYRYLVVSVANVICAICFGKRYDHDNQELLSIVNLNNEFGDVAASGNPADFIPLLYLP SR
AMDLFKDINRRFNAFVQKIVEEHYTTFDKEHIRDITDSLIEHCQEKKAGENS AVQLSNEKIIINIVNDLFGAGF
DTVTTALSWSLMYLALYPD IQKKIQEELDTIGQERRPRLSDRGTLPTYEAFIEMFRHSSFLPFTIPHSTTK
DTVNLNGYYYIPKDRCVFINQWQVNHDEKLWKDPSAFNPERFLNADGTEVNRVESDKVLTFLGGLGKRRCIGETIGR
WEVFLFLSTLLQQLEFSLCDGEEVDITPQYGLTMKYKRCECFQVKKR

>1A (SEQ ID NO:52)

MAKKTSSKGLKRPPGPRSYPLIGNVLELGKNPHLSLTRMSQKYGDVMQIQIGTRPVLVLSGLETIKQALVKQG
DDFMGRPDLYSFRFIGDGQSLTFSTDSGEVWRARRKLAQNALKTFISIAPSPTSSTSSCLLEEHVSKEAEYLVRK
FQELMEEKGSFDPYRYVVVSVANVICAMCFGKRYDHDNQELLSIVNLSNEFGEVAASGNPADFIPIILQYLPNR
TMKAFKDLNKRNFNAFVQKIVKEHYKTFDKNNIRDITDSLIEHCQDKKVDENANIQLSDEKIVNIVNDLFGAGF
DTVTTALSWSLMYLVTPDIQKKIQEELDQVIGRERRPRLSDRPQLPYTEAFIEMFRHSSFLPFTIPHCTTK
DTVNLNGYYYIPKGTVCVFVNQWQVNHDPKLWKDPSAFCPERFLNADGTTINKAESEKVMIFGLGKRRCIGESIGR
WEVFLFLTLLQQLEFSVQDGEKVDMPQYGLTMKHKRCEHFQVKPR

>1A5-Aves (SEQ ID NO:53)

MAKKTSSKGLKSPPGPRGYPI LGNVLELRKDPHLVLTKLSQKYGDVMEIRI GTRPVLVLSGLDTIKQALVKQG
EDFMGRPDLYSFRHVTDGQSLTFSPDSGEVWKARRKLAQNALKTFISIAPSPTSSTCLLEEHVSKEADYLVTK
FLQVMEEEEKSFDPYRYLVVSVANVICAMCFGKRYDHDNQELLNIVNVSEQFTEVAASGNPADFIPLVLYLP SR
AMNLFKDFNKRFIHFLQKIVKEHYETYDKNNIRDITDSLIEQCMEKKVEANTATQIPKEKIVNLVNDLFGAGF

DTVTTGLSWSLMYLVITYPDIQKKIQEELDQTIGQERRPRLSDRGTLPTYTEAFIEMFRHSSFLPFTIPHSTTR
DTVLNGYYIPKDRCVFNQWQVNHDEKLWKDPLTFNPERFLNAEGTEVNKVDGEKVLVFGLGKRRCI GEPIAR
WQVFLFLSTLLQQLEFSVCDGKKVDMTPLYGLSLKHKRCEHFQVKQR

>1A_Mamallia_&_1A_Reptile_&_1A_Amphibia (SEQ ID NO:54)

MAKKTSSHGLKSPPGPWAWPLIGNILELGKNPHLALTRMSQKYGDVMQIQIGTTPVLVLSGLETIRQALVKQG
EDFMGRPDLYSFRHIGDGQSMTFSPDSGEVWAARRKLAQNALKTFSSISSPTSSSSCYLEEHVSKEAEYLISK
FQELMEKKGSFDPYRYVVSVANVICAMCFGKRYDHDDQELLSIVNLSNEFGEVAASGNPADFIPILRYLPNS
AMKAFKDLNQKFAFLQKMVKEHYKTFEKNHIRDITDSLIEHCQDKKLDENANIQLSDKKIVNVVLDLFGAGF
DTVTTALSWSLMYLVITYPEVQKKIQEELDTVIGRARRPRLSDRSQLPYTEAFIETFRHSSFPFTIPHSTTR
DTTLNGYYIPKGRCVFNQWQINHDPKLWEDPSAFRPERFLTADGTTINKALSEKVMIFGLGKRRCI GETIAR
WEVFLFLTILLQQMEFSVQSGEKVDMPITYGLTMKHARCEHFQVKPR

>1A-Actinopterygii (SEQ ID NO:55)

MAKKTSSSEGLRRLPGPKPLPIIGNVLEVGSNPHLSLTAMSERYGDFVFIQIQIGMRPVVVLSGSETVRQALIKQG
EEFAGRDPDLYSFRFINDGKSLAFSTDQAGVWRARRKLALSALRSFSTLEGTTPPEYSCVLEEHICKEGEYLVKQ
LSSVMKADGSFDPFRHIVSVANVICGMCFGRRYSHDDQELLSLVNLSDEFQGVVGSNPADFIPILRFLPSR
TMKKFMDINARFNTFVQKIVSEHYETYDKDNIRDITDSLIDHCEDRKLDENSNVQVSDEKIVGIVNDLFGAGF
DTISTALSWSMYLVAYPEIQERLHQELKENVGMDRTPRLSDKPNLPFLEAFIETFRHSSFLPFTIPHCTTK
DTSNLGYFIPKDTCVFINQWQVNHDPKLWKDPSSFNPDRLSADGTEVNKLEGEKVMVFGMGKRRCI GEAI GR
NEVYFLFLAILIQKLRFHAMP GHPLDMTPEYGLTMKHKRCQLRASMR

>1AD (SEQ ID NO:56)

MAKKTSSKGLKRPPGPRSLPIIGNVLELGKNPHLSLTKMSQKYGDVFQIQIGTRPVVVLSGLETIKQALVKQG
DDFAGRDPDLYSFRFIGNGKSMTFSSDYGEVWRARRKLAQNALRTFSTSESKTSTYSCLEEHVCKEAEYLVKK
LMELMEKKGSFDPVRYIVSVANVICAMCFGKRYDHDDQELLSIVNLSDEF GKVAASGNPADFIPILRYLPNP
TMKAFIDINKRFNTFIQKIVQEHYKTFDKNHIRDITDSLIEHCQDKKVDENANIQLSDEKIVSIVNDLFGAGF
DTITTALSWSLMYLVSYPEIQKKIQEELDETIGRERRPRLSDRPSLPYTEAFIEMFRHSSFPFTIPHCTTK
DTVLNGYFIPKDTCVFNQWQVNHDPKLWKDPSSFNPDRLSADGTEVNKLEGEKVMVFGMGKRRCI GESIGR
IEVFLFLTLLQQLEFEKLPQGELDMTPQYGLTMKHKRCEHLQAKLR

>1D (SEQ ID NO:57)

MAKKTSSKKRNSPPGPWSLPVGNLLQLGEHPYLSLTEMRRKYGDVFQIKLGMVPVVVSGMETVKQVLLKEG
ESFAGRPNFYTFSLFANGKSMTFSEKYGESWKLHKKIAKNALRSFSKTEAKSSTCSCLEEHVCAEASELVKV
LTELAKKGAFDPAGPITSTVANVVCALCFGKRYDHNDKEFLTIIQINNDLMKASASGNLADFIPIFRYLPSP
SVKALRKFVHALNNFIKCVEEHYTTFDKNHIRDITDALIALCQDRKSEGKNAVLSDDQIISTVNDIFGAGFD
TITTGLLWSLLYLIQYPEIQTKIQEIDEKIGSSRPPRFEDRKNLHYTEAFINEVFRHTSFVPFTIPHCTTKD
TILNGYFIPKDTCVFINMYQVNHDET LWKDPDLFRPERFLDENGQLNKSLEKVLIFGMGIRKCLGED IARNE
MFIFLTLLQQLEKSPGQELDLTPVYGLTMKPKPYHLTAEPR

>1ADBC (SEQ ID NO:58)

MAKKTSSKGRKRPPGPRSWPIIGNVLQLGEHPHLSLTKMSQKYGDVFQIKLGTRPVVVLSGLETIKQALVKQG
EDFAGRPDFYSFRLISNGKSMTFSENYGEVWKAHRKIAQNALRTFSTAESKTSTCSCVLEEHVCAEAQELVKV
LLELSEKKGSDPVRYYITVSVANVICALCFGKRYSHDDQEFLLIVNLNDEF GKAVAAGNLADFIPILRYLPNP
VRSTLRAFIEFNKRFFNNFIQKNVEEHYRTFDKNIPRDI TDALISLCQDRKVDSNGDANAQLSDEQIVSTVND
IFGAGFDTITTALQWCLLYLVRYPDIQKKIQEIDEKIGRDLRPLEDRPSLPYTEAFINETFRHSSFPFTI
PHCTTKDTTLNGYYIPKDTCVFNQWQVNHDP SLWKDPDVFRRPERFLDENGTTLNKDLTEKVMIFGMGKRRCI
GENIARLEVFLFLTLLHQLKFENSPGQELDLTPNYGLTMKPKPYEHLQAKLR

>1D_Mammalia (SEQ ID NO:59)

MAKKTSSRKQVSPPGPWSFPIIGNLLQLGDHPYLTFFMEMRRKYGDVFLLIKLGMVPVVVNGMEMVKQVLLKNG
EHFAGRPNMHTFSFLAEGKSF SFVNYGESWKLHKKIASNALRTFSKAEAKSSTCSCLEEHVIEEVSELVKV
FAELTSKNGSFDPRNAITCAVANVVCALCFGKRYDHSDEEFLRIVKTNDLLKASSAANPADFIPCFRYLP LR
IINAPRETIFYQALNQFIALHVQDHLTTYDKDHIRDITDALINTCHNKYAATKTATLNDDDEIISTVSDIFGAG
FETVSTCLYWSFLYLIYYPEIQAKIQEIDGNIGMKS PRFEDRKILPYTEAFINEIFRHASFLPFTIPHCTTA
DTTLNGYFIPRKTCCTFINMYQVNHDETIWDPNPNLFRPERFLNENGELNKS LVEKVLIFGMGIRKCLGEDVARN
EIFIFITTVLQQLKLKKCPGAELDLTPTYGLAMKPKPYQLQAEPR

>1C_Actinopterygii (SEQ ID NO:60)

MAKKTSSRLKRRLPGPFAWPVVG NAMQLGQMPHITFSKLAKKYGNVYQIRLGCS DIVVLNGDTAIREALIQHS
TEFAGRPNFVSFQMSGGRSMTFTNYSKQWKMRKIAQSTIRAFSSANSQTKKAFEQHVGEAMD LVQVFLRL
SADGRYFNPAHEFTVAANVICALCFGKRYGHDDLEFRTLLGRVDKFGGETVGAGSLVDVMPWLQSFNPVRSV
YQNFKNLNEEFFAFVKDKVVQHRETFNPEVTRDMSDAIIGVIEHGDKDSGLTKDFVEGTVDLIGAGQDTVST
VLQWILLLLVKYPNIQTKLQE QIDKVVGRDLRPSIEDKSSLAYLDAFIYETMRFTSFVPVTIPHSTTSDVTIE

GLHIPKDTVVFINQWSVNHDPLKWKDPHFVDP SRFLDENGALDKDLTNSVMIFSTGKRRCIGDQIAKVEVFLE
SAILLHQCSFESNPSQDLSDLCSYGLTLKPLHYTISAKLR
>1BC (SEQ ID NO:61)
MAKKTSSPRRRRPPGPFPPWPLIGNAAQLGNAPHL SF SRMARKYGNVFQIKLGSRTVVVLNGEEAIRQALVQKG
ADFAGRPNFTSFQLVSGGRSMAFGSYSELWKVHRKIAHSTVRAFSTGNPRTKKVFEQHVVGARELIRLFLRL
SADGKYFNPARNLVAVANVMSALCFGKRYSHDDAEFQSLLGRNDKFGKTVGAGSLVDVMPWLQYFPNPVRSV
FRNFKELNREFYDFVRDKVIQHRSTIKPGVPTRDMMDAFISIIDQGEAKSGGDNGHRLDKEYVPSTVTDIFGA
SQDTLSTALQWIIILFLVRYPD IQAKLQEEMDRVVGRDRLPSIEDQPHLPYLMAFLYESMRFSFVPVTIPHST
TTDTSIMGYHIPKDTVVFVNQWSVNHDPPQKWPNEVFDP SRFLDENGALNKDLTSSVMIFSVGKRRCIGDELS
KMQLFLFTSILVHQCTFTANPAEDLTMDFTYGLTLKPKPFTINVTLR
>1B_Actinopterygii (SEQ ID NO:62)
MAKKTSSRSASSPPGPFPAWPAVIGNAAQLGNAPHL YF SRMAQKYGDVFQIKLGSRTVVVLNGEDAIRQALIKKG
LDFAGRDPDFTSFQYVSNGDSMAFGTFSDWWKVHRKVAQSTVRMFSTGNMHTKKTFENHVCEVRELLHLFLRK
TKEQQYFQPMTYLVSTANIMSAVCFGKRYSYDDEEFQQVVGRNDQFTQTVGAGSIVDVMPWLQYFPNP IKT I
FDNFKELNREFSEFIQDKVVEHRKTIQ PSTIRDMTDAFIMALDQGLKDSSPGVSLDKDYVPPTIGDIFGASQD
TLSTALQWIIILILVRYPD IQLRLQEEVDKVVD RSRLPSIEDQPQLPYVMAFIYEV MRFTSFVPLTIPHSTTTD
TSIMGYTIPKDTVIFINQWSVNHDPAKWSHPETFD PQRF LDQD GALNKDLTSSVLIFSLGKRRCIGEELSKMQ
LFLFTALLAHQCHFTADPAKPPTLDYTYGLTLKPNAFSIAVTLR
>1B (SEQ ID NO:63)
MAKKTSSRRSRPPGPFPPWPLIGNAAQIGNAPHL SF ARMARKYGDVFQIKLGSRTVVVLNGEEAIRQALIKKG
ADFAGRDPDFTSFKVVS GGKSLAFGRYS DRWKVHRKIAHSTVRAFSTGNPHTKKVFEQHVIGEVRELIHLFLEK
SKDRKYFNPARNLVAVANVMSAVCFGKRYSHDDAEFQSLLGRNDQFGKTVGAGSLVDVMPWLQYFPNPVRTV
FGNFKQLNRDFYDFIRDKVIQHRSTIKPGTAIRDMMDAFITILDKGEAKSSSDNGHRLDKEYVPSTVTDIFGA
SQDTLSTALQWIIILFLVRYPEVQARLQDEMDKVVGDRDLPSIEDQPHLPYVMAFLYESMRFSFVPVTIPHST
TTDTSIMGYHIPKDTVVFVNQWSVNHDPPQKWPNEAFDPLRFLDENG SINKDLASSVMIFSVGKRRCIGEELS
KMQLFLFTSILVHQCNFTANPNEDPSLDFSYGLTIKPKPFTINVTLR

Figure 3

CYP2_A0

>N3 (SEQ ID NO:64)

MALMELS---TSLILVLVLLLLSLLLLLLLLLWRKR--G-RRRL-GRPPGPTPLPPLLGNLLQ
LDTKAPFKSFMKLSEKYGPVFTVYLGSWQPVVVLGCGYEAVKEALVDHGEEFSGRAAIPVL
QRITKGYGLVVSNGERWKQLRRFTLTTLRNFGMGKRSIEERIQEEAQYLVQAFSETKGKP
FDPTFLLSCAVSNVICSIVFGQRFDYEDKQFLTLLNIINEIFRFVSSPWGQLYNIFPRLM
DHLPGPHHKIFANVEKLKDFIRERVKRHQETLDPNSPARDYIDCFLIKMEQEKQNPSEF
HYENLVMTVLNLFAGTETTSTTLRYSLLVLLKYPHIQEKVQQEIDRVIGRDRSPAMEDR
AKMPYTDAAVIHEIQRFIDIVPMSLPHMVTRDTQFRGYTIPKGTTVIPLLSSVLHDPKQWK
NPETFNPEHFLDENG SFKKND AFMPFSAGKRMCLGEG LARMELFLFFTTLLQKFTFRPLE
DPEEIDLTPEVSGFGNMPSRSYQLCAIPR

>N8 (SEQ ID NO:65)

---MELS---TSLILVLVLLLLTV-LLLLLSRRKR----RRL---RLPPGPTALPLIGNLLQ
LDKKAPFKSFMKFSETYGPVMTVYLG-PRMVVLVGYEAVKEALVDQADDF TGRAP IPFL
HRITKGYGLAISNGERWQRRLFTLTTLRDFGMGRKGMEEWIQEESKYLKVSFSETKGKP
FDPTFLLSCTVSNVICSIVFGQRFDYEDKQFLHLLQI ISEILRFASSPWGQLYNIFPRLM
ERLPGPHHTIFANIEELREFIRTKIKEHQETLDPSSP-RDYIDCFLIRMNQEKNPNTF
HYDNLVSTVLNLFAGTETTSTTLRYALMVLIKYPHIQEKMQQEIDRVIGRDRCP TMEDR
KSLPFTDAVIHEVQRFLDIVPLSLPHYALKDISFRGYTIPKDTVIIPLLHSLVRDEKQWE
TPWTFNPEHFLDQNGNFKKNP AFMPFSAGKRACVGESLARMELFLFIVSLLQKFTFSSPE
GPDSIDLSPELSSFANMPRSYQLIATPR

>N13 (SEQ ID NO:66)

MALMELSGA-TTLLLV-LCLSCLLLLLSAWRKRA-GKRRRLGGRPPGPTPLPPLLGNLLQ
LDTKELLKSLMKLSEKYGPVFTVYLGSWQPVVVLGCGYEAVKEALVDHGEEFSGRGEMPVL
DRITKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQYLVEEFKRTKGQP
FDPTFLLSCAVSNVICSIVFGERFDYEDKKFLTLLNLINETFRMLSSPWGQLYNIFPSLM
DHLPGPHHKIFKNFEKLKDFIAERVKMHQETLDPNSPARDFIDCFLIKMEQEKQNPSEF
HMENLVMTTLNLFAGTETTSTTLRYGFLILLKYPEIQEKVHEEIDRVIGRNRSPSMEDR
SKMPYTDAAVIHEIQRFIDIVPMGLPHAVTRDTHFRGYTIPKGTTFVPLLSSVLHDPKQFK
NPEAFNPGHFLDENG SFKKND AFMPFSAGKRICLGEGLARMELFLFFTTILQNFTLKPLV
DPEEIDITPEVSGFGNIPRPYQLCLVPR

>N23 (SEQ ID NO:67)

---MELSGA-TTLLLV-VCVSC-LLFLSAWRKR----SRRLGGKLPPGPTPLPPLLGNILQ
LNTKELPKSLMKLSEKYGPVFTVYLG-SPVVVLGCGYEAVKEALVDHGEEFSGRGEMP I I
DKITKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQYLVEEFKRTKGQP
FDPTFLLSCAVSNVICSIVFGERFDYEDKKFLTLLNLINETFRLLSSPWGQLYNFFPSLM
DHLPGPHQKIFKNFEKLKDFIAERVKMHQETLDPNSP-RDFIDCFLIKMEQEKQNPSEF
HMENLVMTTLDLFFAGTETTSTTLRYGFLILLKYPEIQEKVHEEIDRVIGRNRSPSMEDR
SKMPYTDAAVIHEIQRFIDIVPLGLPHAVTRDTHFRGYTIPKGTTFVPLLSSVLHDPKQFK
NPEQFNPGHFLDENG SFKKND AFMPFSAGKRICLGEGLARMELFLFLTTLQNFTLKPLV
DPEDIDITPEVSGFGNIPRPYQLCFVPR

>N24 (SEQ ID NO:68)

MALMEL----TTLLLV-LCLSC-LLLLLSAWRKRAKG-RRR-G-RLPPGPTPLPPLLGNLLQ
LDTKELLKSLMKLSEKYGPVFTVYLGSWQPVVVLGCGYEAVKEALVDQAEFSGRGEMPVL
DRITKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFKRTKGAP
FDPTFLLSRAVSNVICSIVFGERFDYEDKKFLTLLNLINETFRMLSSPWGQLYNIFPSLM
DHLPGPHHKIFKNFEKLKDFIAERVKMHQETLDPNSPARDFIDCFLIKMEQEKQNPSEF
HMENLVMTTLNLFAGTETTSTTLRYGFLILLKYPEVQEKVHEEIDRVIGRNRSPSMEDR
SRMPYTDAAVIHEIQRFIDIPMGLPHAVTRDTHFRGYTIPKGTNVFPLLSSVLHDPKQFK
NPEAFNPGHFLDENG SFKKND AFMPFSAGKRICLGEGLARMELFLFFTTILQNFTLKPLV
DPEEIDITPEVSGFGNIPRPYQLCLVPR

>N35 (SEQ ID NO:69)

---MELLGA-TTLFLV-VCVS--LLFLSAWRKR----SRRL-GKLPPGPTPLPILGNILQ
LNTKNLPKSLHKLSEKYGPVFTVYLGs-QRVVVLGYEAVKEALVDHGEEFSGRGNMPII
DKINKGLGIVFSNGERWKQLRRFSLTTLRNFGMGKKSIEERIQEEAQYLVEELRNTKGQP
FDPTFLLSCAVSNVICSIVFGERFDYEDKKFLTLNLLNETFRLSSPWGQLYNFFPSLM
DHLPGPHQKIFKNFEKLKDFIAERVKMHQETLDPNSP-RDFIDCFLIKMEQEKQNPKEF
NMENLVMTTLDLFFAGTETTSTTLRYGLLILLKYPEIQEKVHEEIDRVIGRNRSPSMEDR
SQMPYTDABIHEIQRFIDLVPGLPHAVTRDTHFRGYTIPKGTTFPLSSVLHDPKQFK
NPEQFNPGHFLDENGsFKKNDAFMPFSAGKRICLGEGLARMELFLFLTTLQNFTLKPLV
DPEDIDITPEVSGFGNIPRPYQLCFVPR

>N37 (SEQ ID NO:70)

---MEL---TTATLL-LLLLA-LLCLALWRKGA-GKRRR-G-RLPPGPTPLPPLLGNLLQ
LDTKEMLKSLMKLSEKYGPVFTVHLGS-QPVVVLGCGYEAVKEALVDQAEFSGRGDMPVL
YRFTKNGIAFSNGERWKVLRRFSLQTLRNFGMGKRSIEERIQEEAQCLVEEFRTKKGAP
FDPTFLLSRAVSNVICSIVFGERFDYEDKKFLTLNLLINENFQLMSSPWGQLYNIFPSLM
DWLPGPHHRIQNFELKDFIAERVKRHQETLDPNSP-RDFIDCFLIKMEQEKQDPQSHF
HMETLVMTTNLFAGTETTSTTLRYGFLILMKYPEVQAKVHEEIDRVIGRNRSPSLED
SRMPYTDABIHEIQRFIDIIPMGLPHAVTRDTHFRGYLLPKGTNVIPLSSVLHDPQFK
NPEAFNPGHFLDEKGSFKKNDAFMPFSAGKRICLGEGLARMELFLFFTTLQNFTLKPLV
DPEEIDLTPQVSGLGNIPRPYQLCLVPR

>N38 (SEQ ID NO:71)

M--MELS---TTLLLV-LCLSC-LLLLSAWRKR----RRR-G-RLPPGPTPLPPLLGNLLQ
LDRKELLKSLMKLSEKYGPVFTVYLGsQPVVVLGCGYEAVKEALVDQAEFSGRGEMPVL
DRIFKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRTKKGAP
FDPTFLLSRAVSNVICSIVFGERFDYEDKKFLTLNLLINETFRLMSSPWGQLYNIFPSIM
DHLPGPHHKIFKNFEKLKDFIAERVKMHQETLDPNSPARDFIDCFLIKMEQEKQNPSEF
HMENLVMTTNLFAGTETVSTTLRYGFLILLKYPEVQEKVHEEIDRVIGRNRSPSMEDR
SRMPYTDABIHEIQRFSDIIPMGLPHAVTRDTHFRGYTIPKGTNVFPLSSVLHDPKQFK
NPEAFNPGHFLDENGsFKKNDAFMPFSAGKRICLGEGLARMELFLFFTTLQNFTLKSPV
DPEEIDITPEVSGFGNIPRPYQLCLVPR

>N47 (SEQ ID NO:72)

