(19)中华人民共和国国家知识产权局

(12)发明专利

(10)授权公告号 CN 106471134 B
(45)授权公告日 2021.11.12

(21)申请号 201580035408.5

(22)申请日 2015.07.09

(65)同一申请的已公布的文献号
申请公布号 CN 106471134 A

(43)申请公布日 2017.03.01

(30)优先权数据
14176417.5 2014.07.09 EP

(85)PCT国际申请进入国家阶段日
2016.12.29

(86)PCT国际申请的申请数据
PCT/EP2015/065756 2015.07.09

(87)PCT国际申请的公布数据
WO2016/005524 EN 2016.01.14

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(51)Int.Cl.
C12Q 1/6869(2018.01)
C12Q 1/6806(2018.01)

(56)对比文件
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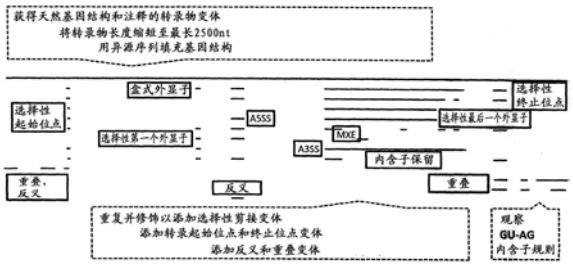
权利要求书1页 说明书98页
序列表322页 附图16页

(54)发明名称

用于定量RNA转录物变体的方法和产物

(57)摘要

本发明涉及转录组学领域,并提供了用于样品中转录物变体的受控鉴定和/或定量的方法,包括提供模拟转录物变体的人工多核酸分子的参照集,并将所述参照集作为外部对照添加到包含转录物变体的样品。本发明还提供这样的参照集以及产生这样的参照集的方法。



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1.一种用于在一个或多个样品中鉴定和/或定量转录物变体的方法,包括:

a)提供模拟转录物变体的核酸(NA)分子的参照集,其中所述NA分子是人工NA分子,所述参照集包含

至少两个不同家族的人工NA分子,每个家族由至少两种不同人工NA分子组成,

其中,独立地对于每个家族,所述每个家族的所有人工NA分子是相同人工基因的转录物变体,其中作为天然存在的基因的已知特征,所述人工基因至少具有转录起始位点、转录区和转录终止位点,并且其中所述人工NA分子包含外显子,其中所述人工NA分子被设计为缺乏与生物体中存在的已知转录物的相似性并且不含有具有起始和终止密码子的阅读框,其中相似性通过具有以下参数的BLASTn程序确定:字大小为28,过滤低复杂度区域,线性缺口成本和匹配/错配分数为1,-2,和

其中,独立地对于每个家族,所述每个家族的人工NA分子共有长度为至少80nt的序列,并且所述每个家族的至少两种人工NA分子相差至少80nt长度的至少另一个序列,和

其中,独立地对于每个家族,所述人工NA分子中至少两种以预设的摩尔量存在;和

b)将所述参照集作为外部对照添加到包含转录物变体的一个或多个样品;和

c)基于读长生成和分配进行NA测序,其中使用参照集的读长产生参照读长分配,并且所述参照读长分配用于调整或移动一个或多个样品的转录物变体读长的统计读长分配,

其中所述NA是RNA或DNA。

2.一种用于评估NA测序方法的方法,包括:

a)提供模拟转录物变体的人工NA分子的参照集,所述参照集包含

至少两个不同家族的人工NA分子,每个家族由至少两种不同人工NA分子组成,

其中,独立地对于每个家族,所述每个家族的所有人工NA分子是相同人工基因的转录物变体,其中作为天然存在的基因的已知特征,所述人工基因至少具有转录起始位点、转录区和转录终止位点,并且其中所述人工NA分子包含外显子,其中所述人工NA分子被设计为缺乏与生物体中存在的已知转录物的相似性并且不含有具有起始和终止密码子的阅读框,其中