---MEPLGA-TTVFLV-VCISC-LLFLSAWRKR----SGRLGGKLPPGPTPLPIIGNILQ
LNTKNLPKSLHKLSEKYGPVFTVYLGs-QRVVVLGYEAVKEALIDHGDEFSGRGNMPII
DKINKGLGIVFSNGERWKQLRRFALTTLRNFGMGKKSIEERIQEEAQYLVEELRNTKGQP
FDPTFLLSCAVSNVICSIVFGERFDYEDKKFLTLNLLINETFRLMSSPWGQLYNFFPSLM
DYLPGPHQKIFKNFEELKDFILERVKMHEQETLDPNSP-RDFIDCFLIKMEQEKQNPKEF
NMENLVMTTLDLFFAGTETTSTTLRYGLLILLKYPEIEEKVHEEIDRVIGRNRSPCMADR
SQMPYTDABIHEIQRFIDLVPGLPHAVTRDTHFRQYIIPKGTTFPLSSVLHDSKEFP
NPEQFNPGHFLDENGsFKKSDYFMPFSAGKRICVGEGLARMELFLFLTTLQNFTLKPLV
DPKDIDITPEVSGFGNVPRPYQLCLFPR

>N54 (SEQ ID NO:73)

M--MELSGA-TTLLLV-ICLSC-LLLLSAWRKR----KRR-G-RLPPGPTPLPPLLGNLLQ
LKRKELLKSLMKLSEKYGPVFTVYLGsWRPVVVLGCGYEAVKEALVDQAEFSGRGEMPVL
DRIFKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRTKKGAP
FDPTFLLSRAVSNVICSIVFGERFDYEDKKFLTLNLLINETFRLMSSPWGQLYNIFPSIM
KHLPGPHHKIFKNFEKLKDFIAERVKMHQETLDPNSPARDFIDCFLIKMEQEKQNPSEF
HMENLVMTTNLFAGTETVSTTLRYGFLILLKYPEVQEKVHEEIDRVIGRNRSPSMEDR
SRMPYTDABIHEIQRFSDIIPMGLPHAVTRDTHFRGYTIPKGTNVFPLSSVLHDPKQFK
NPEAFNPGHFLDENGsFKKNDAFMPFSAGKRICLGEGLARMELFLFFTTLQNFTLKSPV
DPEDIDITPEVSGFGNIPRPYQLCLVPR

>N69 (SEQ ID NO:74)

---MEPLGA-TTVFLV-VCISC-LLFLSAWRKR----SGRLGGKLPPGPTPLPIIGNILQ

LNTKNLPKSLHKLSEKYGPVFTLYLGS-QRVVVLHGYEAVKEALIDHGDEF SGRGNMPI I
DKINKGLGIVFSNGERWKQLRRFALTTLRNFGMGKKSIEERIQEEAQYLVEELRNTKGQP
FDPTFLLSCAVSNVICSIVFGKRFDYEDKKFLTLMLNLLNENFRLNNSPWGQLYNLFPSLM
DYLPGPHHKIFKNFEELKDFILERVKEHQETLDPNSP-RDFIDCFLIKMEQEKQNPKEF
NMENLVMTTLDLFSAGTETTSTTLRYGLLILLKYPEIEEKVHEEIDRVIGRNRSPCMADR
SQMPYTDABIHEIQRFIDLVPGLPHAVTQDTHFRQYIIPKGTTFPLLSVLHDSKEFP
NPEQFNPGHFLDENGSEFKKSDYFMPFSAGKRICVGEGLARMELFLFTTILQNFTLKPLV
DPKDIDITPEVSGFGNVPRPYQLCFLPR

>N70 (SEQ ID NO:75)

---MEPLGA-TTVFLV-VCISC-LLFFSAWRKM----SGS-G-KLPPGPIPLPIIGNTLQ
LNTKNLPQSLHELSEKYGPVFTIYLGS-QRVVVLHGYEAVKEALIDQGDEF SGRGNLPFLF
DKISKGTGIVFSNGERWKQLRRFALTTLRNFGMGKKSIEERIQEEAHFLVERLRNTHGRP
FDPTLFLTHAVSNVICSIVFGDRFDYEDKKFLTLINLLEENNKLNQSPWTQLYNFFPTLM
DYLPGPHQKIFKNFEELRKFI LERVKMHQESLDPNCP-RDFIDAFLIKMEQEKQNSQSEF
NTENLVRSTLDLFFAGTGTTSTTLRYGLLILLKYPEIEEKVHEEIDRVIGRSRSPCMADR
SQMPYTDABIHEIQRFIDLVLGVPHAVTRDTHFRQYIIPKGTTFPVLRSVLHDSKEFP
NPEQFNPGHFLDENGAFKKSDYFMPFSAGKRICVGEGLARMELFLFTTILQNFTLKPLV
DPKDIDITPEVSSLVNPRPYQLCFLPR

>N77 (SEQ ID NO:76)

---MDL----ISTALL-LLLLA-LLCLFLTRSS----RRK-G-RLPPGPRPLPPLLGNLLQ
LRSRDMTSLTKLSKEYGSVFTVHLGS-RPVVVLHGYEAVKEALVDQAEFF SGRGDYPVF
YNFTKGNIAFSNGERWKVLRRFSVQTLRNFGMGKRSIEERILEEASFLLLEELRKTEGAP
FDPTFVLSRSVSNIICSVVFGSRFDYEDERLLTLIHLINENFQIMSSPWGEMYNIFPSLL
DWVPGPHQRLFQNFGRMKDLIARSVREHQASLDPNSP-RDFIDCFLIKMAQEKQDPLSHF
HMETLVMTTNLLFFGGTETVGTTLRHAFVLVMKYPKVQARVQEEIDRVVGRARRPTLEDR
SAMPYTDABIHEVQRFADIIPMNLP HRVTRDTAFRGFLLPKGTDVITLLNTVHYDPSQFK
TPQEFNPEHFLDAKQSFKKSPA FMPFSAGRRLCLGESLARMELFLYLTAILQNFTLQPLG
APEEIDLTPLSGLGNIPRPFQLRLVPR

>N81 (SEQ ID NO:77)

---MELSGA-TTLLLV-ICLSC-LLLLSAWRKR----KRR-G-RLPPGPTPLPPLLGNLLQ
LKRKELLKSLMKLSEKYGPVFTVYLGS-RPVVVLHGYEAVKEALIDQAEFF SGRGEMPVL
DRISKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQFLVEEFNRNKGAP
FDPTFFLSRAVSNVICSIVFGERFDYEDKKFLTLNLLINETFRLMSSTWGQLYNIFPKIM
RHLPGPHHKIFKNFEELKEFIAERVKMHQETLDPNSP-RDFIDCFLIKMQQEKQNPNSEF
HMENLVKTTNLLFFAGTETVSTTLRYGFLILLKHPEVQEKVHEEIDRVIGRNRSPCMEDR
SRMPYTDABIHEIQRFSDIIPMGLPHTVTRDTHFRGYTIPKGTNVFPLLSVLHDPKQFK
NPEAFNPGHFLDENGFRFKKND AFMPFSAGKRICLGEGLARMELFLFFTILQNFTLKSPV
DPEDIDITPEVSGFGNIPRPFQLCLIPR

>N82 (SEQ ID NO:78)

M-LMELSGAWATLLLV-ICLSC-LLLLSAWRKR----KRR-G-RLPPGPTPLPPLLGNLLQ
LKRSELLKSLMKLSEKYGPVFTVYLGSWRPVVVLHGYEAVKEALVDQAEFF SGRGEMPTL
DRIFQGYGVVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRTKKGAP
FDPTFFLSRAVSNVICSIVFGERFDYEDKKFLSLLRMINETFRLMS SPWGQLYEMFPSIM
KYLPGPHHKIFKNLEELKDFIAERVKMHQETLDPNSPARDFIDCFLIKMEQEKQNPNSEF
HMKNLVMTTNLLFFAGTETVSTTLRYGFLLLKYPEVQEKVHEEIDRVIGRNRSPSMEDR
SRMPYTDABIHEIQRFSDIIPMGVPHAVTRDTHFRGYTIPKGTDFVPLLSVLHDPKYFK
NPEAFNPGHFLDENGFRFKKND AFMPFSAGKRICLGEGLARMELFLFFTILQNFTLKSPV
PPEDIDITPKVSGFANIPPSYQLCLVPR

>N97 (SEQ ID NO:79)

---MDPLGV-TTLVLV-VCISC-LLFLSAWRKG----SGRLG-KLPPGPTPLPIIGNILQ
LNTKNIPKSLSKLAEKYGPVFTLYLGS-QRVVVLHGYEAVKEALIDHGDEF SGRGNIP I I
DAINKGLGIVFSNGERWKQMRRLMTLRNFGMGKRSIEERIQEEAQCLVEELRKTGQGP
FDPTFILGCAPCNVICSIIIFHKRFDYNDKKFLHLMNLLNENFRLNNSPWIQLYNLFPSLI

HYLPGSHHKLFKNFQELKDFILERVKEHQETLDPNNP-RDFIDCFLIKMEQEKHNPQSEF
NMENLVITVSDLFSAGTETTSTTLRYGLLLLLKHPEVEEKVHEEIDRVIGNRSPCMKDR
SQMPYTDVVHEIQRFIDLVPSSLPHAVTQDTHFRQYLIPKGTTFPLSSVLYDSKEFP
NPEQFDPGHFLDENG SFKSDYFMPFSAGKRICVGEGLARMELFLFLTILQNFTLKLPLV
DPKDIDITPIANGFGNVPPSYKLCFLPR

>N98 (SEQ ID NO:80)

---MEPLGA-TTVFLV-VCISC-LLFLAAWRKR----SGK-GGKLPPGPTPLPIIGNALQ
LKTKNLSKTLHKLSEKYGPVFTLYFGS-ERVVVLHGYEAVKEALIDRGDEFAARGKMPII
DKINKGLGIIFSNGERWKQLRRFALTTLRNFGMGKKSIEERIQEEAQYLVEELRNTKEQP
FDPTFLLSCAVSNVICSIVFGKRYDYEDKKFLALMNLNMENFRLLNSPWGQLYNLFP SLM
DYLPGPHHKIFKNFEELKEFILLEEVKEHQETLDPSSP-RDFIDCFLIKMEQEKQNDKSEF
NMENLVMTTLDLFSAGTETTSTTLRYGLLILLYKYPEIEEKVQEEIDRVIGRSRSPCMADR
SQMPYTDVAIHEIQRFIALVPLGLPHAVTQDTPFRQYIIPKGTTFIPILSSVLHDSKEFP
NPEQFNPGHFLNENGTFRKSDYFMPFSAGKRICVGEGLARMELFLFLTILQNFTLKLPLV
DPKDIDISPELSGFGNVPRPYQLCVLPR

>N112 (SEQ ID NO:81)

-----MATLL-LLLLL-LLALALWGRGAKGS--R-G-RLPPGPTPLPLLGNLLQ
LEPGGLDKSLMELSRRYGPVFTVRLGP-QPVVVLGCGYEALREALVLQAD-FSGRGGMPVF
DRFTRGNGIVFSNGHRWRTLNRNFGALGKKFGMGTRSIERIQEEAACLVQEFQATKGAP
FDPLRLLSNAVSNVICSVVFGERYGYEDPDLTLLDLFNDNFQIMSSQWGEMYNIFPSLL
DWLPGPHHRIFRNFEKLRAFISEQIQRHQETRQPEEP-RDFIDCFDQMEKEKQDPQSHF
HMETLVMTTHNLFFGGTETTSTTLRYGLLILLYKYPEVAAKVQEEIDSVVGRARAPCLEDR
ARLPYTNVAIHEIQRFISVLPMGLPHALTDRDTHFRGHFLPKGTNVIPLLSAHQDPTQFK
DPESFNPNFLDDKGAFQNEAFMPFAPGKRICLGAGLARMEIFLFLTILQHFTLLPVE
SPEEDLTPQCTGLGNVPPPFQLRLVPR

>N117 (SEQ ID NO:82)

M--MEL----ATLLLV-ICLLA-LLLLSARGKP----KRR-G-RLPPGPAPLPLLGNLLQ
LKRSALLKSLLKLSEKYGPVFTVYLGSWRPVVVLCGYEAVKEALVDQAEFSGRGEIATL
DRIFQGYGVVFSNGERWKQLRRFSLTTLRDFGMGKRSIEERIQEEAQCLVEEFRKTGAP
FDPTFLLSQATSNIICSIVFGERFDYEDKQFLELLRMINETFTLISSPWGQLYEMFSRIL
KYLPGPHRRIFKNLEELKDFIAERVQKHQETLDPSSPARDFIDCFLLKMEKEKQNPNSEF
HHKNLVMTTTLNLFFAGTETVSTTLRYGFLLLLYKYPEVQEKVHEEIDRVIGNRNAPSMEDR
ARMPYTDVAIHEIQRFSDLPMPGVPHAVTKDTHFRGYTLPGKTDVFP LLSSVLHDPKYFE
KPEAFNPGHFLDAQGRFKKNEAFMPFSSGKRICLGEGLARTEFLFFTTILQNFSLSSPV
PPEDIDLTPQVSGLANIPPTYQLCFVPR

>N118 (SEQ ID NO:83)

---MELSGA-ATLLLV-ICLSC-LLLLSAWRKR----QRR-G-KLPPGPTPLPLLGNLLQ
LKRSELLKSLMKLSEKYGPVFTVYLGSRPVVVLGCGYEAVKEALVDQAEFSGRGEMPTL
DRIFQGYGVVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRKTGAP
FDPTFFLSRAVSNVICSIVFGNRFDYEDKKFLSLLRMINETFRMLSSPWGQLYEMFPSIM
KYLPGPHHKIFKLLEELKDFIAERVKMNQETLDPNSP-RDFIDCFLIKMEQEKQNPNSEF
NMKNLVMTTTLNLFFAGTETVSTTLRYGFLLLLYKYPEVQEKVHEEIDRVIGNRNRSRSMEDR
SRMPYTDVAIHEIQRFSDIIPMGVPHAVTRDTQFRGYTIPKGTVDVFP LLGSLVHDPKYFK
NPEAFNPGHFLDENGFRFKKNDAFMPFSSGKRICLGEGLARTEFLFFTTILQNFSLKSPV
PPEDIDITPKVSGFANIPPSYQLCLVPR

>N133 (SEQ ID NO:84)

---MDPSV--TTLVLV-LCISC-LLLLSAWRKG----YGK-G-KLPPGPTPLPIIGNILQ
LNTKNIPKSLCKLAKTYGPVFTLYLGS-KRVVVLHGYEAVKEALIDHGDEFSGRGSFPII
DAINKGLGIVFSNGERWKQMRRLMTLRNFGMGKRSIEERIQEEAKCLVEELRKTGQ
CDPTFILGCAPCNVICSIIIFQKRFDYNDQKFLHLMELLNENFRILSSPWIIQIYNLFP SLI
HYLPGSHHKLFKNFQELKDFILEKVKEHQETLDPNNP-RDFIDCFLIKMEQEKHNPQSEF
TMENLVITVSDLFGAGTETTSTTLRYGLLLLLKHPEVTEKVHEEIDRVIGNRNRSRSPCMKDR

SSMPYTDVVHEIQRYIDLVPSTLPHAVTQDIKFRQYLIPKGTTLPLLTSLVLYDNKEFP
NPEQFDPGHFLDESNGFVKSDYFMPFSAGKRICVGEGLARMELFLFLTTLQNFRTLKPLV
DPKDIDTTPIANGFNVPPSYKLCFLPS

>N134 (SEQ ID NO:85)

---MDPLG--TTLVLV-VCVSF-LLFLSVWRKG----SGRL--KLPPGPTPLPIIGNILQ
LNLKNIPKSFSLAEKYGPVFTLYLGS-QRVVVLHGYEAVKEALIDHGDEFSGRGNIPIF
DATN-GQGIVFSNGERWKQMRRLMTLRNFGMGKRSIEERIQQEAQCLVEELRKTGQPF
FDPTFILGCAPCNVICSILFHKRFDYNDKKFLHLMNLLNENFRLLNSPWIQLYNLFPFSFI
HYLPGSHRKLKFNQELKDFILERVKEHQETLDPNNP-RDFIDCFLIKMEQEKHNPQSEF
NLENLVITVSDLFSAGTETTSTTLRYGLLLLLKHPEVEEKVHEEIDRVIGRNRIPCMKDR
LQMPYTDVVHEIQRFIDLVP SNLPHAVTQDTHFRQYLIPKGTTFVPLLSVLYDSKEFP
NPEQFDPGHFLDENGSKSDYFMPFSAGKRVCGEGLARMELFLFLTTLQNFRTLKPLV
DPKDIDITPIANGFNVPPSYKLCFLPR

>N140 (SEQ ID NO:86)

---MEPLGM-TTIFLM-VCISC--LLFSAWRSI----SRT-G-KQPPGPIPLPIVGNILQ
LNPRNLQPSLEELSKKYGPVFTIHLGP-QKVVVLYGYDAVKEALIDQADEFSGRGNLPFLF
DKLFQGTGIVTSNGETWKQLRRFALTTLRDFGMGKKSIEERIQQEAHFLVERLRNTHERP
FNPSNFLIHAVSNIICSIVFGDRFDYEDKKFLTIELLEENKLQNSIQTLYNFFPTVM
DYLPGPHQKMIKNIKVDKFI SEIVTAHQESLDPTCP-RDFIDAFLIKMEQEKGNHSEF
TTETLTRTTLDLFFAGTGTTSTTLRYGLLILLYPEIEEKIHK EIDRVIGRDRSPCMADR
SQMPYTDVAIHEIQRFIDFLPLNVPHAVTKDTKFRDYLPKGTMIFFVLRSLVHDSKEFP
NPEQFDPGHFLNANGTFKKSDYFMPFSAGKRICAGEGLARMELFIFLTSILQNFRTLKPVV
DHKDIDISPIISSLANMPPRYEVSFLPR

>N157 (SEQ ID NO:87)

---MEL----SVLLLL-TVLLG-LLLLLARGQP----KSR-G-RLPPGPRPLPLLGNLLQ
MDRRGLLKSFLKLREKYGDVFTVYLGS-RPVVVLGCGYEAVKEALVDQAEFSGRGTIAIV
DSIFQGYGVIFANGERWKTLRRFSLATLRDFGMGKRSIEERIQQEAQCLVEELRKSQGAL
LDPTFLFHSVTANIICSIVFGERFDYQDTQFLELLNMFNETFTLISSLWGQLFELEFSGIL
KYFPGPHRRIYKNLQEI KDFIAESVEKHQETLDPSSP-RDFIDSFLLRMEKEKSNPDSEF
HHKNLVLTVLSLFFAGTETTSTTLRYGFLLLLKYPEVAEKVQEEIDRVIGRNRAPALED
AKMPYTDVAIHEIQRFSDLP MGVP HCVT KDTHFRGYHLPKGT DVYPLLSSVLHDPKYFE
KPDADFDPGHFLDAQGSFKNEAFIPFSMGKRICLGEGLARTEFLFFTTTLQNFSLSSPK
PPEDIDLTPQVSGLGTLPPTYQLCFLPR

>N159 (SEQ ID NO:88)

---MELGGA-ATLLLA-ICLSC-LLLLSAWRKR----QRR-G-KLPPGPTPLPLLGNLLQ
LKRSELLKSLMKLREKYGPVFTVYLGP-RPVVVLGCGYEAVKEALVDQAEFSGRGEMPTL
DRIFQGYGVVFANGERWKQLRRFSLTTLRNFGMGKRSIEERIQQEAQCLVEEFRKTGAP
FDPTFFLSRAVSNVICSIVFGNRFDYEDKKFLSLLRMINETFREMS SPWSQLYEMFPSIM
KYLPGPHHRIFKLLEELKDFIAERVKMNQETLDPNSP-RDFIDCFLIKMEQEKQNPNSEF
NMKNLVLTTLNLFFAGTETVSTTLRYGFLLLMKYPEVQEKVHEEIDRVIGRNRSPAMEDR
SRMPYTDVAIHEIQRFSDIIPMGVPHAVTRDTQFRGYLIPKGT DVFPLLGSVLHDPKYFK
NPEAFNPGHFLDENGFRKKND AFMPFSSGKRVC LGEGLARMELFLFFTTTLQNFRTLKSPV
PPEDIDITPKVSGFANIPPSYQLCFLPR

>N169 (SEQ ID NO:89)

---MDPLGL-TTLVLV-VCVSF-LLFLSVWRKG----SKRLG-KLPPGPTPLPIIGNILQ
LNLKNLPTSFSKLAKEYGPVFTLYLGS-QPVVVLHGYEAVKEALIDQGDEFSGRGNIPIF
DDTLKGQGIVFSHGERWKQMRRLMTLRNFGMGKRSIEERIQQEAQCLVEELRKTGQPF
FDPTFILGCAPCNVICSILFHERFNYNDEKFLHLMNLLNENFRLLNSPWIQLYNLFPFSFI
HYLPGEHRKFFKNVQELKDFILERVKEHQETLDPNNP-RDYIDCFLSKMEQEKHNPQSEF
NLENLVTTGSDLFSAGTETTSTTLRYGLLLLLKHPEVEAKVHEEIDRVIGRNRIPCMKDR
LQMPYTDVVHEIQRFIDLVP SNLPHAVTQDTQFRQYFIPKGTTFVPLLSVLYDSKEFP
NPEQFDPGHFLDKNGSFKKSDYFMPFSIGKRACLGEGLARMELFLFLTTLQNFRTLKPVV

DPKEIDIKPISNGFVNVPPSYKLCFLPR

>N170 (SEQ ID NO:90)

---MAPLG--TTLALL-VWVAF-LLFISVWKQI---YSSW---KLPPGPFPPLPIIGNIFQ
LDLKNIPKSFSLAEKYGPVFTLYLGS-RRVVVLHGYKAVKEALLDHKNEFSGRGDIPAF
EAHK-DQGIIFNNGETWKDTRRFSMTLRDFGMGKQSNEERIQREAHFLVEALRKTNGQP
FDPTFVLGCAPCNVICDILFHKRFDYNDKTCLRLMNLFNENFYLLSTPWLQLYNNFSSFL
HYLPGSHRKLLKNVSELKDYALERVKEHQETLDPNNP-RDFTDCLLIQMEKEKHNPQPGF
NLENIAVTVADLFFAGTETTSTTLRYGLLILLKHPEVEEKLHEEIDRVIGPNRIPSMKDR
LEMPYMDAVVHEIQRFINLVP SNLPHAVTQDTHFRGYLIPKGTTVFPTLDSVLYDSQEF
NPEQFDPGHFLNENGKFKYSDYFKAFSAGKRVCGEGLARMELFLFLTITLQHFNLKPLV
DPKDIDISPITIGFGSIPPSYKLCVLP

>N196 (SEQ ID NO:91)

M--MEAAGAWA-LLLV-LVLLL-LLALSAQKPAR-----G-RLPPGPAPLPLLGNLLQ
LRLSALFNSLLKLSKKYGPVFTVYLGSWRPVVVLCGYEAVKEALVDQAEFSGRGKIATL
DRTFQGHGVFFSNGERWRQLRKFTTLALRDLGMGKREGEERIQEEAQCLVEAFRSTKGS
FDPSLLLSQATSNIICSLVFGQRFYEDKQFQAMVRATGGTLTEISSPWGQVYEMFSRIL
KYLPGPHRLLRLHGLTAAAFVAEQVQKHQETLDPSSPARDFIDAFLLKMEKEKQNPNEF
HHKNLMTTINLLFAGTVTVSTTLRYAFLLLKYPEVQERVHEELNRELGRGRAPSLGDR
ARLPYTDVAVLHEVQRFALIPMGVPRAVTKTTRFRGYTLPQGTEVFPLLGSVLHDPPEFFE
KPEEFNPGHFLDADGRFKKNEAFLPFSSGKRICLGEGLARTEFLFFTITLQNFSLSPC
PPGALSILQPAVSGLANIPPTFQLRFRPR

>N200 (SEQ ID NO:92)

---MDLSGA-ITLFLV-ICLSC-LLLLSTWRQR----QRR-G-KLPPGPPTPLPLIGNLLQ
LNTSQMLKSLMKISERYGPVFTIHLGP-RRVVVLCGYEAVKEALVDQAEFSGRGEQATF
DWIFQGYGVAFSNGERAKQLRRFSITTLRNFGVGKRGIEERIQEEAQFLIEALRGTKGAP
FDPTFFLSRTVSNVISSIVFGDRFDYEDKEFLSLLRMMTESFRFTATSWGQLYEMFPSIM
KYLPGPQHAKFLLGLEDFIAKKVKMNQETLDPNSP-RDFIDCFLIKMQQEKQNPNEF
SMKNLVMTTNLFFAGTETVSTTLRYGFLLLKHPEVEEKEVHEEIDRVIGRNRSPSMEDR
SRMPYTDVAVIHEIQRFSDIIPMGLPRRVTKDTQFRGYTIPKGTEVFPLLGSVLHDPKYFS
NPEAFNPGHFLDNGQFKKNDAFMPFSIGKRYCFGEGLARMELFLFLTITLQNFREFKSPV
PPQDIDISPKLVGFANIPPSYQMCLVPR

>N218 (SEQ ID NO:93)

---MELLGA-TTVVLL-VCIAAC-LLSFAAWRKR----SGK-G-KMPPGPVPLPILGNMLQ
VKPKNLAKTLHLKSEKYGPVFTVHLGS-EPVVVLHGYDVVKEALIDRADEF AARGHMP IG
DRANGLGIIFSNNEEWLQVRRFALSTLRNFGMGKRSIEERIQEEAEYLLIEINKTKRMP
FDPTFMLSACVSNVICSIVFGKRYDYKDKKFLALMNNMNNIFQMMNSHWGQLYQMFPKIL
DYLPGPHNKIFAEDALKAFVSEEVKKHQASLDPSSP-QDFIDCFLSKMQEKENANSF
HMKNLITSTFDLFIAGTETTSTTIRYGLLLLLLKYPKIQEKVQEEIDQVVGRSRRPCVADR
TQMPYTDVAVVHEIQRFIALVPLGLPHTVTKDTHFREYVIPKGTTIFPILSSVLHDSKEFP
NPNEFNPGHFLNENGTFRKSKFFMPFSAGKRICPGEGLARMEIFLLIATITLQNFRTLPV
DPQEINITPTLSGTGNVPPAYQLCALPR

>N312 (SEQ ID NO:94)

---MLASGL-LLVALL-ACLSV-MVLMVVRQR----KLR-G-KLPPGPPTPLPFIGNYLQ
LNTEQMYSNLMKISERYGPVFTIHLGP-RRVVVLCGYDAVKEALVDQAEFSGRGEQATF
DWLFKGYGVAFSNGERAKQLRRFSIATLRDFGVGKRGIEERIQEEAGFLIEALRGTRGAF
IDPTFYLSRTVSNVISSIVFGDRFDYEDKEFLSLLRMMTGSGFTATSTGQLYEMFSSVM
KHLPGPQQQAFKELQGLEDFIAKKVEQNQRTLDPNSP-RDFIDSFLIRMQEEKKNPNTF
YMKNLVMTTNLFFAGTETVSTTLRYGFLLLMKHPDVEAKVHEEIDRVIGRNRQPKFEDR
MKMPYTEAVIHEIQRFQDVIPMGLPRRVTKDTKFRDFLIPKGTEVFPLLGSVLKDPKFFS
NPEDFNPGHFLDNGQFKKNDAFVPFSIGKRYCFGEGLARMELFLFLTITLQNFREFKSPQ
APQDIDVSPKLVGFATIPPNYTMSFLPR

Figure 4

CYP2_A1

>N3 (SEQ ID NO:95)

MAKKTSSSLGRLPPGPTPLPLLGNLLQLDTKAPFKSFMKLSEKYGPVFTVYLGSWQPVVVLCGYEAVKEALVDH
GEEFSGRAAIPVLQRITKGYGLVVSNGERWKQLRRFTLTTLRNFGMGKRSIEERIQEEAQYLVOAFSETKGKP
FDPTFLLSCAVSNVICSIVFGQRFDYEDKQFLTLNLINEIFRFVSSPWGQLYNIFPRLMDHLPGPHHKIFAN
VEKLKDFIRERVKRHQETLDPNSPARDYIDCFLIKMEQEKQNPNSEFHYNLVMTVLNLFFAGTETTSTTLRY
SLLVLLKYPHIQEKVQQEIDRVIGRDRSPAMEDRAKMPYTDABIHEIQRFIDIVPMSLPHMVTRDTQFRGYTI
PKGTTVIPLLSSVLHDPKQWKNPETFNPEHFLDENGSEFKKNDAFMPFSAGKRMCLGEGGLARMELFLFFTTLLQ
KFTFRPLEDPEEIDLTPEVSGFGNMPSYQLCAIPR

>N8 (SEQ ID NO:96)

MAKKTSSRLRLPPGPTALPLIGNLLQLDKKAPFKSFMKFSETYGPVMTVYLGPRMVVLVGYEAVKEALVDQA
DDFTGRAPIPFLHRITKGYGLAISNGERWRQLRRFTLTTLRDFGMGRKGMEEWIQEESKYLVKSFSETKGKPF
DPTFFLSCTVSNVICSIVFGQRFDYEDKQFLHLLQIISEILRFASSPWGQLYNIFPRLMERLPGPHHTIFANI
EELREFIRTKIKEHQETLDPSSPRDYIDCFLIRMNQEKDNPNTTEFHYNLVSSTVLNLFFAGTETTSTTLRYAL
MVLIKYPHIQEKMQQEIDRVIGRDRCPMEDRKSPLFTDAVIHEVQRFIDIVPLSLPHYALKDISFRGYTIPK
DTVIIPLLHSLRDEKQWETPWFNPEHFLDQNGNFKKNPAPMPFSAGKRACVGEGLARMELFLFIVSLLQKF
TFSSPEGPDSIDLSPELSSFANMPRSYQLIATPR

>N13 (SEQ ID NO:97)

MAKKTSSGRLPPGPTPLPLLGNLLQLDTKELLKSLMKLSEKYGPVFTVYLGSWQPVVVLCGYEAVKEALVDH
GEEFSGRGEMPVLDRITKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQYLVEEFRKTKGQP
FDPTFLLSCAVSNVICSIVFGERFDYEDKKFLTLNLINEFRLMSSPWGQLYNIFPSLMDHLPGPHHKIFKN
FEKLKDFIAERVKMHQETLDPNSPARDYIDCFLIKMEQEKQNPNSEFHMENLVMTTNLNLFFAGTETTSTTLRY
GFLILLKYPEIQEKVHEEIDRVIGRNRSPSMEDRSKMPYTDABIHEIQRFIDIVPMGLPHAVTRDTHFRGYTI
PKGTTVFPLLSSVLHDPKQFKNPEAFNPGHFLDENGSEFKKNDAFMPFSAGKRICLGEGLARMELFLFFTTILQ
NFTLKPLVDPEEIDITPEVSGFGNIPRPYQLCLVPR

>N24 (SEQ ID NO:98)

MAKKTSSRRLPPGPTPLPLLGNLLQLDTKELLKSLMKLSEKYGPVFTVYLGSWQPVVVLCGYEAVKEALVDQ
AEEFSGRGEMPVLDRITKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRKTKGAP
FDPTFLLSRAVSNVICSIVFGERFDYEDKKFLTLNLINEFRLMSSPWGQLYNIFPSLMDHLPGPHHKIFKN
FEKLKDFIAERVKMHQETLDPNSPARDYIDCFLIKMEQEKQNPNSEFHMENLVMTTNLNLFFAGTETTSTTLRY
GFLILLKYPEVQEKVHEEIDRVIGRNRSPSMEDRSRMPYTDABIHEIQRFIDIPMGLPHAVTRDTHFRGYTI
PKGTNVFPLLSSVLHDPKQFKNPEAFNPGHFLDENGSEFKKNDAFMPFSAGKRICLGEGLARMELFLFFTTILQ
NFTLKPLVDPEEIDITPEVSGFGNIPRPYQLCLVPR

>N38 (SEQ ID NO:99)

MAKKTSSRRLPPGPTPLPLLGNLLQLDRKELLKSLMKLSEKYGPVFTVYLGSWQPVVVLCGYEAVKEALVDQ
AEEFSGRGEMPVLDRIFKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRKTKGAP
FDPTFLLSRAVSNVICSIVFGERFDYEDKKFLTLNLINEFRLMSSPWGQLYNIFPSIMDHLPGPHHKIFKN
FEKLKDFIAERVKMHQETLDPNSPARDYIDCFLIKMEQEKQNPNSEFHMENLVMTTNLNLFFAGTETVSTTLRY
GFLILLKYPEVQEKVHEEIDRVIGRNRSPSMEDRSRMPYTDABIHEIQRFSDIIPMGLPHAVTRDTHFRGYTI
PKGTNVFPLLSSVLHDPKQFKNPEAFNPGHFLDENGSEFKKNDAFMPFSAGKRICLGEGLARMELFLFFTTILQ
NFTLKSPVDPEEIDITPEVSGFGNIPRPYQLCLVPR

>N54 (SEQ ID NO:100)

MAKKTSSRRLPPGPTPLPLLGNLLQLKRKELLKSLMKLSEKYGPVFTVYLGSRPVVVLCGYEAVKEALVDQ
AEEFSGRGEMPVLDRIFKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRKTKGAP
FDPTFLLSRAVSNVICSIVFGERFDYEDKKFLTLNLINEFRLMSSPWGQLYNIFPSIMKHLPGPHHKIFKN
FEKLKDFIAERVKMHQETLDPNSPARDYIDCFLIKMEQEKQNPNSEFHMENLVMTTNLNLFFAGTETVSTTLRY
GFLILLKYPEVQEKVHEEIDRVIGRNRSPSMEDRSRMPYTDABIHEIQRFSDIIPMGLPHAVTRDTHFRGYTI
PKGTNVFPLLSSVLHDPKQFKNPEAFNPGHFLDENGSEFKKNDAFMPFSAGKRICLGEGLARMELFLFFTTILQ
NFTLKSPVDPEDIDITPEVSGFGNIPRPYQLCLVPR

>N81 (SEQ ID NO:101)

MAKKTSSRRLPPGPTPLPFLGNLLQLKRKELLKSLMKLSEKYGPVFTVYLGSRPVVVLCGYEAVKEALIDQA
EEFSGRGEMPVLDRISKGYGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQFLVEEFRNTKGAPF
DPTFFLSRAVSNVICSIVFGERFDYEDKKFLTLNLINEFRLMSSTWGQLYNIFPKIMRHLPGPHHKIFKNF
EKLKEFIAERVKMHQETLDPNSPRDFIDCFLIKMQEKQNPNSEFHMENLVKTTNLNLFFAGTETVSTTLRYGF
LILLKHPEVQEKVHEEIDRVIGRNRSPCMEDRSRMPYTDABIHEIQRFSDIIPMGLPHTVTRDTHFRGYTIPK

GTNVFPLLSSVLHDPKQFKNPEAFNPGHFLDENGFRFKKNDAFMPFSAGKRICLGEGLARMELFLFFTITILQNF
TLKSPVDPEDIDITPEVSGFGNIPRPYQLCLIPR

>N82 (SEQ ID NO:102)

MAKKTSSRGRLLPPGPTPLPLLGNLLQLKRSELLKSLMKLSEKYGPVFTVYLGSRPVVVLTCGYEAVKEALVDQ
AEFSGRGEMPTLDRIFQGYGVVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRKTKGAP
FDPTFFLSRAVSNVICSIVFGERFDYEDKKFLSLLRMINETFRMLSSPWGQLYEMFPSIMKYLPGPHHKIFKN
LEELKDFIAERVVMHQTLDPNSPARDFIDCFLIKMEQEKQNPNSEFHMKNLVMTTNLNFFAGTETVSTTLRY
GFLLLKYPEVQEKVHEEIDRVIGRNRSPSMEDRSRMPYTDABIHEIQRFSDIIPMGVPHAVTRDTHFRGYTI
PKGTDVFPLLSSVLHDPKYFKNPEAFNPGHFLDENGFRFKKNDAFMPFSSGKRICLGEGLARMELFLFFTITILQ
NFTLKSPVPPEDIDITPKVSGFANIPPSYQLCLVPR

>N118 (SEQ ID NO:103)

MAKKTSSRGRLLPPGPTPLPLLGNLLQLKRSELLKSLMKLSEKYGPVFTVYLGPRPVVVLTCGYEAVKEALVDQA
EEFSGRGEMPTLDRIFQGYGVVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRKTKGAPF
DPTFFLSRAVSNVICSIVFGNRFDYEDKKFLSLLRMINETFRMLSSPWGQLYEMFPSIMKYLPGPHHKIFKLL
EELKDFIAERVVMHQTLDPNSPARDFIDCFLIKMEQEKQNPNSEFNMKNLVMTTNLNFFAGTETVSTTLRYGF
LLLLKYPEVQEKVHEEIDRVIGRNRSPSMEDRSRMPYTDABIHEIQRFSDIIPMGVPHAVTRDTQFRGYTI
PKGTDVFPLLGSVLHDPKYFKNPEAFNPGHFLDENGFRFKKNDAFMPFSSGKRICLGEGLARMELFLFFTITILQNF
TLKSPVPPEDIDITPKVSGFANIPPSYQLCLVPR

>N159 (SEQ ID NO:104)

MAKKTSSRGRLLPPGPTPLPLLGNLLQLKRSELLKSLMKLREKYGPVFTVYLGPRPVVVLTCGYEAVKEALVDQA
EEFSGRGEMPTLDRIFQGYGVVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQCLVEEFRKTKGAPF
DPTFFLSRAVSNVICSIVFGNRFDYEDKKFLSLLRMINETFRMSSPWSQLYEMFPSIMKYLPGPHHRIFKLL
EELKDFIAERVVMHQTLDPNSPARDFIDCFLIKMEQEKQNPNSEFNMKNLVLTTNLNFFAGTETVSTTLRYGF
LLLLKYPEVQEKVHEEIDRVIGRNRSPAMEDRSRMPYTDABIHEIQRFSDIIPMGVPHAVTRDTQFRGYTI
PKGTDVFPLLGSVLHDPKYFKNPEAFNPGHFLDENGFRFKKNDAFMPFSSGKRVCCLGEGLARMELFLFFTITILQNF
TLKSPVPPEDIDITPKVSGFANIPPSYQLCLVPR

>N200 (SEQ ID NO:105)

MAKKTSSRGRLLPPGPTPLPLIGNLLQLNTSQMLKSLMKISERYGPVFTIHLGPRRVVVLTCGYEAVKEALVDQA
EEFSGRGEQATFDWIFQGYGVAFSNGERAKQLRRFSITTLRNFGVGKRGIEERIQEEAQFLIEALRGTKGAPF
DPTFFLSRTVSNVISSIVFGDRFDYEDKEFLSLLRMMTESFRFTATSWGQLYEMFPSIMKYLPGPQHAKFKLL
EGLEDFAIAKKVMHQTLDPNSPARDFIDCFLIKMQEKQNPNSEFSMKNLVMTTNLNFFAGTETVSTTLRYGF
LLLLKHPEVEEKVHEEIDRVIGRNRSPSMEDRSRMPYTDABIHEIQRFSDIIPMGLPRRVTKDTQFRGYTI
PKGTEVFPLLGSVLHDPKYFSNPEAFNPGHFLDDNGQFKKNDAFMPFSSIGKRYCFGEGLARMELFLFLTITILQNF
RFKSPVPPQDIDISPKLVGAFANIPPSYQMCLVPR

>N312 (SEQ ID NO:106)

MAKKTSSRGRLLPPGPTPLPFIGNYLQLNTEQMYNSLMKISERYGPVFTIHLGPRRVVVLTCGYDAVKEALVDQA
EEFSGRGEQATFDWLFKGYGVAFSNGERAKQLRRFSIATLRDFGVGKRGIEERIQEEAGFLIEALRGTRGAFI
DPTFFLSRTVSNVISSIVFGDRFDYEDKEFLSLLRMMTGSGFTATSTGQLYEMFSSVMKHLPGPQQQAFKEL
QGLEDFAIAKKVEQNQRTLDPNSPARDFIDSFLIRMQEEKKNPNTFYMKNLVMTTNLNFFAGTETVSTTLRYGF
LLLLMKHPDVEAKVHEEIDRVIGRNRQPKFEDRMKMPYTEAVIHEIQRFSDIIPMGLPRRVTKDTKFRDFLIPK
GTEVFPMGLSVLKDPKFFSNPEDFNPQHFLDDNGQFKKNDAFVPFSSIGKRYCFGEGLARMELFLFLTITILQNF
RFKSPQAPQDIDVSPKLVGAFATIPPNYTMSFLPR

>N117 (SEQ ID NO:107)

MAKKTSSRGRLLPPGPAPLPLLGNLLQLKRSALLKSLKLSEKYGPVFTVYLGSRPVVVLTCGYEAVKEALVDQ
AEFSGRGEIATLDRIFQGYGVVFSNGERWKQLRRFSLTTLRDFGMGKRSIEERIQEEAQCLVEEFRKTKGAP
FDPTFFLSQATSNIICSIVFGERFDYEDKQFLELLRMINETFTLISSPWGQLYEMFSRILKYLPGPHRRIFKN
LEELKDFIAERVQKHQETLDPSSPARDFIDCFLIKMEKEKQNPNSEFHKNLVMTTNLNFFAGTETVSTTLRY
GFLLLKYPEVQEKVHEEIDRVIGRNRAPSMEDRARMPYTDABIHEIQRFSDIIPMGVPHAVTKDTHFRGYTL
PKGTDVFPLLSSVLHDPKYFEKPEAFNPGHFLDAQGRFKKNEAFMPFSSGKRICLGEGLARTEFLFFTITILQ
NFSLSSPVPEDIDLTPQVSGLANIPPTYQLCFVPR

>N157 (SEQ ID NO:108)

MAKKTSSRGRLLPPGPRPLPLLGNLLQMDRGLLKSLKLREKYGDVFTVYLGSRPVVVLTCGYEAVKEALVDQA
EEFSGRGITIAIVDSIFQGYGVIFANGERWKTLRRFSLATLRDFGMGKRSIEERIQEEAQCLVEELRKSQGALL
DPTFLFHSVTANIICSIVFGERFDYQDTQFLELLNMNETFTLISSLWGQLFELFSGILKYFPGPHRRYKKNL
QEIKDFIAESVEKHQETLDPSSPARDFIDSFLLRMEKEKSNPDSEFHKNLVLTVLSLFFAGTETTSTTLRYGF
LLLLKYPEVAEKVQEEIDRVIGRNRAPALEDRAKMPYTDABIHEIQRFSDIIPMGVPHCVTKDTHFRGYHLPK
GTDVYPLLSSVLHDPKYFEKPDADFPGHFLDAQGSFKKNEAFIPFSMGKRICLGEGLARTEFLFFTITILQNF
SLSSPKPPEDIDLTPQVSGLGLTPPTYQLCFLPR

>N196 (SEQ ID NO:109)

MAKKTSSRGRLLPPGPAPLPPLLGNLLQLRLSALFNSLLKLSKKYGPVFTVYLGSRPVVVLTCGYEAVKEALVDQ
AEFSGRGKIATLDRFTQGHGVFFSNGERWRQLRKFTTLALRDLGMGKREGEERIQEEAQCLVEAFRSTKGSP
FDPSSLSSQATSNIICSLVFGQRFDYEDKQFQAMVRATGGTLTEISSPWGQVYEMFSRILKYLPGPHRRLLRH
LGTAAAFVAEQVQKHQETLDPSSPARDFIDAFLLKMEKEKQNPVNEFHKNLLMTTINLLFAGTVTVSTTLRY
AFLLLKYPEVQERVHEELNRELGRGRAPSLGDRARLPYTDVAVLHEVQRFALALIPMGVPRAVTKTTRFRGYTL
PQGTEVFPLLGSVLHDPEFFFEKPEEFNPGHFLDADGRFKKNEAFLPFSSGKRICLGEGLARTEFLFFTTILQ
NFSLESPCPPGALSQPAVSGLANIPPTFQLRFRPR

>N37 (SEQ ID NO:110)

MAKKTSSRGRLLPPGPTPLPLLGNLLQLDTEMLKSLMKLSEKYGPVFTVHLGSQPVVVLTCGYEAVKEALVDQA
EEFSGRGDMPVLYRFTKNGIAFSNGERWKVLRRLSLQTLRNFGMGKRSIEERIQEEAQCLVEEFRKTKGAPF
DPTFLLSRAVSNVICSVVFGERFDYEDKKFLTLLNLINENFQLMSSPWGQLYNIFPSLMDWLPGPHHRIFQNF
EKLKDFIAERVKRHQETLDPNSPRDFIDCFLIKMEQEKQDPQSHFHMETLVMTHNLFFAGTETTSTTLRYGF
LILMKYPEVQAKVHEEIDRVIGRNRSPSLEDRSRMPYTDVIHEIQRFIDIPMGLPHAVTRDTHFRGYLLPK
GTNVIPLLSVLHDPTQFKNPEAFNPGHFLDEKGSFKKNDAFMPFSAGKRICLGEGLARMEFLFFTTILQNF
TLKPLVDPEEIDLTPQVSGLGNIPRPYQLCLVPR

>N77 (SEQ ID NO:111)

MAKKTSSRGRLLPPGPRPLPLLGNLLQLRSRDMLTSLTKLSKEYGSVFTVHLGSRPVVVLTCGYEAVKEALVDQA
EEFSGRGDYPVFYNFTKNGIAFSNGERWKVLRRLSVQTLRNFGMGKRSIEERILEEASFLLLEELRKTEGAPF
DPTFVLSRSVSNIICSVVFGSRFDYEDERLLTLIHLINENFQIMSSPWGEMYNIFPSLDDWVPGPHQRFLQNF
GRMKDLIARSVREHQASLDPNSPRDFIDCFLIKMAQEKQDPLSHFHMETLVMTHNLFFGGTETVGTTLRHAF
LVLMKYPKVQARVQEEIDRVVGRARRPTLEDRSAMPYTDVIHEVQRFADIPMNLPHRVTRDTAFRGFLLPK
GTDVITLLNTVHYDPSQFKTPQEFNPEHFLDAKQSFKKSPAFMPFSAGRRLCLGESLARMEFLLYLTAILQNF
TLQPLGAPEEIDLTPLSGLGNIPRPYQLRLVPR

>N112 (SEQ ID NO:112)

MAKKTSSRGRLLPPGPTPLPLLGNLLQLEPGGLDKSLMELSRRYGPVFTVRLGPQPVVVLTCGYEALREALVLQA
DFSGRGGMPVDFRFTRGNGIVFSNGHRWRTLNRNFBALGALKKFGMGTRSIEERIQEEAACLVQEFQATKGAPFD
PLRLLSNAVSNVICSVVFGERYGYEDPDFLTLLDLFNDNFQIMSSQWGEMYNIFPSLDDWLPGPHHRIFRNF
KLRAFISEQIQRHQETRQPEEPRDFIDCFLDQMEKEKQDPQSHFHMETLVMTHNLFFGGTETTSTTLRYGLL
ILLKYPEVAAKVQEEIDSVVGRARAPCLEDRARLPYTNVIHEIQRFISVLPMGLPHALTRDTHFRGHFLPKG
TNVIPLLSVAHQDPTQFKDPESFNPNFLDDKGAFQNNFAFMPFAPGKRICLGAGLARMEIFLFLTTILQHFT
LLPVESPEEIDLTPQCTGLGNVPPPFQLRLVPR

>N23 (SEQ ID NO:113)

MAKKTSSGGKLPPGPTPLPLLGNILQLNTKELPKSLMKLSEKYGPVFTVYLGSRPVVVLTCGYEAVKEALVDHG
EEFSGRGEMPIIDKITKGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQYLVEEFRKTKGQPF
DPTFLLSCAVSNVICSIIVFGERFDYEDKKFLTLLNLLNETFRLSSPWGQLYNFFPSLMDHLPGPHQKIFKNF
EKLKDFIAERVVMHQETLDPNSPRDFIDCFLIKMEQEKQNPSEFHMENLVMTTLDLFFAGTETTSTTLRYGF
LILLKYPEIQEKVHEEIDRVIGRNRSPSMEDRSKMPYTDVIHEIQRFIDIVPLGLPHAVTRDTHFRGYTIPK
GTTIFPLSSSVLHDPKQFKNPEQFNPGHFLDENGSEFKKNDAFMPFSAGKRICLGEGLARMEFLFLTTILQNF
TLKPLVDPEDIDITPEVSGFGNIPRPYQLCFVPR

>N35 (SEQ ID NO:114)

MAKKTSSLGLKPPGPTPLPILGNILQLNTKNLPKSLHKLSEKYGPVFTVYLGSRQVVLVLYGYEAVKEALVDHG
EEFSGRGNMPIIDKINKGLGIVFSNGERWKQLRRFSLTTLRNFGMGKRSIEERIQEEAQYLVEELRNKTKGQPF
DPTFLLSCAVSNVICSIIVFGERFDYEDKKFLTLLNLLNETFRLSSPWGQLYNFFPSLMDHLPGPHQKIFKNF
EKLKDFIAERVVMHQETLDPNSPRDFIDCFLIKMEQEKQNPSEFNMENLVMTTLDLFFAGTETTSTTLRYGL
LILLKYPEIQEKVHEEIDRVIGRNRSPSMEDRSQMPYTDVIHEIQRFIDLVPLGLPHAVTRDTHFRGYTIPK
GTTIFPLSSSVLHDPKQFKNPEQFNPGHFLDENGSEFKKNDAFMPFSAGKRICLGEGLARMEFLFLTTILQNF
TLKPLVDPEDIDITPEVSGFGNIPRPYQLCFVPR

>N47 (SEQ ID NO:115)

MAKKTSSGGKLPPGPTPLPIIGNILQLNTKNLPKSLHKLSEKYGPVFTVYLGSRQVVLVLYGYEAVKEALIDHG
DEFSGRGNMPIIDKINKGLGIVFSNGERWKQLRRFALTTLRNFGMGKRSIEERIQEEAQYLVEELRNKTKGQPF
DPTFLLSCAVSNVICSIIVFGERFDYEDKKFLTLMNLLNENFRLNSPWGQLYNFFPSLMDYLPGPHQKIFKNF
EELKDFILERVVMHQETLDPNSPRDFIDCFLIKMEQEKQNPSEFNMENLVMTTLDLFFAGTETTSTTLRYGL
LILLKYPEIEEKVHEEIDRVIGRNRSPCMADRSQMPYTDVIHEIQRFIDLVPLGLPHAVTRDTHFRQYIIPK
GTTIFPLSSSVLHDSKEFPNPEQFNPGHFLDENGSEFKKSDYFMPFSAGKRICVGEGLARMEFLFLTTILQNF
TLKPLVDPKDIDITPEVSGFGNVPRPYQLCLFLPR

>N69 (SEQ ID NO:116)

MAKKTSSGGKLPPGPTPLPIIGNILQLNTKNLPKSLHKLSEKYGPVFTLYLGSQRVVVLHGYEAVKEALIDHG
DEFSGRGNMPIIDKINKGLGIVFSNGERWKQLRRFALTTLRNFGMGKKSIEERIQQEAAQYLVEELRNTHGRPF
DPTFLLSCAVSNVICSIIVFGKRFDYEDKKFLTLNLLNENFRLNNSPWGQLYNLFP SLMDYLP GPHHKIFKNF
EELKDFILERVKEHQETLDPNSPRDFIDCFLIKMEQEKQNPKEFNENLVMTTLDLFSAGTETTSTTLRYGL
LILLKYPEIEEKVHEEIDRVIGRNRSPCMADRSQMPYTD A VIHEIQRFIDLVP LGLPHAVTQDTHFRQYIIPK
GTTIFP LLSVLHDSKEFPNPEQFNPGHFLDENG SFK KSDYFMPFSAGKRICVGEGLARMELFLFLT TILQNF
TLKPLVDPKDIDITPEVSGFGNVPRPYQLCFLPR

>N70 (SEQ ID NO:117)

MAKKTSSSGKLPPGPIPLPIIGNTLQLNTKNLPQSLHELSEKYGPVFTIYLGSRVVVLGYEAVKEALIDQG
DEFSGRGNLPLFDKISKGTGIVFSNGERWKQLRRFALTTLRNFGMGKKSIEERIQQEAAHFLVERLRNTHGRPF
DPTLFLTHAVSNVICSIIVFGDRFDYEDKKFLTLINLLEENNKLNQNSPWTQLYNFFPTLMDYLP GPHQKIFKNF
EELRKFI LERVKMHQESLDPNCP RDFIDAF L I KMEQEKQNSQSEFN TENLVRSTLDLFFAGTGT TSTTLRYGL
LILLKYPEIEEKVHEEIDRVIGRSRSPCMADRSQMPYTD A VIHEIQRFIDLVP LGVPHAVTRDTHFRQYIIPK
GTTIFPVLRSVLHDSKEFPNPEQFNPGHFLDENGAFK KSDYFMPFSAGKRICVGEGLARMELFLFLT TILQNF
TLKPLVDPKDIDITPEVSSLVNVPRPYQLCFLPR

>N140 (SEQ ID NO:118)

MAKKTSSSTGKQPPGPIPLPIVGNILQLNPRNLPQSLEELSKKYGPVFTIHLGPQKVVLGYDAVKEALIDQA
DEFSGRGNLPLFDKLFQGTGIVTSNGETWKQLRRFALTTLRDFGMGKKSIEERIQQEAAHFLVERLRNTHGRPF
NPSNFLIHAVSNIICSIVFGDRFDYEDKKFLTLIELLEENNKLNQNSIQ TQLYNFFPTVMDYLP GPHQKMIKNI
EKVDKFISEIVTAHQESLDP TCPRDFIDAF L I KMEQEKGN SHSEFTTETL TRTTLDLFFAGTGT TSTTLRYGL
LILLKYPEIEEKIHK EIDRVIGRDRSPCMADRSQMPYTD A VIHEIQRFIDLPLNVPHAVTKDTKFRDYLIIPK
GTMIFPVLRSVLHDSKEFPNPEQFDPGHFLNANGTFK KSDYFMPFSAGKRICAGEGLARMELFLFLT TILQNF
TLKPVVDHKDIDISPIISSLANMPR PYEVSFLPR

>N98 (SEQ ID NO:119)

MAKKTSSGGKLPPGPTPLPIIGNALQLKTKNLSKTLHKLSEKYGPVFTLYFGSERVVVLHGYEAVKEALIDRG
DEFAARGKMPIIDKINKGLGIFSNGERWKQLRRFALTTLRNFGMGKKSIEERIQQEAAQYLVEELRNTHGRPF
DPTFLLSCAVSNVICSIIVFGKRYDYEDKKFLALMNLNENFRLNNSPWGQLYNLFP SLMDYLP GPHHKIFKNF
EELKEFILEEVKEHQETLDPSSPRDFIDCFLIKMEQEKQNDKSEFNENLVMTTLDLFSAGTETTSTTLRYGL
LILLKYPEIEEKVQEEIDRVIGRSRSPCMADRSQMPYTD A VIHEIQRFIALVPLGLPHAVTQDTPFRQYIIPK
GTTIFPILSSVLHDSKEFPNPEQFNPGHFLNENGTFRKSDYFMPFSAGKRICVGEGLARMELFLFLT TILQNF
TLKPLVDPKDIDISP ELSGFGNVPRPYQLCVLPR

>N218 (SEQ ID NO:120)

MAKKTSSSGKMPPGPVPLPIILGNMLQVKPNLAKTLHKLSEKYGPVFTVHLGSEPVVLHGYDVVKEALIDRA
DEFAARGHMPIGDRANGLGIIFSNNEEWLQVRRFALSTLRNFGMGKRSIEERIQQEAAEYLLEEINKTKRMPF
DPTFMLSCAVSNVICSIIVFGKRYDYKDKFLALMNLNENFRLNNSPWGQLYNLFP SLMDYLP GPHNKFIAEF
DALKAFVSEEVKKHQASLDPSSPQDFIDCFLSKMQEKENANSSFHMKNLITSTFDLFIAGTETTSTTLRYGL
LLLLKYPKIQEKVQEEIDQVVGSRRCVADRTQMPYTD A VVHEIQRFIALVPLGLPHVTKDTHFREYVIPK
GTTIFPILSSVLHDSKEFPNPEFNPNGHFLNENGTFRKSKFFMPFSAGKRICPGEGLARMEIFLLIATILQNF
TLKPVDPQ EINITPTLSGTGNVPPAYQLCALPR

>N133 (SEQ ID NO:121)

MAKKTSSGKLPPGPTPLPIIGNILQLNTKNIPKSLCKLAKTYGPVFTLYLGSKRVVVLHGYEAVKEALIDHG
DEFSGRGSFPIDAINKGLGIVFSNGERWKQMRRLSLMTLRNFGMGKRSIEERIQQEAAKCLVEELRKTGQPC
DPTFILGCAPCNVICSIIFQKRFDYNDQKFLHLMELLNENFRILSSPWIQIYNLFP SLIHYLP GSHHKLKFNK
QELKDFILEKVKEHQETLDPNNPRDFIDCFLIKMEQEKHNPQSEFTMENLVITVSDLFGAGTETTSTTLRYGL
LLLLKHPEVTEKVHEEIDRVIGRNRSPCMKDRSSMPYTD A VVHEIQRYIDLVP TSLPHAVTQDIKFRQYLIPK
GTTILP LLSVLNDKEFPNPEQFDPGHFLDESNGFK KSDYFMPFSAGKRICVGEGLARMELFLFLT TILQNF
TLKPLVDPKDIDITPIANGFGNVPPSYKLCFLPS

>N134 (SEQ ID NO:122)

MAKKTSSRLKLPPGPTPLPIIGNILQLNLKNIPKSF SKLA EKYGPVFTLYLGSQRVVVLHGYEAVKEALIDHG
DEFSGRGNIPIDATNGQGIVFSNGERWKQMRRLSLMTLRNFGMGKRSIEERIQQEAAQCLVEELRKTGQPF
PTFILGCAPCNVICSIILFHKRFDYNDKKFLHLMNLNENFRLNNSPWIQIYNLFP SFIHYLP GSHRKLKFNK
ELKDFILERVKEHQETLDPNNPRDFIDCFLIKMEQEKHNPQSEFNENLVIITVSDLFSAGTETTSTTLRYGL
LLLLKHPEVEEKVHEEIDRVIGRNRIPCMKDR LQMPYTD A VVHEIQRFIDLVP SNLPHAVTQDTHFRQYLIPK
TTVFPL LSSVLDSKEFPNPEQFDPGHFLDENG SFK KSDYFMPFSAGKRVCVGEGLARMELFLFLT TILQNF
LKPLVDPKDIDITPIANGFGNVPPSYKLCFLPR

>N169 (SEQ ID NO:123)

MAKKTSSLGKLPPGPTPLPIIGNILQLNLKNLPTSF SKLA EKYGPVFTLYLGSQPVVLHGYEAVKEALIDQG
DEFSGRGNIPIDDTLKGQGIVFSNGERWKQMRRLSLMTLRNFGMGKRSIEERIQQEAAQCLVEELRKTGQPF

DPTFILGCAPCNVICSIILFHERFNYNDEKFLHLMNLLNENFRLNNSPWIQLYNLFPSFIHYLPGEHRKFFKNV
QELKDFILERVKEHQETLDPNNPRDYIDCFLSKMEQEKHNPQSEFNLENLVTTGSDLFSAGTETTSTTLRYGL
LLLLKHPEVEAKVHEEIDRVIGRNRIPCMKDRLQMPYTDVVHEIQRFIDLVP SNLPHAVTQDTQFRQYFIPK
GTTVFPLLSSVLYDSKEFPNPEQFDPGHFLDKNGSFKKSDYFMPFSIGKRACLGEGGLARMELFLFLTITILQNF
TLKPVVDPKEIDIKPISNGFVNVPPSYKLCFLPR
>N170 (SEQ ID NO:124)
MAKKTSSSWKLPPGPFPLPIIGNIFQLDLKNIPKSF SKLAEKYGPVFTLYLGSRRVVVLHGYKAVKEALLDHK
NEFSGRGDIPAFEAHKDQGIIFNNGETWKDTRRFSLMTLRDFGMGKQSNEERI QREAHFLVEALRKTNQGPFD
PTFVLGCAPCNVICDILFHKRFDYNDKTCRLMNLFNENFYLLSTPWLQLYNNFSSFLHYLPGSHRKLKKNVS
ELKDYALERVKEHQETLDPNNPRDFTDCLLIQMEKEKHNPQPGFNLENI AVTVADLFFAGTETTSTTLRYGLL
ILLKHPEVEEKLHEEIDRVIGPNRIPSMKDRLEMPYMDAVVHEIQRFINLVP SNLPHAVTQDTHFRGYLIPKG
TTVFPTLDSVLYDSQEFNPPEQFDPGHFLNENGKFYSDYFKAFA SAGKRVCVGEGLARMELFLFLTITILQHFN
LKPLVDPKDIDISPITIGFGSIPPSYKLCVLPR
>N97 (SEQ ID NO:125)
MAKKTSSLGKLPPGPTPLPIIGNILQLNTKNIPKSLSKLAEKYGPVFTLYLGSQRVVVLHGYEAVKEALIDHG
DEFSGRGNIPIIDAINKGLGIVFSNGERWKQMRRFSLMTLRNFGMGKRSIEERI QEEAQCLVEELRKTKGQPF
DPTFILGCAPCNVICSIIFHKRFDYNDKKFLHLMNLLNENFRLNNSPWIQLYNLFPSLIHYLPGSHHKLKFNK
QELKDFILERVKEHQETLDPNNPRDFIDCFLIKMEQEKHNPQSEFNMENLVITVSDLFSAGTETTSTTLRYGL
LLLLKHPEVEEKVHEEIDRVIGRNRSPCMKDRSQMPYTDVVHEIQRFIDLVPSSLPHAVTQDTHFRQYLIPK
GTTIFPLLSSVLYDSKEFPNPEQFDPGHFLDENG SFKKSDYFMPFSAGKRICVGEGLARMELFLFLTITILQNF
TLKPLVDPKDIDITPIANGFGNVPPSYKLCFLPR

Figure 5

CYP2_A2

>2A_Mammal (SEQ ID NO:126)

MAKKTSSRGKLP PGPTPLPFIGNYLQLNTEQMYNSLMKISERYGPVFTIHLGPRRVVVL CGYDAVKEALVDQA
EEFSGRGEQATFDWLFKGYGVAFSNGERAKQLRRFSITTLRDFGVGKRGIEERIQQEEAGFLIEALRGTRGAFI
DPTFYLSRTVSNVISSIVFGDRFDYEDKEFLSLLRMLGSGFQFTATSTGQLYEMFYSVMKHLPGPQQQAFKEL
QGLEDFAIAKKVEQNQRTLDPNSPRDFIDSFLIRMQEEKKNPNTEFYMKNLVMTTLNLFFAGTETVSTTLRYGF
LLL MKHPDVEAKVHEEIDRVIGRNRQPKFEDRAKMPYTEAVIHEIQRF GDMIPMGLARRVTKDTKFRDFLLPK
GTEVF PMLGSVLRDPKFFSNPQDFNPQHFLDEKGFQKKSDAFVPFSIGKRYCFGEGLARMELFLFLTITIMQNF
RFKSPQAPQDIDVSPKHVGFATIPPNYTMSFLPR

>2AG (SEQ ID NO:127)

MAKKTSSRGKLP PGPTPLPFLGNLLQVRTDEMFKSLMKLREKYGPVFTVYLGPRRVVVL CGHEAVKEALVDQA
EEFSGRGEMPSLD RNFQGHGVAFANGERWKQLRRFSITTLRNFGMKRSIEERIQQEEAQYLLEEFKTKGAPF
DPTFFLSRTVSNVISSVVFSGRFDYEDKQFLSLLRMINESFREMSTPWAQLYDMYSGIMQYLP GPHNRIYYLI
EDLKDFIAERVKINQATLDPNSPRDFIDCFLIKMEQEEKKNPNSEFNMKNLVLTTLNLFFAGTETVSSTLRYGF
LLL MKYPEVEEKVHEEIDQVIGRNRSPAIEDRSKMPYTD AVIHEIQRFDTIIPMGVPHRVTRDTQFRGYTLPK
GTDVF PLLGSVLRDPKYFSNPENFN PQHFLDENGFRKKND AFVPFSSGKRVCLGEGLARMELFLFFTITILQNF
RLKSPVPPQDIDITPKMSGFANIPPSYQLCLVPR

>2B_Mammal (SEQ ID NO:128)

MAKKTSSHGHLPPGPRPLPFLGNLLQMDRKGLLKSFLQLREKYGDVFTVYLGPRPVVVL CGTEAIREALVDQA
EAFSGRGKIAVVDPVFQGYGVIFANGERWKALRRFSLATMRDFGMGKRSVEERIQQEEAQCLVEELRKSQGALL
DPTFLFHSVTANIICSI VFGKRFDYKDPQFLRLDLFYQSFSLISSFSSQVFELFSSILKHFP GTHRQIYKNL
QEINTFIGHSVEKHRETLDPSNPRDFIDTYLLRMDKEKSDPNSEFHHKNLILTVLSLFFAGTETTSTTLRYGF
LLL LKYPHVTERVQKEIEQVIGSHRPPALDDRAMPYTD AVIHEIQRFSDIIPMGVPHVTKDTHFRGYIIPK
NTEVYPILSSALHDP RYFEKPDTFNPDHFLDAKGA LKKNEAFIPFSMGKRICLGEGIARTEFLFFTITILQNF
SIASPVAPEDIDLTPQESGVGKVPPTYQISFLPR

>2BS (SEQ ID NO:129)

MAKKTSSRGHLPPGPAPLP LLLGNLLQLRP SALLNSLLRLSEKYGPVFTVHLGPWRPVVVL CGYEAVKEALVDQ
AEAFSGRGTLAAVDQIFQGYGVIFANGERWRQLRRFSLAALRDLGMGKREVEERIQQEEAQCLVEELRSTQGAP
LDPTLLLSQATSNIICSLIFGQRFDYEDQQLALLDATNEILSLISSPWGQVYEMFSGFLKYLP GPHRRISR
LQEI AAFIAQQVQHQETLDPSNPARDFIDTFLLRMEKEKSNPNTEFHHKNLVLTVLNLFFAGTVTVSTTLRY
GFL LLLKYPHVAERVQEELDQELGRGRAPSLGDRAMPYTD AVLHEVQRFLALVPMGVPHVTTRTTCFRGYTL
PQGTEVF PLLGSVLHDPEYFEKPD EYFGHFLDAEGHFRKNEAFLPFSLGKRVCLGEGLARTEFLFFTITILQ
NFSLESPCPPGDL SLPASVGLANIPPTFQLQVRPR

>2BSAG (SEQ ID NO:130)

MAKKTSSRGKLP PGPTPLP LLLGNLLQIRRGEMLSLMKLREKYGPVFTVYLG PWRPVVVL CGYEAVKEALVDQ
AEFSGRGTMPTLDRIFQGYGVVFANGERWKQLRRFSITTLRNFGMKRSIEERIQQEEAQCLVEEFKTKGAP
FDPTLLLSQAVSNVICSIVFGNRFDYEDKQFLSLLRMINEIFLEMS SPWSQLYDMFSGIMKYLP GPHNRIYRL
LEDLND FIAERVKKNQETLDPSNPARDFIDCFLIKMEQEKQNPSEFNMKNLVLTVLNLFFAGTETVSSTLRY
GFL LLLKYPEVQEKVHEEIDRVIGRNRAPAIEDRSMPYTD AVIHEIQRFSDIIPMGVPHVTTRDTQFRGYTL
PKGTDVF PLLGSVLRDPKYFSNPENFN PGHFLDENGFRKKND AFMPFSSGKRVCLGEGLARMELFLFFTITILQ
NFTLKSPVPPQDIDITPKVSGFANIPPSYQLCFLPR

>2C1_Mammal (SEQ ID NO:131)

MAKKTSSKGKLP PGPTPLPIIGNILQLDVKNISKSLSNLSKVYGPVFTLYFGMKPTVVLHG YEAVKEALIDHG
EEFSGRGSFPVAEKANKGHGII FSNGRWKEIRRFSLMTLRNFGMKRSIEDRVQEEARCLVEELRKTNASPC
DPTFILGCAPCNVICSIIFQNRFDYTDQNFLNLMEKFNENIKILSSPWIQVCNSFPVLIDYFPGSHNKLKNI
AYLKS YILEKVKEHQESLDINNPRDFIDCFLIKMEQEKHNQQSEFTIENLIITVSDLFGAGTETTSTTLRYGL
LLL LKHPEVTAKVQEEIDRVIGRHRSPCMQDRSSMPYTD AVVHEIQRYIDLIPTNLPHAVTRDIKFRNYLIPK
GTTILTS LTVLHDDKEFPNPETFDPGHFLDES GNFKKSDYFMAFSAGKRICVGEGLARMELFLFLTITILQKF
TLKPLVDPKDIDTTPVANGFASVPPSYQLCFIPV

>2C2_Mammal (SEQ ID NO:132)

MAKKTSSSLGRLP PGPTPLPIIGNMLQLNLKDLP TSFSKLAEKYGPVYTYLGPQPVVVLHG YEAVKEALIDQG
DNFLGRGHIPIFDDTLKGYGIVFSHGERWKQMRFSMTLRNFGMKRSIEERVQEEAQCLVEELRKTEAQP
DPTFILACAPCNVICSI LFNERNFYDDEKFLYLMNLLNENFRLINSPWAQLYNLWPSFIRYLPGEHRKFFKNV
KDVKNF ILEKVKEHQETLDPN NPRDYIDCFLSKMEQEKHNPQSEFDLENLATTGSNLSAGTETTSTTLRYGL
LLL LKHPEVEAKVHEEIDRVIGRNRVPCMKDRLKMPYTD AVVHEIQRYINLVPSNLPHAVTQDTKFRQYFIPK

GTTVFPLLSSVLYDSKEFPNPEQFDPGHFLDKNGSFRKSDYFVPFSIGKRACLGESLARMELFLFLTITLQNF
TLKPVVDPKELNIKPMFTGLINIPPSYKLCFLPR
>2CE_Mammal (SEQ ID NO:133)
MAKKTSSSLGKLPPGPTPLPIIGNILQLDTKNISKSLSNLAKTYGPVFTLYFGSKRVVVLHGYEAVKEALIDHG
EEFAGRGSPFIIDAINKGLGIVFSNGERWKQIRRFSLMTLRNFGMGKRSIEERVQEEAKCLVEELKKTNGQPC
DPTFILGCAPCNVICSIIFQKRFEYSDQKFLNLMELLNENIKILSSPWIQVYNLFPSLIHYLPGSHHKLKFKNI
QEMHNFILEKVKEHQETLDPNNPRDFIDCFLIKMEQEKQNNQSEFTIENLIITVSDLFGAGTETTSTTLRYGL
LLLLKHPEITDKIHEEIDRVIGRNRSPCMKDRNSMPYTDABIHEIQRYIDLVP TNLPHAVTQDIKFREYLIPIK
GTTIFTSLTSVLYDNKEFPNPDQFDPGHFLDESIGNFKKSDYFMPFSIGKRACVGEGLARMELFLFFTITLQNF
TLKPLVDPKDIDTTPISNGFGSVPPSYKLCFLPV
>2CE_Mammal_&_2C_Reptile_&_2C_Aves (SEQ ID NO:134)
MAKKTSSSLGKLPPGPTPLPIIGNILQLDTKNISKSLSMLAKVYGPVFTLYFGSEPVVVLHGYEAVKEALIDHG
DEFAGRGSPFIIDKINKGLGIVFSNGERWKQIRRFSLMTLRNFGMGKRSIEERIQQEAKCLVEELRKTNGQPC
DPTFILGCAPCNVICSIIFQKRFDYNDQKFLTLMELLNENFKILSSPWIQVYNMFPSLIHYLPGSHHKLKFKNF
QELKNFILEKVKEHQETLDPNNPRDFIDCFLIKMEQEKHNQSEFTMENLIITVSDLFGAGTETTSTTLRYGL
LLLLKHPEITEKVHEEIDRVIGRNRSPCMKDRSSMPYTDVVHEIQRYIDLVP TNLPHAVTQDTKFRQYLIPIK
GTTIFPLLTSLVLYDDKEFPNPEQFDPGHFLDESIGNFKKSDYFMPFSAGKRVCVGEGLARMELFLFLTITLQNF
TLKPLVDPKDIDTTPISNGFGNVPPSYKLCFLPV
>2CEH (SEQ ID NO:135)
MAKKTSSSGKLPPGPTPLPIIGNILQLDTKNIPKSLSMLAKTYGPVFTLYLGSERVVVLHGYEAVKEALIDHG
DEFAGRGSPFIIDKINKGLGIVFSNGERWKQMRRFSLMTLRNFGMGKRSIEERIQQEAKCLVEELRKTNGLPC
DPTFILGCAPCNVICSIIFQKRFDYNDQKFLTLMKLLNENFKILSSPWIQVYNLFPSLIHYLPGSHHKLKFKNF
QELKNFILEKVKEHQESLDPNNPRDFIDCFLIKMEQEKHNQSEFTMENLVTTVSDLFGAGTETTSTTLRYGL
LLLLKHPEITEKVHEEIDRVIGRNRSPCMKDRSSMPYTDVVHEIQRYIDLVP TNLPHAVTQDIKFRQYLIPIK
GTTILPLLTSLVLYDNKEFPNPEQFDPGHFLDESIGNFKKSDYFMPFSAGKRVCVGEGLARMELFLFLTITLQNF
TLKPLVDPKDIDTTPITNGFGNVPPSYKLCFLPS
>2E_Mammal (SEQ ID NO:136)
MAKKTSSSWKLPPGPFPLPIIGNLFLDLKNIPKSFTRLAEQYGPVFTLYLGSRRVVVMHGYKAVKEVLLDLK
NEFSGRGEIPAFEAHKDAGIIFNNGPTWKDTRRFSLTTLRDYGMKGQNEERIQQEAHFLLEALRKTGKQPF
PTFVIGGGPCNVIADILFRRRFDYNDKTCLRLMHLFNENFYLLSTPWLQLYNNFSSYLRYLPGSHRKMKNVS
EIKYALERVKEHHKSLDPNCPRDLTDCLLIQMEKEKQSREPGYTLDNVAVTVADLFFAGTETTSTTLRYGLL
ILMKYPEIEEKLHEEIDRVIGPSRIPAIDRLEMPYMDVVHEIQRFINLVPSNLPHEATRDMFRGYVIPKG
TVVIPTLDSLLYDNQEFDPDEKFKPEHFLNENKFKYSDYFKAFSAGKRVCVGEGLARMELFLFLSAILQHFN
LKSLVDPKDIDLSPVTIGFGSIPPHYKLCVIPR
>2F_Mammal (SEQ ID NO:137)
MAKKTSSSKGRLLPPGPRPLPLLLGNLLQLRSQDMLTSLTKLSKEYGSVYTVYLGPRRVVVLSCGYQAVKEALVDQG
EEFSGRGDYPVFNFNFTKNGIAFSNGERWKVLRRFSVQILRNFGMGKRSIEERILEEGSFLLLEELRKTEGEPF
DPTFVLSRSVSNIIICSVIFGSRFDYDDERLLTIIHLINDNFQIMSSPWGEMYNIFPSLLDWLPGPHRRFLQNF
GRMKDLIARSVREHQASLDPNSPRDFIDCFLTKMAQEKQDPLSHFMDTLLMTTHNLLFFGGTETVGTTLRHAF
LVLMKYPKVQARVQEEIDRVVGRARLTLEDRAAMPYTDABIHEVQRFADVIPMNLPHRVIRDTAFRGFLLPK
GTDVITLLNTVHYDPSQFLTPQEFNPEHFLDANQSFKKSPAFMPFSAGRRLCLGESLARMELFLYLTAILQNF
SLQPLGAPEDIDLTPLSGLGNLPRPFQLCMRAR
>2FT (SEQ ID NO:138)
MAKKTSSSKGRLLPPGPRPLPLLLGNLLQLESRDMHRSLSLTKLSKYGPVYTVHLGPRPVVVLSCGYQAVKEALVDQA
DDFSGRGDYPVFYRFTKNGIAFSNGERWKILRRFALQTLKNFGMGKRSIEERILEEAAQLLEEFQKTEGAPF
DPINLLSRAVSNVICSVVFGNRFDYEDADFLRLDLFNDNFQIMSSPWGELYNIFPSLLDWLPGPHRRFLQNF
EKLRTFITERIRQHQNLDPEAPRDFIDCFLIRMEEEKQDPLSHFMDTLLMTTHNLLFFGGTETTSTTLRYSF
LILMKYPEVAARVQEEIDSVVGRARTPCLEDRASMPYTDABIHEIQRFISILPMGLPRAVTRDTPFRGFLLPK
GTNVIPLLSVHYDPTQFKDPNSFNPDHFLDEKGEFKNSDAFMPFAPGKRICLGAGLARMELFLFLTAILQHF
SLQPLGAPAEIDLTPQCTGLGNVPRPFQLRLVPR
>2H (SEQ ID NO:139)
MAKKTSSSGKLPPGPPIALPIVGNMLQLNTKNLPQSIEELSEKYGPVFTIYLGSRVVVLGYGHEAVKEALIDQG
DEFSGRGTLPLFEKLFKSGGIVISNGETWKQLRRFALTLRNFGMGKRSIEERIQQEAAHFLVERIRNTHERP
DPSSFLIHAVSNVICSVVFGDRFDYEDKKFLTLIDLLEENKQLQSLWTQLYNFFPTVMDYLPGPQRFLKFN
EEIHKFILERVKMHQESLDPCTPRDFIDAFLIKMEQEKENSQSEFNTETLVRSTLDLFFAGTETTSTTLRYGL
LILLKYPEIEEKIHKIDRVIGRSRSPCMADRSQMPYTDVVHEIQRFINLLPLNVPHAVTRDTRFRQYVIPK
DTMIFPALRSVLYDSKEFPNPEQFNPGHFLDENGAFKKSDYFMPFSAGKRICVGEGLARMELFLFLTITLQNF
TLKPVVDHKDIDISPVISSVVNMPRPYQLCFLPR

>2S_Mammal (SEQ ID NO:140)

MAKKTSSPGHLPPGPAPLPILGNLLQLRPGALYSGLLRLSRKYGPVFTVHLGPRRRVVVLVGHEAVQEALGGQ
AEEFNNGRGRLATLDGTFQGHGVFFSNGERWRQLRKFTMLSLRDLGMGKREGEELIQAEARCLLEALRGTQGQP
FDPSLLLAQATSNIIVCSLLFGRRFPEDEEFQAMVQAAGGILLEVSSPWGQTYEMFSQLLQHLPGPHGRLLGH
VGTAAAFATQQVQHQESLDPSPGARDVVDFAFLKMAQEEQDPDTELTDKDLLMTVIYLLFAGTVTVSATTF
TFLLLLLKYPQVQERVREELTRELGAGRAPSLGDRARLPYTDVAVLHEAQRLALVPMGIPRALTKTTCFRGYTL
PQGTEVFPLLGSVLHDPEVFERPEEFNPDRFLDADGRFKKQEAFLPFSLGKRVCLGEGLARAEFLLVTAILQ
TFSLDSPSPPGALSQPAVSGLFNIPPAFQLQVRPR

>2C_Aves (SEQ ID NO:141)

MAKKTSSKGMPPGPAPLPILGNVLQVKPNLAKTLQKLSEYGPVFTVHLGSDPVVVLHGHVVDVKEALVDRA
DEFAARGHMPIGDRANGLGIVFSNNEEWLQVRRFALSTLRNFGMGKRSIEERIQEETEYLLLEEINKTKGTPF
DPTFMLSCAVSNVICSIIVFGKRYDYKDKKFLSLMNNMNNIFEMNSHWGQLYQMFISKILDYLPGPHNKFTEF
DALKAFVSEEVKMHQASLDPSSPQDFIDCFLSKMQEKENPNSSFHMKNLITSTFDLFIAGTETTSTTIRYGL
LLLLLKYPKIQEKVQEEIDRVVGRSRRPCVADRTQMPYTDVAVHEIQRFISLIPLSVPHAVTKDTCFREYVIPK
GTTIFPVLSSVLHDSKEFPNPNEFNPGHFLNENGTFRKSEFFMPFSAGKRICPGEGLARMEIFLLIATILQNF
TLKPVDPQELNITPTLSGTGNVPPAYQLCALPR

Figure 6

CYP4F_A0

>N0 (SEQ ID NO:142)

FSPLASSSSLLLLVLALTFRALLRLLRFLRLRYARNARRLRCAQPPRRNWLLGHLGLMKNT
EEGLQAVDELVKTYRHSCSWWLGPFYSIVRLFHPDYIKPVLLASASITLKDELFGFLRP
WLGEGLLLSNGEKWSRHRRLTPAFHFIDILKIYVKIFNQSTDIMHAKWRRLVAEGTTSLD
MFEHVSMLTDSLQKCTFSYDSNCQEKPSYIAAIYELSTLVVKREHYLPHHFDWIYWS
SEGRRFKRACDIVHRFTADIVQRRRAQLNQQAESYLKRKRKGKVTDFIDVLLLSKDE
NGLTDEEIKAEADTFMFEHGDTTASGISWVLYNLARHPEYQEKCAEVNDLLQGRDTEEI
EWDDLSNLPFTTMCIKESRLRHPPVTAVTRRYSEDIKLPGGRVIPKGNICLVSIYGTHHN
PTVWPDPDVYNPYRFDPENPQGRSSHAFVFPFAGPRNCIGQNFAMAEMRVVVALTLRRFR
VTPDPTVVRKPELILRAEGGLWLQLEPLNPPQS

>N4 (SEQ ID NO:143)

FRTVAVSALLLLLLLALLFRLLLQLLRFCHRFYINCRRLRCFPQPPRRNWLLGHLGMIQPT
EEGLQEVTLVATFRHVFLLWWMGPFPLILRLVHPDYIKPVLSASAAIAPKDKLFYGFLLP
WLGDGLLLSKGDKWSRHRRLTPAFHFIDILKPYMKIFNQSTDIMHAKWRRLAAEGSTSLD
MFEHISMLTDSLQKCVFSYDSNCQEKPSYIAAILELSALVVRQHRLLHHLDFIYYLT
SDGRRFRACDIVHHTADVIQERRQALNQQAELKAK-QGKTMDFIDVLLLADEG
KELSDERAEADTFMFEHGDTTASGLSWVLYNLARHPEYQERCREEIQELKGREPEEI
EWDDLAQLPFLTMCIKESRLRHPPVTAVSRCTEDIKLPDGRVIPKGNICLISYIGTHHN
PAVWPDPEVYNPYRFDPENPQQRSPALFVFPFAGPRNCIGQNFAMAEMKVVALTLRLFR
VLPDETTP-RRKPELILRAENGLWLRVEPLSPPPS

>N9 (SEQ ID NO:144)

LGPVAASPWLLLLLVGASWLLARVLAWTYTFYDNCRRRLRCFPQPPKRNWFWGHLGLVTPT
EEGMRELTLVATYPQGFMVWMPFPIITLCHPDIIIRSVLNASAAIAPKDMVFYSFLKP
WLGDGLLLSAGDKWSRHRRLTPAFHFNIILKPYMKIFNKSVMIMHAKWQRLASEGSARLD
MFEHISMLTDSLQKCVFSYDSNCQEKPSYIAAILELSALVAKRHQQILLHMDFLYYLT
PDGRRFRACRLVHDFDAVIQERRRRLTLPQGVDDFLKAKAKTKTLDIDVLLLSKDEG
KELSDERAEADTFMFEHGDTTASGLSWVLYNLAKHPEYQERCRQEVQELLRDREPKEI
EWDDLAQLPFLTMCIKESRLRHPPVTVISRCCTQDIVLPDGRVIPKGVICLISIFGTHHN
PAVWPDPEVYDPFRFDPENIKERSPLAFIPFAGPRNCIGQTFAMAEMKVVALTLRLFR
VLPDDTEP-RRKPELILRAEGGLWLRVEPLSAGPQ

>N10 (SEQ ID NO:145)

LGPVAASPWLLLLLVGASWLLARVLAWTYTFYDNCRRRLRCFPQPPKRNWFWGHLGLVTPT
EQGMRELTLVATYPQGFMVWMPFPIITLCHPDIIIRSVLNASAAIAPKDMVFYSFLKP
WLGDGLLLSAGDKWSRHRRLTPAFHFNIILKPYMKIFNKSVMIMHAKWQRLASEGSARLD
MFEHISMLTDSLQKCVFSYDSNCQEKPSYIAAILELSALVAKRHQQILLHMDFLYYLT
PDGRRFRACRLVHDFDAVIQERRRRLTLPQGVDDFLKAKAKTKTLDIDVLLLSKDEG
KELSDERAEADTFMFEHGDTTASGLSWVLYNLAKHPEYQERCRQEVQELLRDREPKEI
EWDDLAQLPFLTMCIKESRLRHPPVTVISRCCTQDIVLPDGRVIPKGVICLISIFGTHHN
PAVWPDPEVYDPFRFDPENIKERSPLAFIPFAGPRNCIGQTFAMAEMKVVALTLRLFR
VLPDDTEP-RRKPELILRAEGGLWLRVEPLSAGPQ

>N105 (SEQ ID NO:146)

LGPVAASPWLLLLLVGASWLLARVLAWTYTFYDNCRRRLRCFPQPPKRNWFWGHLGLVTPT
EEGMKKLTQLVATYPQGFVWLGPTFPLIILCHPDIVRSITSASAAIAPKDMVFYRFLKP
WLGDGLLLSAGDKWSRHRRLTPAFHFNIILKPYMKIFNKSVMIMHAKWQRLASEGSARLD
MFEHISMLTDSLQKCVFSYDSNCQEKPSYIAAILELSALVEKRNQQILLHMDFLYYLT
PDGRRFRACRLVHDFDAVIQERRRRLTLPQGIDDFLAKAKSKTLDIDVLLLSKDEG
KELSDERAEADTFMFEHGDTTASGLSWVLYHLAKHPEYQERCRQEVQELLKDREPKEI
EWDDLAQLPFLTMCIKESRLRHPPVPVISRCCTQDIVLPDGRVIPKGVICLISIFGIHNN
PTVWPDPEVYDPFRFDPENIKERSPLAFIPFAGPRNCIGQAFAMAEMKVVALTLRLFR
VLPDHTEP-RRKPELILRAEGGLWLRVEPLNAGPQ

>N129 (SEQ ID NO:147)

LGPVAASPWLLLLLVGASWLLARVLAWTYTFYDNCRRRLRCFPQPPKRNWFWGHLGLVTPT
EEGLRELTQLVATYPQGFKVWVGPIIPVITLCHPDIIRSVINASAAIAPKDKVFYRFLKP
WLGEGLLLSGGDKWSHRRMLTPAFHFNIILKPYIKIFNKSANIMLDKWQHLASEGSSRLD
MFEHISLMTLDSLQKCFISFDSHCQERPSEYIATILELSALVEKRSQHILQYMDFLYYLT
QDGRRFERRACRLVHDFDTDAVIQERRRTLPTQGIDDFLKDKAKSKTLDFIDVLLLSKDEDEG
KALSDEDIRAEADTFMFGHDTTASGLSWVLYNLARHPEYQERCRCQEVQELLKDRDPKEI
EWDDLALPFLTMCLKESLRLHPPAPFISRRCTQDIVLPDGRVIPKGNICVINIIGVHHN
PTVWPDPEVYDPFRFDPENSKERSPLAFIPFSAGPRNCIGQAFAMAEMKTVLALMLLHFR
FLPDHTEP-RRKPELILRAEGGLWLRVEPLNAGLQ

>N151 (SEQ ID NO:148)

LGPVAASPWLLLLLVGASWLLARVLAWTYAFYDNCRRRLRCFPQPPKRNWFLGHLGLIQSS
EEGLLYTQGLASTFGDVCCWVGPWHAIIRIFHPTFIKPVLFAPAAIAPKDMVFYSFLKP
WLGDGLLLSAGDKWSRHRMLTPAFHFNIILKPYMKIFNESVNIMHAKWQRLASEGSARLD
MFEHISLMTLDSLQKCVFSFDSNCQEKPSYIAAILELSALVAKRHQQILLHMDFLYYLT
PDGQRFERRACRLVHDFDTDAVIQERRRTLPSQGVDDFLKAKAKSKTLDFIDVLLLSKDEDEG
KELSDERAEADTFMFEHDTTASGLSWVLYNLAKHPEYQERCRCQEVQELLRDREPKEI
EWDDLALPFLTMCIKESLRLHPPVTVISRCCTQDIVLPDGRVIPKGVICLISIFGTHHN
PAVWPDPEVYDPFRFDPENIKERSPLAFIPFSAGPRNCIGQTFAMTEMKVVLALTLLRFR
VLPDDTEP-RRKPELILRAEGGLWLRVEPLSAGPQ

>N195 (SEQ ID NO:149)

LGPVAASPWLLLLLVGASWLLARVLAWTYAFYDNCRRRLRCFPQPPKRNWFLGHLGLIQPT
EEGLREVTQLVATFRDVFLLWVGPFYPIIRLCHPDFIRPVLNAPAAVAPKDMVFYGFLLKP
WLGDGLLLSAGDKWSRHRMLTPAFHFDIILKPYMKIFNKSTNIMHAKWQRLASEGSARLD
MFEHISLMTLDSLQKCVFSFDSNCQENPSEYIAAILELSALVVKRHQQILLHMDFLYYLT
PDGRRFRACDLVHDFDTDAVIQERRRTLASQGVDDFLKAKAKSKTLDFIDVLLLSKDEDEG
KELSDERAEADTFMFEHDTTASGLSWVLYNLARHPEYQERCRCQEVQELLRDREPEEI
EWDDLALPFLTMCIKESLRLHPPVTVISRCCTQDVVLPDGRVIPKGNICVISIFGIHHN
PAVWPDPEVYDPFRFDPENPQKRSPALAFIPFSAGPRNCIGQTFAMAEMKVVLALTLLRFR
VLPDDAEP-RRKPELILRAEGGLWLRVEPLSAGPQ

>N261 (SEQ ID NO:150)

FRTYAVSALLLFLFLFRLLQLFLRLCHRFYITCRRRLRCFPQPPRRNWLLGHLGLMYLPN
EAGLQDETKVLDTMHHVVLVWVGPFLLPLLVLPDYIKPVLGASAAIAPKDDLFGYGFLLKP
WLGDGLLLSKGDKWSRHRLLTPAFHFDIILKPYMKIFNQCTDIMHAKWRRLAEGSVVSLD
MFEHVSLMTLDSLQKCVFSYNSNCQEKMSDYISAIIELSALVRRQYRLHHHLDIYYRT
ADGRRFRQACDIVHHFTTEVIQERRQALNQQAELWAKAK-QGKTDLDFIDVLLLAKDEDEG
KELSDERAEADTFMFEHDTTASGLSWVLYNLAKHPEYQERCREEIQELLKGREPEEI
EWDDLALPFLTMCIKESLRLHPPVTAVSRCCTEDIKLPDGRVIPKGIICLISYIGTHHN
PAVWPDPEVYNPYRFDPENPQQRSPLAFVFPFSAGPRNCIGQSFAMAEMKVVLALTLLRFR
VLPDRTRP-RRKPELILRAENGLWLRVEP-----

>N337 (SEQ ID NO:151)

FSPLASSLLLLVLALTFRALLRLLRFLRLRYARNARRLRCAQPPRRNWLLGHLGLMKNT
EEGLQAVDELVKTYRHSCSWWLGPFYSIVRLFHPDYIKPVLLASASITLKDELFGYFLRP
WLGEGLLLSNGEKWSRHRLLTPAFHFDIILKIYVKIFNQSTDIMHAKWRRLVAEGTTSLD
MFEHVSLMTLDSLKCTFSYDSNCQEKPSYIAAIYELSTLVKREHYLPHHFDWIYWRS
SEGRFRKACDIVHRFTADIVQRRRAQLNQQAESY--RKRKGKVTDFIDVLLLSKDEDEG
NGLTDEEIKAEADTFMFEHDTTASGISWVLYNLARHPEYQEKCAEVNDLLQGRDTEEI
EWDDLNLPLFTTMCIKESLRLHPPVTAVTRRYSEDIKLPGRVIPKGNICLVSIYIGTHHN
PTVWPDVDPVYNPYRFDPENPQGRSSHAFVFPFSAGPRNCIGQNFAMAEMRVVVALTLRFR
VTPDPTEV-RRKPELILRAEGGLWLQLEPLNPP--

Figure 7

CYP4ABXZ_A0

>N2 (SEQ ID NO:152)

LALLLLKAIQLYLRRQRLLRALQLFPGPPTHWLYGHVREFQQEEEELQKFLEWVEKYPCAF
PLWFGPFMVFLNIYDPDYAKVILSRDPKSHVSYKFLIPWIGKGLLVNNGPKWFQHRRL
TPGFHFSILKPYVALMADSVRVMLDKWEKLITQDSSVEIFEHISLMTLDSIMKCAFSHOT
NCQTDSSNSYSYKAVYDLSYLVFHLRNFLYHNDLIYWFSPQGHRFRKACQLAHQYTDKV
IQERKESLKDEREQEKIQKKRHLDLFDILLCAKSENGEGLSDEDLRAEVDTFMFEGHDTT
ASGISWLLYCMAMNPEHQQRCEEIRGILGDGDSITWDHLGQMPYTTMCIKESLRLYPPV
PSISRELSKPITFPDGRSLPAGTIVVLNIYALHHNPTVWENPEVFDPLRFSPENSTRRHS
HAFLPFSAGPRNCIGQQFAMIEMKVALALTLLRFELAPDPTKPPPIPQIVLRSKNGIHL
HLKKLH

>N4 (SEQ ID NO:153)

LTLLVLLKAIQLYLRRQKLLKALESFPGPPTHWLYGHVHELQQEEEELNKILSWAEKYPYAF
PLWFGGFMFAFLNIYHPDYAKAVFSRGDPKSNVSYKFLIPWIGKGLLVNNGPKWFQHRRL
TPGFHYDILKPYVALMADSTKVMLDKWEKLITQDKSVEIFEHVSLMTLDSIMKCAFSYHS
NCQTDSDSSNSYSYKAVYDLSYLVHQRIRSFYHNDLIYWLSPQGRRFRKACQLAHQHTDKV
IRERKESLKDERELEKIQKKRHLDLFDILLCAKDENGEGLSDEDLRAEVDTFMFEGHDTT
ASGISWLLYCMALHPEHQQRCEEIKEILGDRDTIQWDDLGMKMTYTTMCIKESLRLYPPV
PGVSRQLSKPITFSDGRTLPEGSLVSLNIYALHRNPTVWEDPEVFDPLRFSPENSSRRHS
HAFLPFAAGPRNCIGQQFAMNEMKVALALTLLRFELSPDPAKPPPIPQIVLRSKNGIHL
HLKKLQ

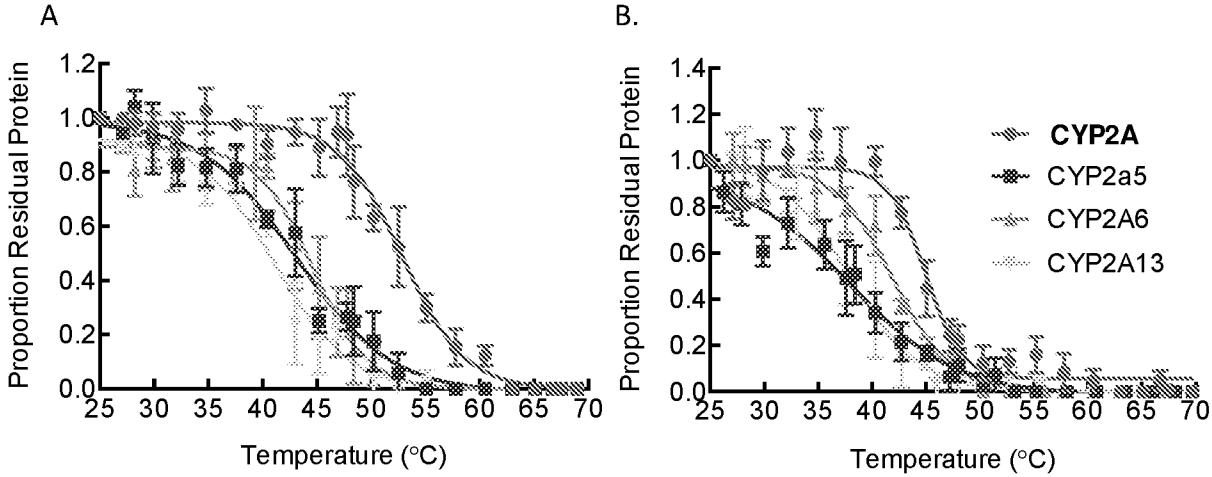
>N122 (SEQ ID NO:154)

LVLLLLKAAQLYLRRQRLLRALQSFPGPPAHWLYGHFWEFQKEEELQKILSWAEKFPCAF
PRWFSGFMVFLQVYDPDYMKVILSRDPKSHASYRFLTPWIGKGLLVNNGSTWFQHRRL
TPAFHYDILKPYVALMADSVRVMLDKWEKLITQDSSLEIFEHVSLMTLDSIMKCAFSHQ
NCQMDRNSNSYIQAVHDLSYLVFSRIRNVFYHNDIIYWFSPQGHRTRRACQLAHQHTDQV
IQKRKQHLQQEGELEKIQKKRHLDLFDILLCAKTENGDSLDEDLRAEVDTFMFEGHDTT
ASGISWLLYALAMHPEHQQRCEEIRGLLDGDSITWDHLGQMPYTTMCIKEALRLYPPV
PSIGRELSKPITFPDGRSLPAGTIVSLNIYALHHNPRVWPNEVFDPLRFSPENLTSRHS
HAFLPFSAGSRNCIGQQFAMNEMKVALALTLLRFELAPDPTKPPPIPRIVLRSKNGIHL
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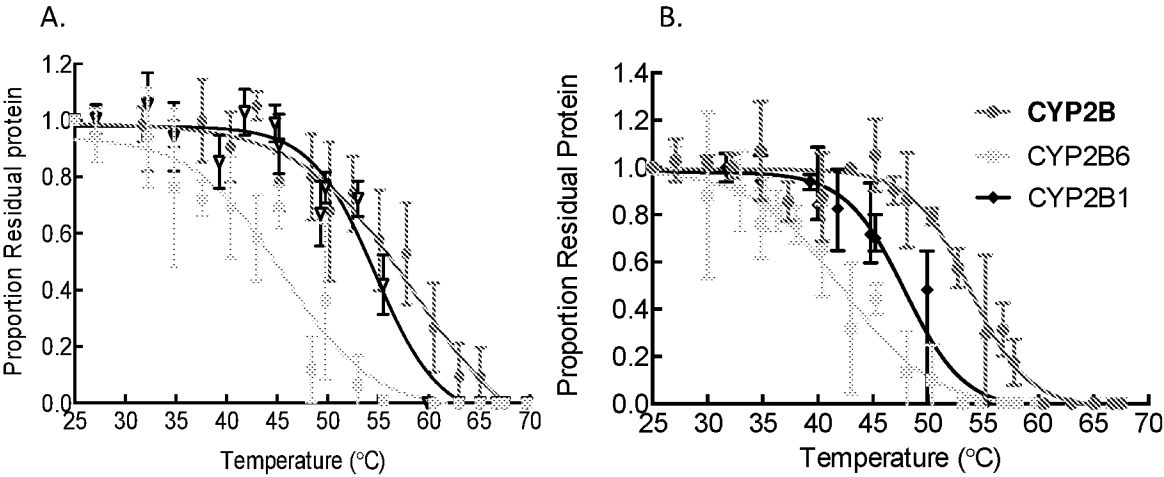
>N198 (SEQ ID NO:155)

LALLLLQAIKLYLRRQRLLRALRLFPGPPTHWLYGHQREFQQEEEELQKFNELVEKYPCAF
PLWVGPFQVFLNIYDPDYAKVLLSRDPKSQVSYKFLIPWIGKGLLSLDGPKWFQHRRL
TPGFHFSILKPYVAVMADSVRVMLDKWEKLITQDSSVEIFEHISLMTLDSIMKCAFSHOT
NCQTDSTSSNSYKAVFDLSKLIFHLRNFLHNDLIYRFSPQGHRFQKLCQVAHQYTDKV
IQERKESLKDEREQDKIQKKRYLDFLDILLCAKSENGEGLSDEDLRAEVNTFMFAGHDTT
ASGISWLLYCMAMNPEHQQRCEEIRGILGDGDSITWDHLGQMPYTTMCIKESLRLYPPV
PSISRELSKPITFPDGRSLPAGMTVVLNIYALHHNPTVWENPQVFDPLRFSQENSTKRHS
HAFLPFSAGPRNCIGQQFAMIELKVALALTLLRFELAPDPTKPPPIPQIVLRSKNGIHL
HLKKLH

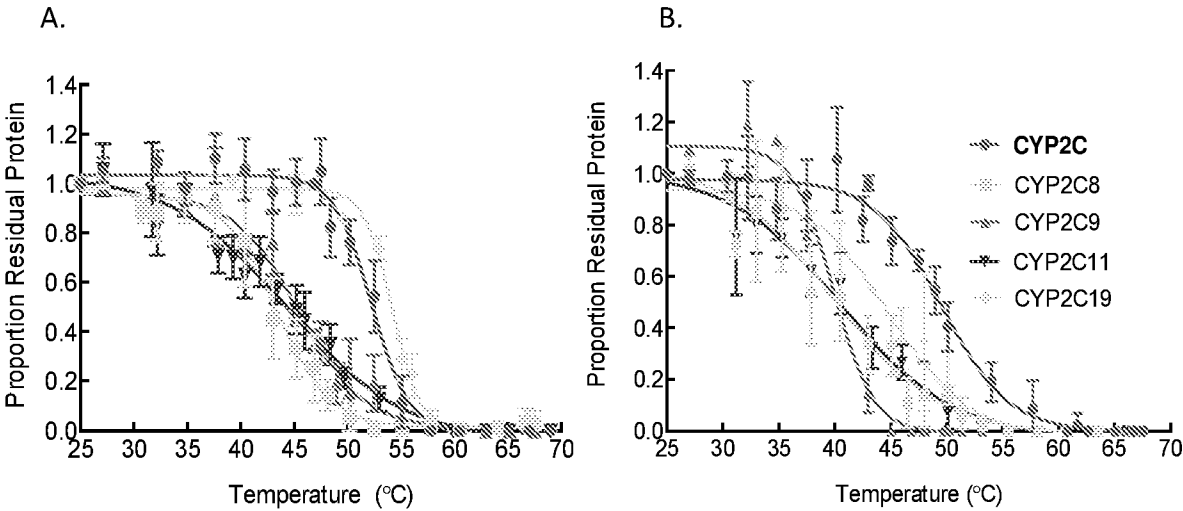
Figure 8



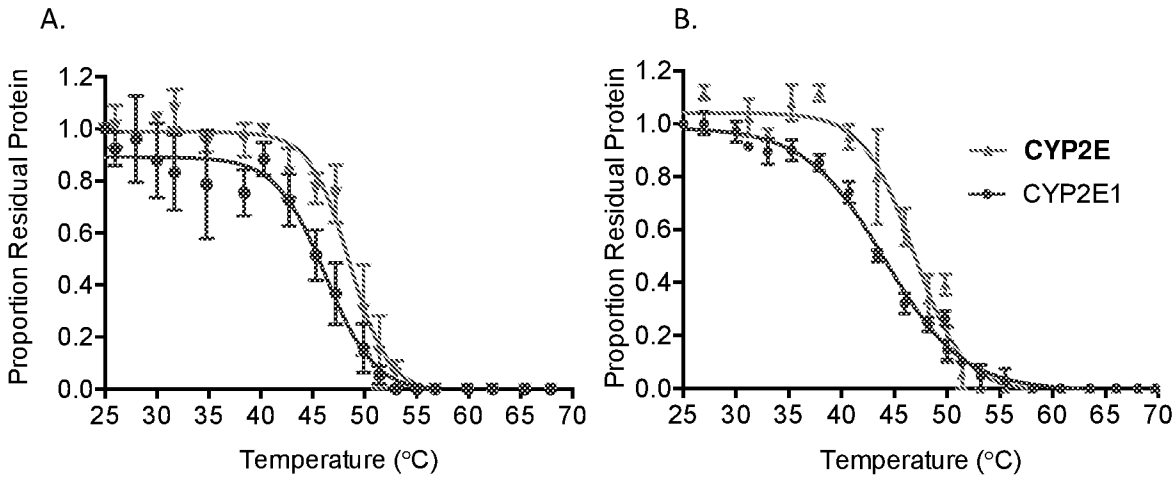
(I)



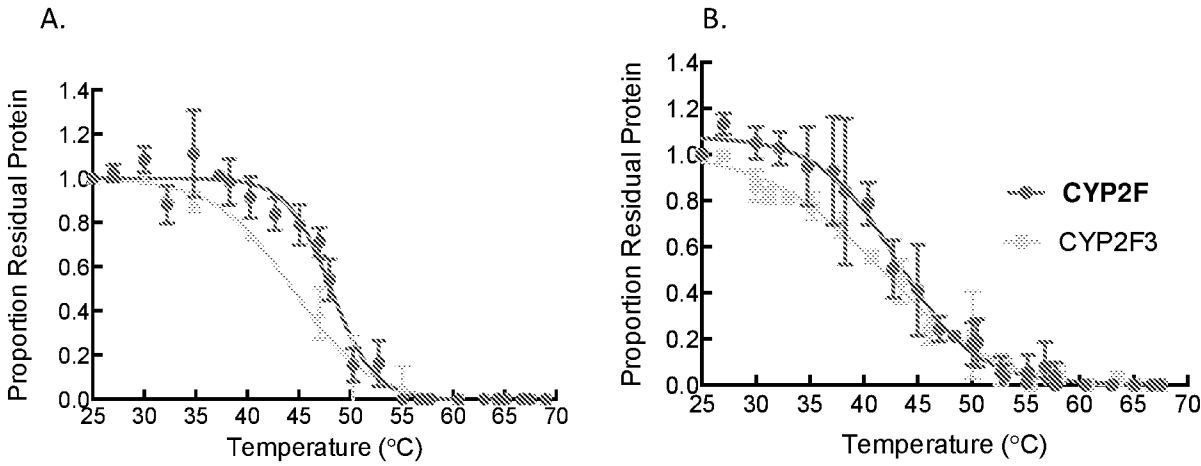
(II)



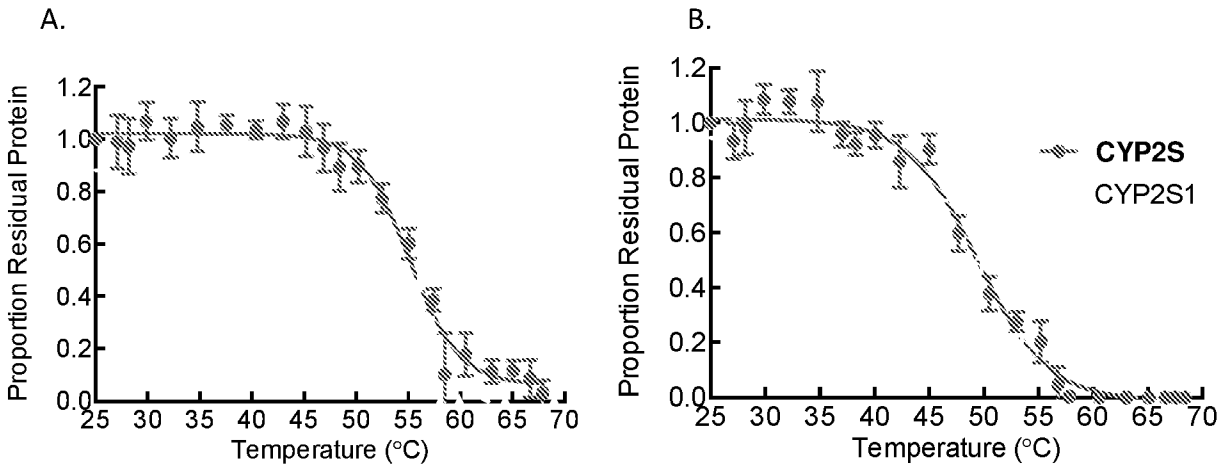
(III)



(IV)

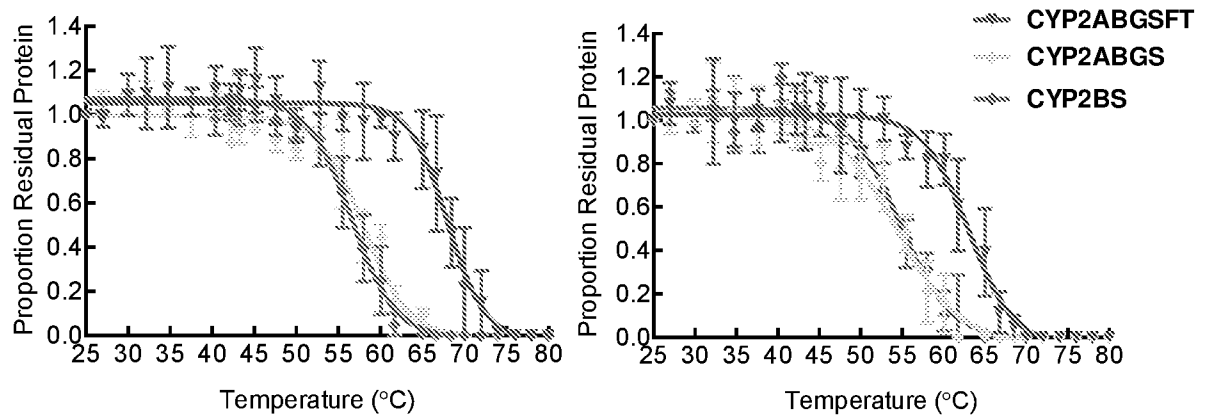


(V)



(VI)

A. B.



(VII)

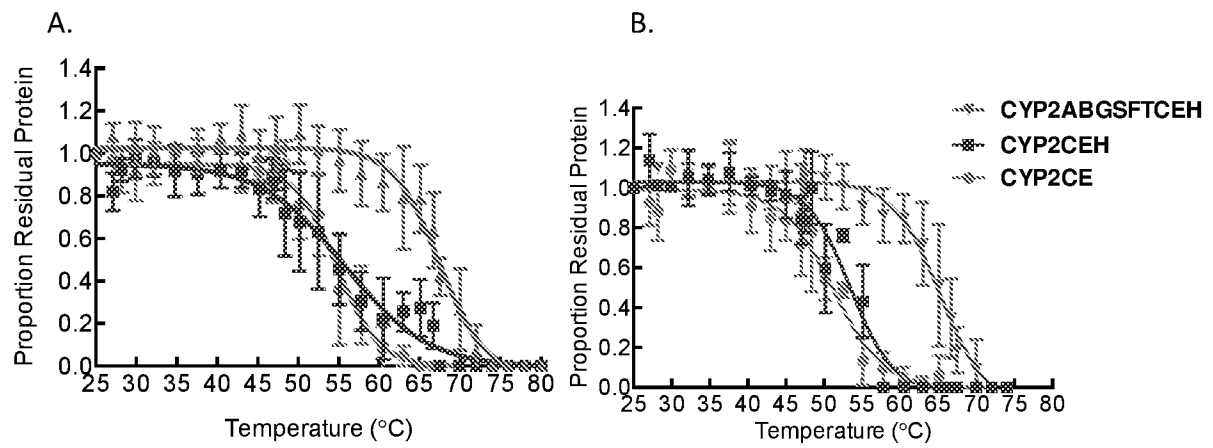
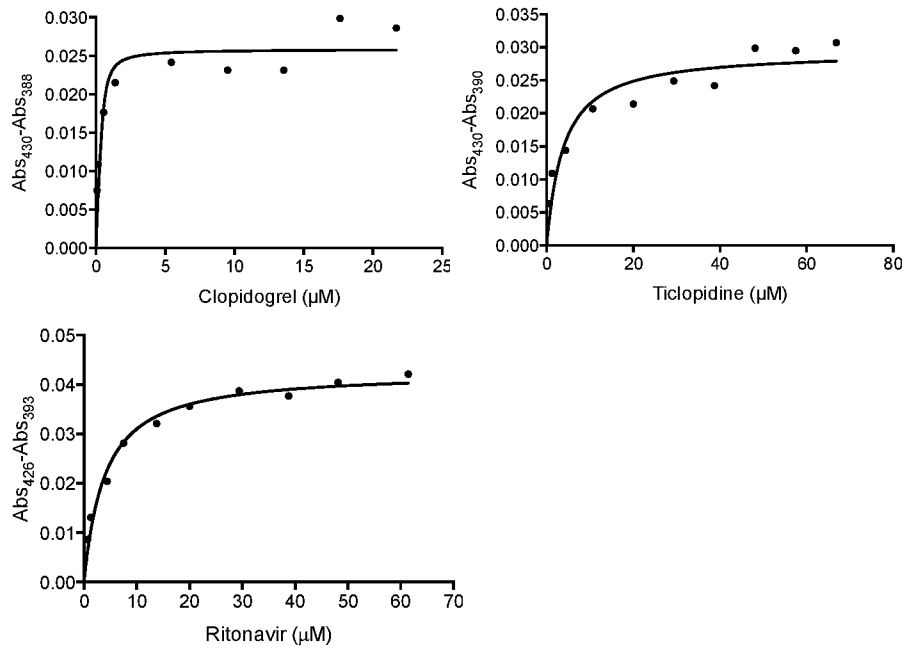
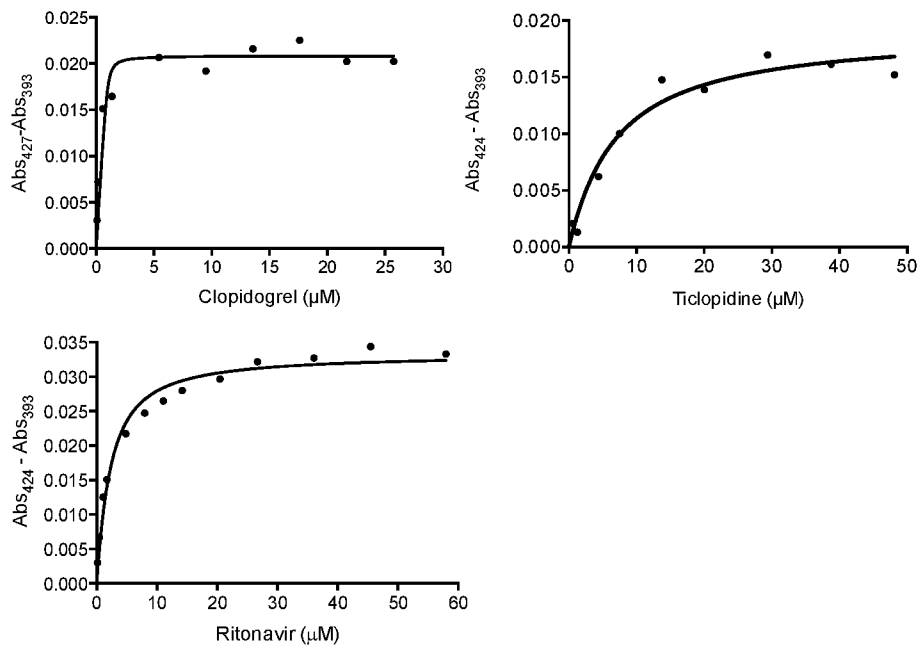


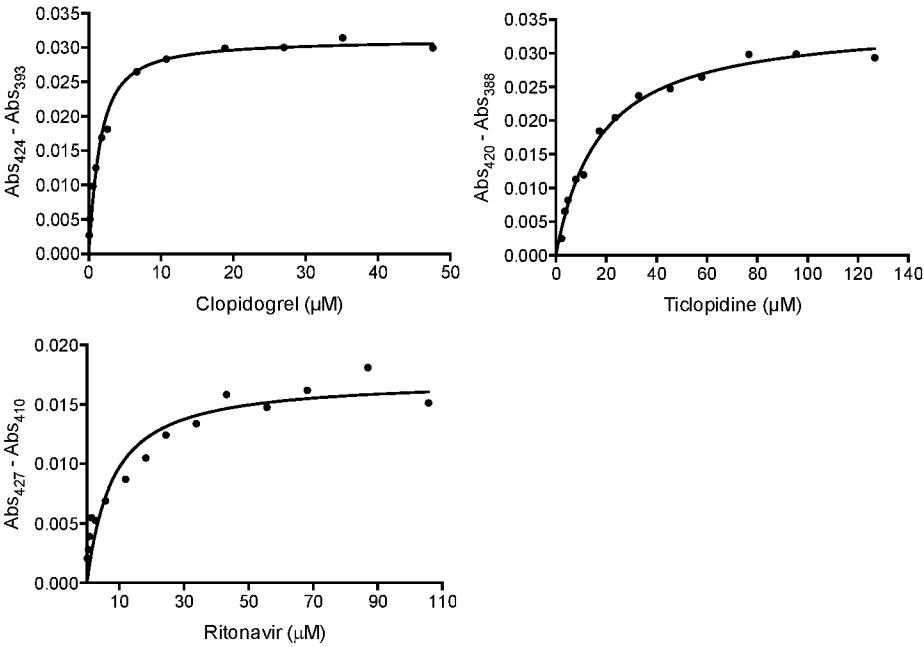
Figure 9



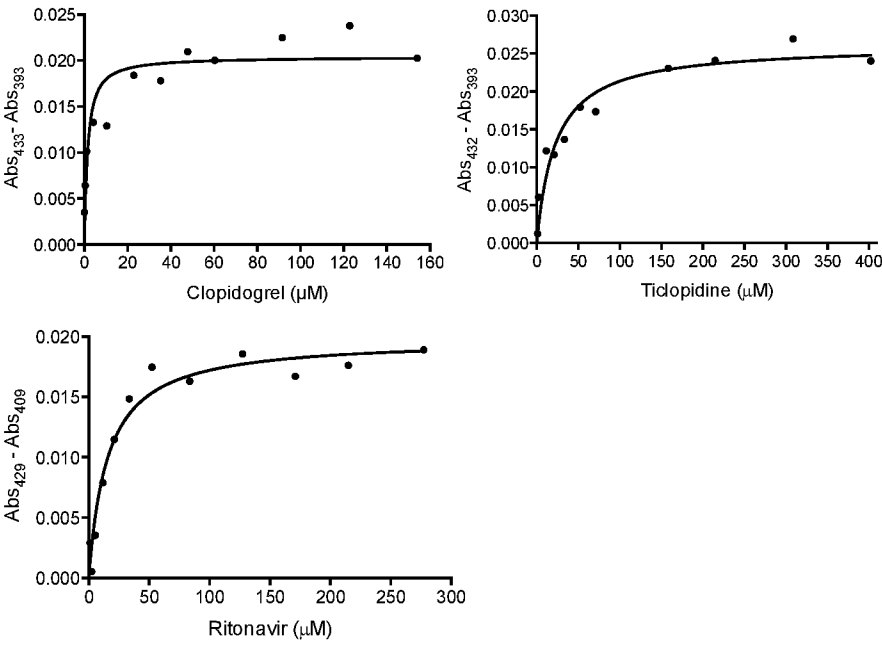
(I)



(II)



(III)



(IV)

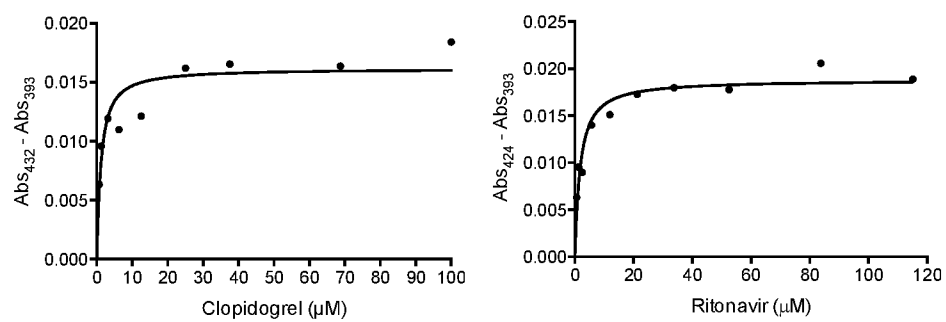


Figure 10

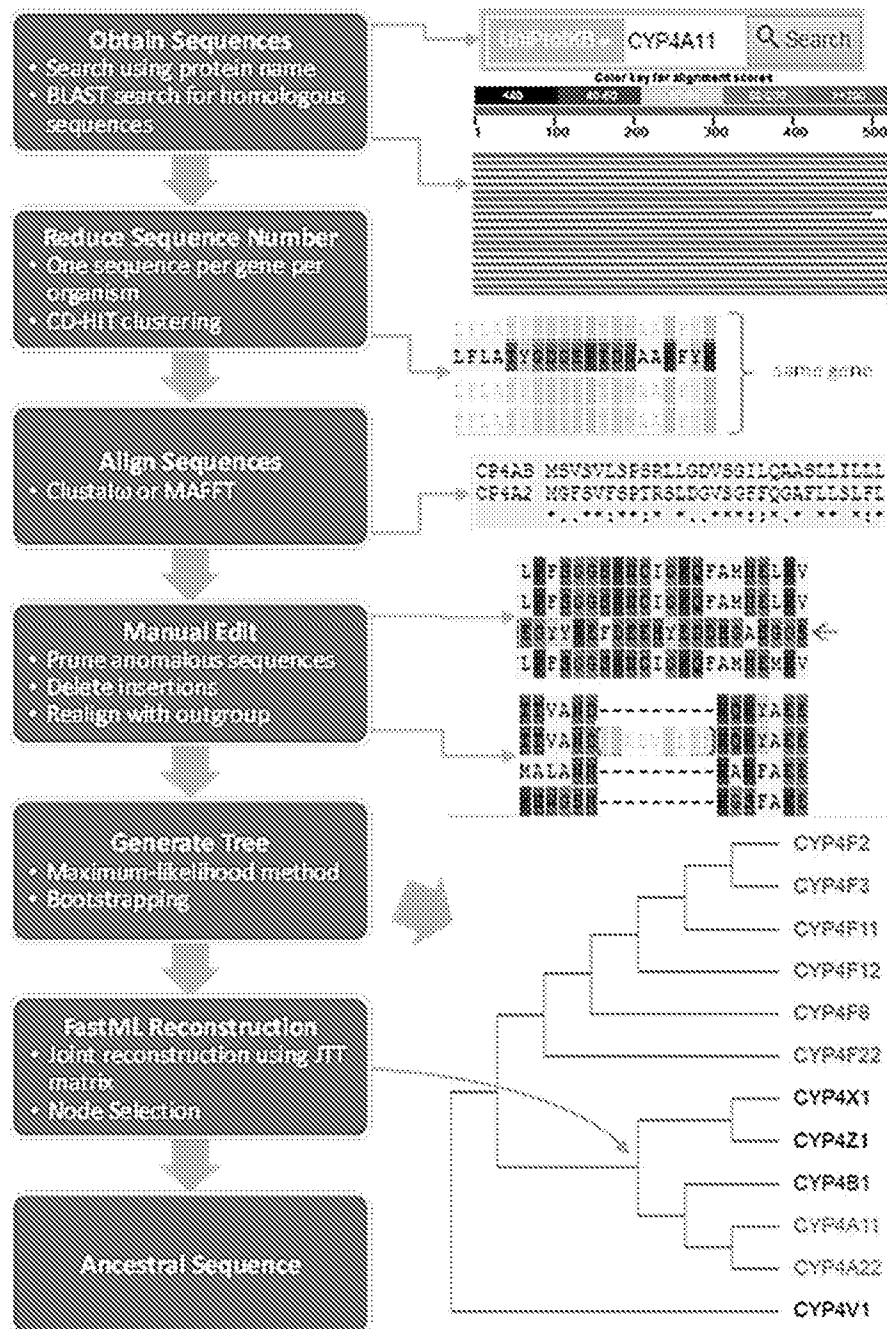
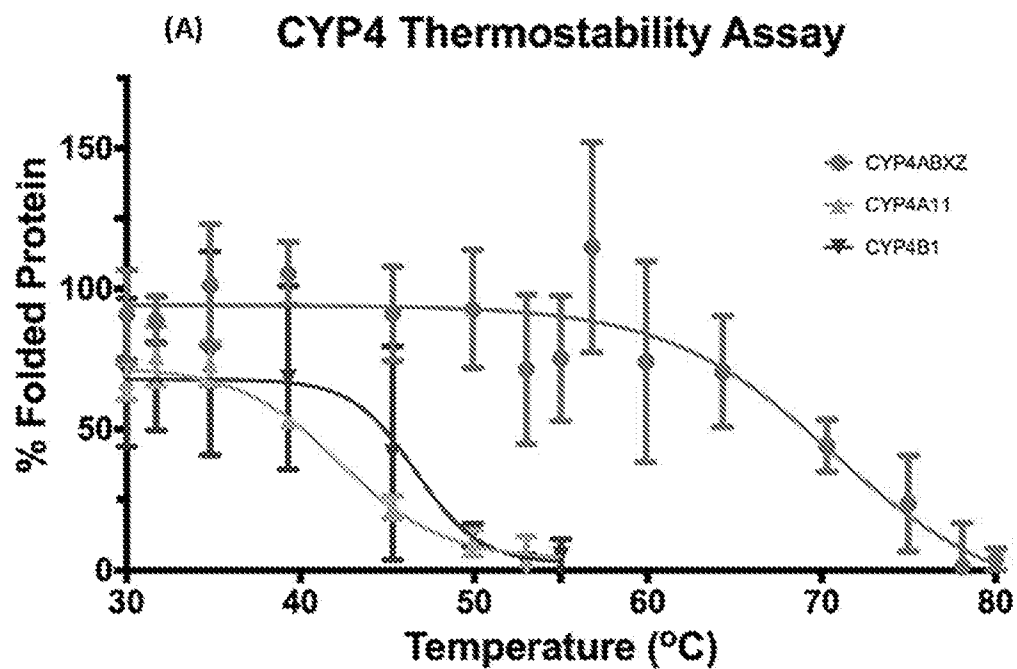


Figure 11



(B) 10T50 (°C)					
Enzyme	1	2	3	4	Average
CYP4ABXZ	71	69	69	68	69 ± 1
Human CYP4A11	40	-	-	-	40
Rabbit CYP4B1	44	-	-	-	44

Figure 12

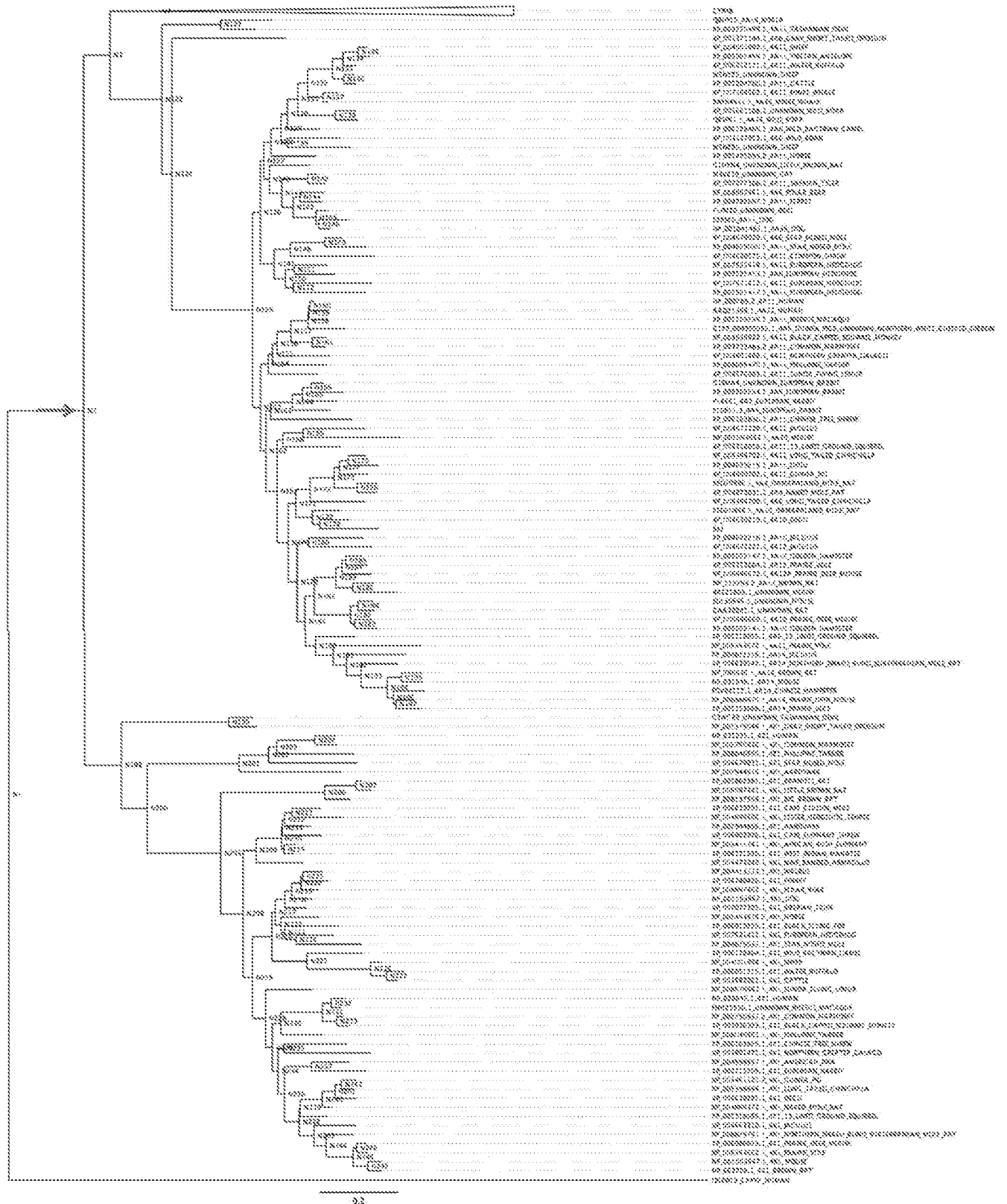


Figure 13

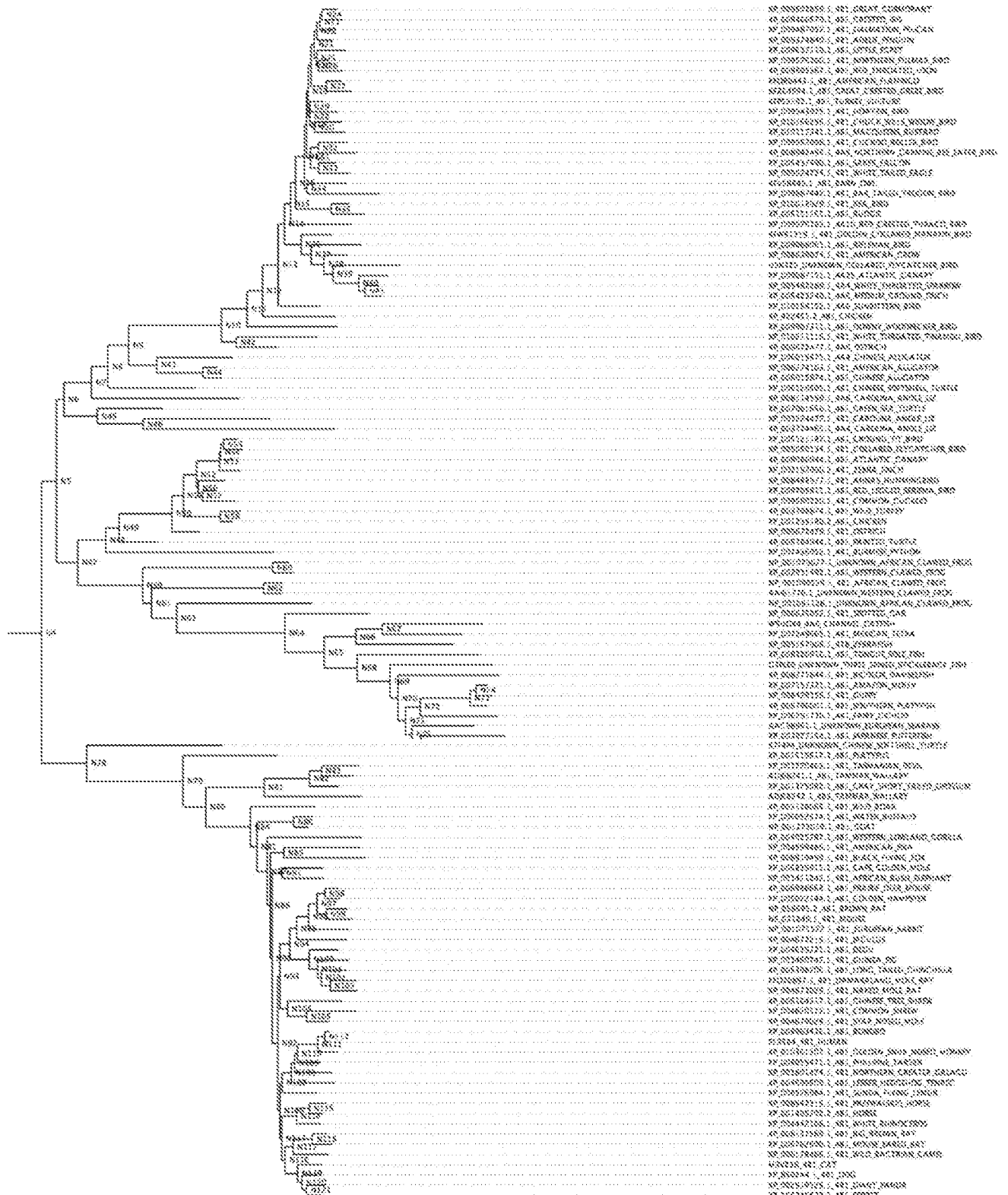


Figure 14

>CYP4ABXZ (SEQ ID NO:156)

MALLAVFLALLLLKAIQLYLRRQRLRALQLFPGPPTHWLYGHVREFQQEEELQKFLEWVEKYPCAFPLWF
GPFMVFLNIYDPDYAKVILSRRDPKSHVSYKFLIPWIGKGLLVNNGPKWFQHRRLTPGFHFSILKPYVALMA
DSVRVMLDKWEKLITQDSSVEIFEHISLMTLDSIMKCAFSSHQTNCTDSNSNSYIKAVYDLSYLVFHLRNFL
YHNDLIYWFSPQGHFRKACQLAHQYTDKVIQERKESLKDEREQEKIQKKRHLDFLDILLCAKSENGEGLSD
EDLRAEVDTFMFEGHDTTASGISWLLYCMAMNPEHQQRCEEIRGILGDGDSITWDHLGQMPYTTMCIK
ESLRLYPPVPSISRELSKPITFPDGRSLPAGTIVVLNIYALHHNPTVWENPEVFDPLRFSPENSTRRHSHAFLPF
SAGPRNCIGQQFAMIEMKVALALTLLRFELAPDPTKPPPIPIQIVLRSKNGIHLHLKKLHA~~ASTHHHHHH~~

>CYP4A (SEQ ID NO:157)

MALLAVFLVLLLLKAAQLYLRRQRLRAFQSFPGPPAHWLYGHFWFQKEEELQKILSWAEKFPCAFPRW
FSGFMVFLQVYDPDYMKVILSRRDPKSHASYRFLTPWIGKGLLVNNGSTWFQHRRLTPAFHYDILKPYVAL
MADSVRVMLDKWEKLITQDSSLEIFEHVSLMTLDSIMKCAFSHQSNCQMDRNSNSYIQAVHDLSYLVFSRI
RNVFYHNDIYWFSPQGHRRACQLAHQHTDQVIQKRKQHLQQEGELEKIQKKRHLDFLDILLCAKTENG
DSLSDDLRAEVDTFMFEGHDTTASGISWLLYALAMHPEHQQRCEEIRGLLDGASITWDHLGQMPYTT
MCIKEALRLYPPVPSIGRELSKPITFPDGRSLPAGTIVSLNIYALHHNPRVWPNEVFDPLRFSPENLTSRHS
AFLPFSAGSRNCIGQQFAMNEMKVALALTLLRFELAPDPTKPPPIPRIVLRSKNGIHLHLKKLHA~~ASTHHHHHH~~
H

>CYP4B (SEQ ID NO:158)

MALLAVFLTLVLLKAIQLYLRRQKLLKALESFPGPPTHWLYGHVHELQKEEELNKILSWAEKYPYAFPLWFG
GFMAFLNIYHPDYAKAVFSRGDPKSNVSYKFLIPWIGKGLLVNNGPKWFQHRRLTPGFHYDILKPYVALMA
DSTKVMLDKWEKLITQDKSVEIFEHVSLMTLDSIMKCAFSYHSNCQTDSDSNSYIKAVYDLSYLVHQIRSF
YHNDLIYWLSPQGRFRKACQLAHQHTDKVIRERKESLKDERELEKIQKKRHLDFLDILLCAKDENGEGLSDE
DLRAEVDTFMFEGHDTTASGISWLLYCMALHPEHQQRCEEIKEILGDRDTIQWDDL GKMTYTTMCIKESL
RLYPPVPGVSRQLSKPITFSDGRTLPEGSLVSLNIYALHRNPTVWEDPEVFDPLRFSPENSSRRHSHAFLPFAA
GPRNCIGQQFAMNEMKVALALTLLRFELSPDPAKPPPIPIQIVLRSKNGIHLHLKKLQA~~ASTHHHHHH~~

>CYP4XZ (SEQ ID NO:159)

MALLAVFLALLLLQAIKLYLRRQRLRALRLFPGPPTHWLYGHQREFQQEEELQKFNELVEKYPCAFPLWV
GPFQVFLNIYDPDYAKVLLSRRDPKSQVSYKFLIPWIGKGLSLDGPKWFQHRRLTPGFHFSILKPYVAVMA
DSVRVMLDKWEKLITQDSSVEIFEHISLMTLDSIMKCAFSSHQTNCTDSTSNSYIKAVFDLSKLIFHLRNHFL
HHNDLIYRFSPQGHFRQKLCQVAHQYTDKVIQERKESLKDEREQDKIQKKRYLDFLDILLCAKSENGEGLSDE
DLRAEVNTFMFAGHDTTASGISWLLYCMAMNPEHQQRCEEIRGILGDGDSITWDHLGQMPYTTMCIKE
SLRLYPPVPSISRELSKPITFPDGRSLPAGMTVVLNIWALHHNPTVWENPQVFDPLRFSQENSTKRHSHAF
LPFSAGPRNCIGQQFAMIELKVALALTLLRFELAPDPTKPPPIPIQIVLRSKNGIHLHLKKLHA~~ASTHHHHHH~~

Figure 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2016/050449

A. CLASSIFICATION OF SUBJECT MATTER

C07K 14/80 (2006.01) C12N 15/53 (2006.01) C12N 15/63 (2006.01) C07K 16/40 (2006.01) C12N 9/02 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

GenomeQuest Search of SEQ ID NOs: 3, 9, 14, 76, 84, 87, 90, 94, 142 and 154. Databases searched in GQ: GQ-Pat GoldPlus Protein & Nucleotide, GQ-Pat Platinum Protein & Nucleotide, Protein Data Bank, Genbank, Genpept, ENSEMBL, Swiss-Prot, RefSeq, Translated EMBL, GB SET.

Applicant/Inventor Search in Auspat/Espacenet/Patentscope. Keywords used: The University of Queensland; GILLAM, E.

Applicant(s)/Inventor(s) name searched in internal databases provided by IP Australia.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	



Further documents are listed in the continuation of Box C



See patent family annex

* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search 20 September 2016		Date of mailing of the international search report 20 September 2016	
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustalia.gov.au		Authorised officer Vanessa Williams AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262832356	

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. PCT/AU2016/050449
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013/130417 A1 (FOX CHASE CANCER CENTER) 06 September 2013 See page 2, second and third paragraph; SEQ ID NO: 13 comprises a sequence which shares 81 % sequence identity with instant SEQ ID NO: 9 (N98); See also SEQ ID NO: 8.	1, 5 and 15
X	US 2003/0170630 A1 (ALSOBROOK, II ET AL.) 11 September 2003 See SEQ ID NO: 10 which shares 86 % overall sequence identity with instant SEQ ID NO: 76 (N77); [0028]; SEQ ID NO: 9; Table 2A, Table 2B, Table 2E; [0079] - [0081]; [0090]; [0626]; [0546] -[0558]; [0520] - [0537]; [0088].	1, 5-11 and 15-23.
X	WO 2002/024945 A2 (MEAT AND LIVESTOCK COMMISSION) 28 March 2002 SEQ ID NO: 2 comprises a sequence which shares 80 % sequence identity with instant SEQ ID NO: 90 (N170); SEQ ID NO: 1; page 17, lines 15-17 and page 22, line 17- page 23, line 2; Example 1, particularly pages 17-19.	1, 5 and 15-23.
X	UniProtKB/TrEMBL Accession No. F7D0J8, 27 July 2011. Sequence shares 83 % overall sequence identity with instant SEQ ID NO: 84 (N133).	1 and 5
X	UniProtKB/TrEMBL Accession No. G3VHJ8, 16 November 2011. Sequence shares 80.5 % overall sequence identity with instant SEQ ID NO: 87 (N157).	1 and 5
X	NCBI REFSEQ Accession No. XP_005963575, 05 November 2013. Sequence shares 94 % overall sequence identity with instant SEQ ID NO: 94 (N312).	1 and 5
X	UniProtKB/TrEMBL Accession No. W5MQP4, 16 April 2014. Comprises a sequence which shares 80.5 % sequence identity with instant SEQ ID NO: 142 (N0).	1 and 5
X	NCBI REFSEQ Accession No. XP_003770498, 15 May 2015. Comprises a sequence which shares 82.5 % sequence identity with instant SEQ ID NO: 154 (N122).	1 and 5
Form PCT/ISA/210 (fifth sheet) (July 2009)		

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
the subject matter listed in Rule 39 on which, under Article 17(2)(a)(i), an international search is not required to be carried out, including
2. ☒ Claims Nos.: **2-4, 12 and 14**
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
See Supplemental Box
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See Supplemental Box for Details

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
1-12 and 14-23 (all partially)
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

Supplemental Box**Continuation of Box II**

The claims do not comply with Rule 6.2(a) because they rely on references to the description. Note that Claim 14 refers to X_1-X_n which is a reference to Tables 1-4 of the description.

Continuation of: Box III

The International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features/ PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

The polypeptides of SEQ ID NOs: 1-159 would be regarded as having the same or corresponding special technical feature if the alternatives had a common property or activity and shared a significant structural element that is essential to the common property or activity.

The polypeptides are each said to be oxidoreductase proteins for use in biocatalysis. As such, this may be regarded as a common property/activity. However, a sequence alignment of SEQ ID NOs: 1-159 revealed that there is no common structural element present amongst each of the claimed polypeptides that is responsible for imparting this common property/activity. As such, there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a priori*. As a consequence, there are 159 different inventions (each sequence constituting a single, separate invention).

However, as a courtesy to the applicant, this International Searching Authority agreed to search 5 sequences (as elected by the applicant) per search fee. In response to the Invitation to Pay Additional Fees, the applicant elected to pay 1 additional search fee (five sequences). Thus, this International Searching Authority has searched and examined the following 10 sequences which relate to claims 1-12 and 14-23 (all partially).

SEQ ID NO: 3;

SEQ ID NO: 9;

SEQ ID NO: 14;

SEQ ID NO: 76;

SEQ ID NO: 84.

SEQ ID NO: 87;

SEQ ID NO: 90;

SEQ ID NO: 94;

SEQ ID NO: 142;

SEQ ID NO: 154.

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of a sequence listing filed or furnished:

a. (means)

☐ on paper

☐ in electronic form

b. (time)

☐ in the international application as filed

☐ together with the international application in electronic form

☐ subsequently to this Authority for the purposes of search

2. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments:

A sequence listing was not filed, however the sequences depicted in the drawings were used for the purposes of this search and opinion.

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
WO 2013/130417 A1	06 September 2013	WO 2013130417 A1	06 Sep 2013
		US 2014363406 A1	11 Dec 2014
US 2003/0170630 A1	11 September 2003	US 2003170630 A1	11 Sep 2003
		AU 778692 B2	16 Dec 2004
		AU 779667 B2	03 Feb 2005
		AU 779787 B2	10 Feb 2005
		AU 780221 B2	10 Mar 2005
		AU 782985 B2	15 Sep 2005
		AU 783334 B2	20 Oct 2005
		AU 783811 B2	08 Dec 2005
		AU 1150202 A	15 Apr 2002
		AU 1154302 A	22 Apr 2002
		AU 1202101 A	23 Apr 2001
		AU 1204301 A	30 Apr 2001
		AU 1453102 A	30 Jan 2002
		AU 1616801 A	30 May 2001
		AU 1631701 A	10 May 2001
		AU 1817201 A	12 Jun 2001
		AU 2021502 A	18 Jun 2002
		AU 2287101 A	03 Jul 2001
		AU 2716102 A	06 May 2002
		AU 2744502 A	01 Jul 2002
		AU 2792501 A	24 Jul 2001
		AU 3039102 A	29 Apr 2002
		AU 3097602 A	11 Jun 2002
		AU 3099402 A	01 Jul 2002
		AU 3103502 A	01 Jul 2002
		AU 3115302 A	01 Jul 2002
		AU 3736000 A	28 Sep 2000
		AU 3830301 A	27 Aug 2001
		AU 3975601 A	20 Aug 2001
		AU 3988901 A	03 Sep 2001
		AU 4149001 A	27 Aug 2001
		AU 4216800 A	14 Nov 2000
		AU 4592001 A	03 Oct 2001
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		AU 4729401 A	17 Sep 2001
		AU 5124701 A	15 Oct 2001
		AU 5134200 A	05 Dec 2000
		AU 5634700 A	09 Jan 2001
		AU 5726200 A	28 Dec 2000
		AU 5909601 A	30 Oct 2001
		AU 5910901 A	30 Oct 2001
		AU 6229100 A	05 Feb 2001
		AU 6293799 A	26 Apr 2000
		AU 6899700 A	05 Mar 2001
		AU 7021501 A	08 Jan 2002
		AU 7355801 A	30 Jan 2002
		AU 7377300 A	17 Apr 2001
		AU 7717800 A	30 Apr 2001
		AU 7868000 A	10 May 2001
		AU 8023100 A	23 Apr 2001
		AU 9273401 A	02 Apr 2002
		AU 2002211474 A1	04 Mar 2004
		AU 2002211476 A1	04 Mar 2004
		AU 2002214531 A1	30 Jan 2002
		AU 2002230994 A1	01 Jul 2002
		AU 2002246729 A1	06 Aug 2002
		AU 2002246808 A1	06 Aug 2002
		AU 2002248201 A1	06 Aug 2002
		AU 2002249817 A1	24 Jul 2002
		AU 2002249818 A1	24 Jul 2002
		AU 2002254163 A1	24 Sep 2002
		AU 2002257014 A1	19 Sep 2002
		AU 2002303232 A1	21 Oct 2002
		AU 2002303804 A1	03 Dec 2002
		AU 2002309238 A1	16 Dec 2002
		AU 2002309239 A1	16 Dec 2002
		AU 2002309646 A1	18 Nov 2002
		AU 2002316064 A1	17 Feb 2003
		AU 2002322277 A1	08 Jan 2003
		AU 2002322404 A1	21 Jan 2003
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		AU 2002322405 A1	21 Jan 2003
		AU 2002322406 A1	21 Jan 2003
		AU 2002326911 A1	24 Mar 2003
		AU 2002327676 A1	01 Apr 2003
		AU 2002334781 A1	22 Apr 2003
		AU 2002338323 A1	21 Oct 2002
		AU 2002354034 A1	19 May 2003
		AU 2002359579 A1	23 Jun 2003
		AU 2002360485 A1	09 Jul 2003
		AU 2002362063 A1	30 Jun 2003
		AU 2002364705 A1	09 Sep 2003
		AU 2002365216 A1	02 Sep 2003
		AU 2002367467 A1	22 Sep 2003
		AU 2002367747 A1	13 Oct 2003
		AU 2002368153 A1	25 Feb 2004
		AU 2002368272 A1	29 Jul 2004
		AU 2002368398 A1	18 Jun 2004
		AU 2003209162 A1	30 Jul 2003
		AU 2003209163 A1	24 Jul 2003
		AU 2003213760 A1	22 Sep 2003
		AU 2003215010 A1	02 Sep 2003
		AU 2003217956 A1	29 Sep 2003
		AU 2003219743 A1	04 Sep 2003
		AU 2003228284 A1	22 Sep 2003
		AU 2003228336 A1	08 Oct 2003
		AU 2003228336 B2	30 Jul 2009
		AU 2003228405 A1	20 Oct 2003
		AU 2003228426 A1	13 Oct 2003
		AU 2003230775 A1	20 Oct 2003
		AU 2003232034 A1	17 Nov 2003
		AU 2003232457 A1	19 Dec 2003
		AU 2003237460 A1	22 Dec 2003
		AU 2003245387 A1	19 Dec 2003
		AU 2003256263 A1	19 Dec 2003
		AU 2003259027 A1	19 Dec 2003
		AU 2003259704 A1	25 Feb 2004
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		AU 2003261449 A1	25 Feb 2004
		AU 2003263992 A1	23 Feb 2004
		AU 2003265381 A1	25 Feb 2004
		AU 2003270424 A1	29 Mar 2004
		AU 2003272200 A1	06 Jan 2004
		AU 2003304034 A1	01 Nov 2004
		AU 2005200105 A1	10 Feb 2005
		AU 2008201991 A1	29 May 2008
		AU 2009202669 A1	23 Jul 2009
		AU 2009210387 A1	10 Sep 2009
		AU 2013205381 A1	23 May 2013
		AU 2013205381 B2	14 Apr 2016
		CA 2347120 A1	13 Apr 2000
		CA 2362422 A1	14 Sep 2000
		CA 2365910 A1	19 Oct 2000
		CA 2374053 A1	23 Nov 2000
		CA 2374073 A1	27 Sep 2001
		CA 2375424 A1	14 Dec 2000
		CA 2377263 A1	28 Dec 2000
		CA 2379925 A1	25 Jan 2001
		CA 2381396 A1	15 Feb 2001
		CA 2384749 A1	22 Mar 2001
		CA 2385196 A1	19 Apr 2001
		CA 2386199 A1	12 Apr 2001
		CA 2386383 A1	12 Apr 2001
		CA 2386922 A1	26 Apr 2001
		CA 2386925 A1	19 Apr 2001
		CA 2391885 A1	25 May 2001
		CA 2392110 A1	07 Jun 2001
		CA 2395212 A1	28 Jun 2001
		CA 2400332 A1	23 Aug 2001
		CA 2400360 A1	23 Aug 2001
		CA 2401552 A1	15 Sep 2001
		CA 2404519 A1	11 Oct 2001
		CA 2404541 A1	11 Oct 2001
		CA 2406096 A1	25 Oct 2001
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		CA 2412256 A1	03 Jan 2002
		CA 2416452 A1	24 Jan 2002
		CA 2421576 A1	28 Mar 2002
		CA 2423677 A1	11 Apr 2002
		CA 2425302 A1	18 Apr 2002
		CA 2426588 A1	18 Jul 2002
		CA 2430634 A1	25 Jul 2002
		CA 2433439 A1	15 Aug 2002
		CA 2433742 A1	18 Jul 2002
		CA 2434690 A1	06 Sep 2002
		CA 2435528 A1	17 Oct 2002
		CA 2437364 A1	06 Sep 2002
		CA 2438571 A1	12 Dec 2002
		CA 2439529 A1	06 Sep 2002
		CA 2440108 A1	10 Oct 2002
		CA 2440219 A1	17 Oct 2002
		CA 2440337 A1	19 Sep 2002
		CA 2440345 A1	19 Sep 2002
		CA 2442574 A1	17 Oct 2002
		CA 2442729 A1	24 Oct 2002
		CA 2442739 A1	17 Oct 2002
		CA 2443770 A1	31 Oct 2002
		CA 2446427 A1	14 Nov 2002
		CA 2446437 A1	14 Nov 2002
		CA 2447935 A1	12 Dec 2002
		CA 2447941 A1	03 Jan 2003
		CA 2448073 A1	12 Dec 2002
		CA 2448256 A1	12 Dec 2002
		CA 2448540 A1	09 Oct 2003
		CA 2449341 A1	18 Sep 2003
		CA 2451254 A1	20 Mar 2003
		CA 2451454 A1	20 Mar 2003
		CA 2451919 A1	20 Feb 2003
		CA 2455225 A1	10 Apr 2003
		CA 2455389 A1	10 Apr 2003
		CA 2456310 A1	20 Mar 2003
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Form PCT/ISA/210 (Family Annex)(July 2009)			

INTERNATIONAL SEARCH REPORT		International application No.	
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		CA 2460653 A1	15 May 2003
		CA 2463325 A1	15 May 2003
		CA 2463490 A1	19 Feb 2003
		CA 2465239 A1	15 May 2003
		CA 2467721 A1	19 Jun 2003
		CA 2467732 A1	26 Jun 2003
		CA 2470012 A1	17 Jul 2003
		CA 2471480 A1	24 Jul 2003
		CA 2474649 A1	07 Aug 2003
		CA 2474652 A1	14 Aug 2003
		CA 2476691 A1	10 Jun 2004
		CA 2478032 A1	18 Sep 2003
		CA 2479732 A1	02 Oct 2003
		CA 2480450 A1	16 Oct 2003
		CA 2481039 A1	16 Oct 2003
		CA 2481376 A1	09 Oct 2003
		CA 2485089 A1	13 Nov 2003
		CA 2486490 A1	31 Dec 2003
		CA 2487939 A1	11 Dec 2003
		CA 2488539 A1	11 Dec 2003
		CA 2488547 A1	11 Dec 2003
		CA 2495123 A1	12 Feb 2004
		CA 2495563 A1	19 Feb 2004
		CN 1432069 A	23 Jul 2003
		EP 1119619 A2	01 Aug 2001
		EP 1159417 A2	05 Dec 2001
		EP 1169445 A2	09 Jan 2002
		EP 1179064 A2	13 Feb 2002
		EP 1181367 A2	27 Feb 2002
		EP 1194545 A2	10 Apr 2002
		EP 1196576 A2	17 Apr 2002
		EP 1218406 A1	03 Jul 2002
		EP 1222270 A2	17 Jul 2002
		EP 1222272 A2	17 Jul 2002
		EP 1222277 A2	17 Jul 2002
		EP 1222279 A2	17 Jul 2002
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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

INTERNATIONAL SEARCH REPORT		International application No.	
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		EP 1222286 A2	17 Jul 2002
		EP 1232263 A2	21 Aug 2002
		EP 1232266 A2	21 Aug 2002
		EP 1240195 A2	18 Sep 2002
		EP 1250425 A2	23 Oct 2002
		EP 1255833 A2	13 Nov 2002
		EP 1255835 A2	13 Nov 2002
		EP 1259538 A2	27 Nov 2002
		EP 1261712 A2	04 Dec 2002
		EP 1261712 B1	13 Dec 2006
		EP 1268792 A2	02 Jan 2003
		EP 1274844 A2	15 Jan 2003
		EP 1280938 A2	05 Feb 2003
		EP 1309684 A2	14 May 2003
		EP 1354042 A2	22 Oct 2003
		EP 1356043 A2	29 Oct 2003
		EP 1356047 A2	29 Oct 2003
		EP 1358327 A2	05 Nov 2003
		EP 1360198 A2	12 Nov 2003
		EP 1360291 A2	12 Nov 2003
		EP 1370659 A2	17 Dec 2003
		EP 1373526 A2	02 Jan 2004
		EP 1379554 A2	14 Jan 2004
		EP 1383533 A2	28 Jan 2004
		EP 1390057 A2	25 Feb 2004
		EP 1392865 A2	03 Mar 2004
		EP 1399537 A2	24 Mar 2004
		EP 1399552 A2	24 Mar 2004
		EP 1401470 A2	31 Mar 2004
		EP 1401486 A2	31 Mar 2004
		EP 1401858 A2	31 Mar 2004
		EP 1407018 A2	14 Apr 2004
		EP 1409536 A2	21 Apr 2004
		EP 1409679 A2	21 Apr 2004
		EP 1409681 A2	21 Apr 2004
		EP 1420693 A2	26 May 2004
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		EP 1420697 A2	26 May 2004
		EP 1427749 A2	16 Jun 2004
		EP 1430110 A2	23 Jun 2004
		EP 1432726 A2	30 Jun 2004
		EP 1443913 A2	11 Aug 2004
		EP 1446419 A2	18 Aug 2004
		EP 1463747 A2	06 Oct 2004
		EP 1469073 A2	20 Oct 2004
		EP 1484401 A1	08 Dec 2004
		EP 1487864 A2	22 Dec 2004
		EP 1492807 A2	05 Jan 2005
		EP 1504026 A2	09 Feb 2005
		EP 1513864 A2	16 Mar 2005
		EP 1523322 A2	20 Apr 2005
		EP 1532238 A2	25 May 2005
		EP 1537239 A2	08 Jun 2005
		EP 1539806 A2	15 Jun 2005
		EP 1539807 A2	15 Jun 2005
		EP 1539985 A2	15 Jun 2005
		EP 1549671 A2	06 Jul 2005
		EP 1549951 A2	06 Jul 2005
		EP 1551972 A2	13 Jul 2005
		EP 1565199 A2	24 Aug 2005
		EP 1572898 A2	14 Sep 2005
		EP 1572922 A2	14 Sep 2005
		EP 1572948 A2	14 Sep 2005
		EP 1572995 A2	14 Sep 2005
		EP 1576086 A2	21 Sep 2005
		EP 1576146 A2	21 Sep 2005
		EP 1576168 A2	21 Sep 2005
		EP 1576169 A2	21 Sep 2005
		EP 1576169 B1	10 Aug 2016
		EP 1578905 A2	28 Sep 2005
		EP 1581616 A2	05 Oct 2005
		EP 1581618 A2	05 Oct 2005
		EP 1586643 A2	19 Oct 2005
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			
Form PCT/ISA/210 (Family Annex)(July 2009)			

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		EP 1590480 A2	02 Nov 2005
		EP 1605045 A2	14 Dec 2005
		EP 1622634 A2	08 Feb 2006
		EP 1637601 A2	22 Mar 2006
		EP 1638986 A1	29 Mar 2006
		EP 1661998 A2	31 May 2006
		EP 1664081 A2	07 Jun 2006
		EP 1686175 A2	02 Aug 2006
		EP 1790725 A2	30 May 2007
		EP 1792912 A2	06 Jun 2007
		EP 1852441 A2	07 Nov 2007
		EP 1852441 B1	28 Mar 2012
		HU 0301031 A2	28 Jul 2003
		IL 159174 A	29 Dec 2008
		JP 2002526099 A	20 Aug 2002
		JP 2002538786 A	19 Nov 2002
		JP 2003508030 A	04 Mar 2003
		JP 2003511030 A	25 Mar 2003
		JP 2003511076 A	25 Mar 2003
		JP 2003514530 A	22 Apr 2003
		JP 2003521239 A	15 Jul 2003
		JP 2003521885 A	22 Jul 2003
		JP 2003524402 A	19 Aug 2003
		JP 2003525634 A	02 Sep 2003
		JP 2003527108 A	16 Sep 2003
		JP 2003527831 A	24 Sep 2003
		JP 2003527859 A	24 Sep 2003
		JP 2003529334 A	07 Oct 2003
		JP 2003529350 A	07 Oct 2003
		JP 2003529355 A	07 Oct 2003
		JP 2003531571 A	28 Oct 2003
		JP 2003534779 A	25 Nov 2003
		JP 2004500046 A	08 Jan 2004
		JP 2004500068 A	08 Jan 2004
		JP 2004501615 A	22 Jan 2004
		JP 2004501623 A	22 Jan 2004
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
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Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		JP 2004524819 A	19 Aug 2004
		JP 2004527202 A	09 Sep 2004
		JP 2004529607 A	30 Sep 2004
		JP 2004532613 A	28 Oct 2004
		JP 2004533235 A	04 Nov 2004
		JP 2004533298 A	04 Nov 2004
		JP 2004535861 A	02 Dec 2004
		JP 2004537266 A	16 Dec 2004
		JP 2005500802 A	13 Jan 2005
		JP 2005500815 A	13 Jan 2005
		JP 2005501516 A	20 Jan 2005
		JP 2005504514 A	17 Feb 2005
		JP 2005505247 A	24 Feb 2005
		JP 2005506054 A	03 Mar 2005
		JP 2005506833 A	10 Mar 2005
		JP 2005507236 A	17 Mar 2005
		JP 2005508133 A	31 Mar 2005
		JP 2005508604 A	07 Apr 2005
		JP 2005511013 A	28 Apr 2005
		JP 2005512515 A	12 May 2005
		JP 2005515758 A	02 Jun 2005
		JP 2005518185 A	23 Jun 2005
		JP 2005518193 A	23 Jun 2005
		JP 2005518200 A	23 Jun 2005
		JP 2005519629 A	07 Jul 2005
		JP 2005520496 A	14 Jul 2005
		JP 2005522186 A	28 Jul 2005
		JP 2005526507 A	08 Sep 2005
		JP 2005527197 A	15 Sep 2005
		JP 2005528080 A	22 Sep 2005
		JP 2005528434 A	22 Sep 2005
		JP 2005528886 A	29 Sep 2005
		JP 2005532786 A	04 Nov 2005
		JP 2005535294 A	24 Nov 2005
		JP 2006501813 A	19 Jan 2006
		JP 2006507793 A	09 Mar 2006
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		JP 2006509491 A	23 Mar 2006
		JP 2006511237 A	06 Apr 2006
		JP 2006515753 A	08 Jun 2006
		JP 2006516082 A	22 Jun 2006
		KR 20030005289 A	17 Jan 2003
		MX PA02010283 A	23 May 2003
		PL 362928 A1	02 Nov 2004
		US 6420155 B1	16 Jul 2002
		US 6476193 B1	05 Nov 2002
		US 6573048 B1	03 Jun 2003
		US 6653448 B1	25 Nov 2003
		US 6689866 B1	10 Feb 2004
		US 2003056617 A1	27 Mar 2003
		US 6832636 B2	21 Dec 2004
		US 6855806 B1	15 Feb 2005
		US 2003054514 A1	20 Mar 2003
		US 6863889 B2	08 Mar 2005
		US 2003003532 A1	02 Jan 2003
		US 6942992 B2	13 Sep 2005
		US 2003215449 A1	20 Nov 2003
		US 6964849 B2	15 Nov 2005
		US 2003232347 A1	18 Dec 2003
		US 6974684 B2	13 Dec 2005
		US 2004018196 A1	29 Jan 2004
		US 6991901 B2	31 Jan 2006
		US 2003203426 A1	30 Oct 2003
		US 6992170 B2	31 Jan 2006
		US 2002164699 A1	07 Nov 2002
		US 7001766 B2	21 Feb 2006
		US 2004030110 A1	12 Feb 2004
		US 7033790 B2	25 Apr 2006
		US 2004009480 A1	15 Jan 2004
		US 7034132 B2	25 Apr 2006
		US 2004002584 A1	01 Jan 2004
		US 7108972 B2	19 Sep 2006
		US 2004029116 A1	12 Feb 2004
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		US 7109000 B2	19 Sep 2006
		US 2005288241 A1	29 Dec 2005
		US 7112668 B2	26 Sep 2006
		US 2006013813 A1	19 Jan 2006
		US 7141549 B2	28 Nov 2006
		US 2004236193 A1	25 Nov 2004
		US 7207941 B2	24 Apr 2007
		US 2003150003 A1	07 Aug 2003
		US 7238475 B2	03 Jul 2007
		US 2004022781 A1	05 Feb 2004
		US 7276593 B2	02 Oct 2007
		US 2007036772 A1	15 Feb 2007
		US 7547545 B2	16 Jun 2009
		US 2004203145 A1	14 Oct 2004
		US 8729036 B2	20 May 2014
		US 2002037850 A1	28 Mar 2002
		US 2002065405 A1	30 May 2002
		US 2002068279 A1	06 Jun 2002
		US 2002094546 A1	18 Jul 2002
		US 2002123612 A1	05 Sep 2002
		US 2002137202 A1	26 Sep 2002
		US 2002151494 A1	17 Oct 2002
		US 2002155115 A1	24 Oct 2002
		US 2002168716 A1	14 Nov 2002
		US 2002172999 A1	21 Nov 2002
		US 2003003090 A1	02 Jan 2003
		US 2003003462 A1	02 Jan 2003
		US 2003004310 A1	02 Jan 2003
		US 2003027158 A1	06 Feb 2003
		US 2003032095 A1	13 Feb 2003
		US 2003032166 A1	13 Feb 2003
		US 2003036185 A1	20 Feb 2003
		US 2003050232 A1	13 Mar 2003
		US 2003059768 A1	27 Mar 2003
		US 2003077774 A1	24 Apr 2003
		US 2003077794 A1	24 Apr 2003
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		US 2003082554 A1	01 May 2003
		US 2003082757 A1	01 May 2003
		US 2003083463 A1	01 May 2003
		US 2003087274 A1	08 May 2003
		US 2003087412 A1	08 May 2003
		US 2003087816 A1	08 May 2003
		US 2003100491 A1	29 May 2003
		US 2003109692 A1	12 Jun 2003
		US 2003119095 A1	26 Jun 2003
		US 2003129613 A1	10 Jul 2003
		US 2003134430 A1	17 Jul 2003
		US 2003148298 A1	07 Aug 2003
		US 2003148305 A1	07 Aug 2003
		US 2003148485 A1	07 Aug 2003
		US 2003149237 A1	07 Aug 2003
		US 2003165851 A1	04 Sep 2003
		US 2003165858 A1	04 Sep 2003
		US 2003170838 A1	11 Sep 2003
		US 2003176385 A1	18 Sep 2003
		US 2003176650 A1	18 Sep 2003
		US 2003185815 A1	02 Oct 2003
		US 2003194761 A1	16 Oct 2003
		US 2003195149 A1	16 Oct 2003
		US 2003195335 A1	16 Oct 2003
		US 2003198955 A1	23 Oct 2003
		US 2003198957 A1	23 Oct 2003
		US 2003198958 A1	23 Oct 2003
		US 2003199103 A1	23 Oct 2003
		US 2003199442 A1	23 Oct 2003
		US 2003199465 A1	23 Oct 2003
		US 2003202971 A1	30 Oct 2003
		US 2003203363 A1	30 Oct 2003
		US 2003203843 A1	30 Oct 2003
		US 2003204052 A1	30 Oct 2003
		US 2003207348 A1	06 Nov 2003
		US 2003207394 A1	06 Nov 2003
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		US 2003207800 A1	06 Nov 2003
		US 2003207801 A1	06 Nov 2003
		US 2003208039 A1	06 Nov 2003
		US 2003211985 A1	13 Nov 2003
		US 2003212257 A1	13 Nov 2003
		US 2003216308 A1	20 Nov 2003
		US 2003219823 A1	27 Nov 2003
		US 2003224982 A1	04 Dec 2003
		US 2003229016 A1	11 Dec 2003
		US 2003232331 A1	18 Dec 2003
		US 2003232332 A1	18 Dec 2003
		US 2003235821 A1	25 Dec 2003
		US 2003235882 A1	25 Dec 2003
		US 2003236188 A1	25 Dec 2003
		US 2003236389 A1	25 Dec 2003
		US 2004002120 A1	01 Jan 2004
		US 2004002134 A1	01 Jan 2004
		US 2004002453 A1	01 Jan 2004
		US 2004005557 A1	08 Jan 2004
		US 2004005558 A1	08 Jan 2004
		US 2004006205 A1	08 Jan 2004
		US 2004009907 A1	15 Jan 2004
		US 2004010119 A1	15 Jan 2004
		US 2004010120 A1	15 Jan 2004
		US 2004014053 A1	22 Jan 2004
		US 2004014058 A1	22 Jan 2004
		US 2004014081 A1	22 Jan 2004
		US 2004014120 A1	22 Jan 2004
		US 2004014173 A1	22 Jan 2004
		US 2004018199 A1	29 Jan 2004
		US 2004018555 A1	29 Jan 2004
		US 2004018594 A1	29 Jan 2004
		US 2004018970 A1	29 Jan 2004
		US 2004018977 A1	29 Jan 2004
		US 2004023241 A1	05 Feb 2004
		US 2004023259 A1	05 Feb 2004
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		US 2004023874 A1	05 Feb 2004
		US 2004024181 A1	05 Feb 2004
		US 2004029140 A1	12 Feb 2004
		US 2004029150 A1	12 Feb 2004
		US 2004029222 A1	12 Feb 2004
		US 2004029226 A1	12 Feb 2004
		US 2004029789 A1	12 Feb 2004
		US 2004029790 A1	12 Feb 2004
		US 2004030096 A1	12 Feb 2004
		US 2004033493 A1	19 Feb 2004
		US 2004038223 A1	26 Feb 2004
		US 2004038230 A1	26 Feb 2004
		US 2004038877 A1	26 Feb 2004
		US 2004043382 A1	04 Mar 2004
		US 2004043928 A1	04 Mar 2004
		US 2004043929 A1	04 Mar 2004
		US 2004043930 A1	04 Mar 2004
		US 2004048248 A1	11 Mar 2004
		US 2004048256 A1	11 Mar 2004
		US 2004058338 A1	25 Mar 2004
		US 2004058347 A1	25 Mar 2004
		US 2004067490 A1	08 Apr 2004
		US 2004067505 A1	08 Apr 2004
		US 2004067882 A1	08 Apr 2004
		US 2004072997 A1	15 Apr 2004
		US 2004076967 A1	22 Apr 2004
		US 2004086875 A1	06 May 2004
		US 2004121380 A1	24 Jun 2004
		US 2004146936 A1	29 Jul 2004
		US 2004147003 A1	29 Jul 2004
		US 2004153008 A1	05 Aug 2004
		US 2004162236 A1	19 Aug 2004
		US 2004229779 A1	18 Nov 2004
		US 2004259774 A1	23 Dec 2004
		US 2005003370 A1	06 Jan 2005
		US 2005014687 A1	20 Jan 2005
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2016/050449	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		US 2005037957 A1	17 Feb 2005
		US 2005048507 A1	03 Mar 2005
		US 2005049192 A1	03 Mar 2005
		US 2005053930 A1	10 Mar 2005
		US 2005170380 A1	04 Aug 2005
		US 2005171020 A1	04 Aug 2005
		US 2005191681 A1	01 Sep 2005
		US 2005208040 A1	22 Sep 2005
		US 2005233328 A1	20 Oct 2005
		US 2005244868 A1	03 Nov 2005
		US 2005266431 A1	01 Dec 2005
		US 2005287564 A1	29 Dec 2005
		US 2006003323 A1	05 Jan 2006
		US 2006057664 A1	16 Mar 2006
		US 2006063200 A1	23 Mar 2006
		US 2006084054 A1	20 Apr 2006
		US 2006084086 A1	20 Apr 2006
		US 2006111561 A1	25 May 2006
		US 2006141565 A1	29 Jun 2006
		US 2006188921 A1	24 Aug 2006
		US 2006210559 A1	21 Sep 2006
		US 2006211031 A1	21 Sep 2006
		US 2006234255 A1	19 Oct 2006
		US 2006234257 A1	19 Oct 2006
		US 2006257882 A1	16 Nov 2006
		US 2007166756 A1	19 Jul 2007
		US 2008171046 A1	17 Jul 2008
		US 2009181884 A1	16 Jul 2009
		US 2009263817 A1	22 Oct 2009
		US 2010158918 A1	24 Jun 2010
		US 2014373188 A1	18 Dec 2014
		WO 0020448 A2	13 Apr 2000
		WO 0053742 A2	14 Sep 2000
		WO 0061754 A2	19 Oct 2000
		WO 0070046 A2	23 Nov 2000
		WO 0075321 A2	14 Dec 2000
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			

INTERNATIONAL SEARCH REPORT Information on patent family members		International application No. PCT/AU2016/050449	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		WO 0078802 A2	28 Dec 2000
		WO 0105971 A2	25 Jan 2001
		WO 0110902 A2	15 Feb 2001
		WO 0119856 A2	22 Mar 2001
		WO 0123561 A2	05 Apr 2001
		WO 0125436 A2	12 Apr 2001
		WO 0125437 A2	12 Apr 2001
		WO 0127277 A2	19 Apr 2001
		WO 0127290 A2	19 Apr 2001
		WO 0129217 A2	26 Apr 2001
		WO 0136638 A2	25 May 2001
		WO 0140291 A2	07 Jun 2001
		WO 0146231 A2	28 Jun 2001
		WO 0151632 A2	19 Jul 2001
		WO 0159113 A2	16 Aug 2001
		WO 0161008 A2	23 Aug 2001
		WO 0161009 A2	23 Aug 2001
		WO 0162928 A2	30 Aug 2001
		WO 0166747 A2	13 Sep 2001
		WO 0170978 A2	27 Sep 2001
		WO 0174856 A2	11 Oct 2001
		WO 0174904 A2	11 Oct 2001
		WO 0179294 A2	25 Oct 2001
		WO 0179563 A2	25 Oct 2001
		WO 0200691 A2	03 Jan 2002
		WO 0206339 A2	24 Jan 2002
		WO 0206345 A2	24 Jan 2002
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001. Form PCT/ISA/210 (Family Annex)(July 2009)			

INTERNATIONAL SEARCH REPORT Information on patent family members		International application No. PCT/AU2016/050449	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
WO 2002/024945 A2	28 March 2002	WO 0224945 A2	28 Mar 2002
		AU 8792501 A	02 Apr 2002
End of Annex			
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001. Form PCT/ISA/210 (Family Annex)(July 2009)			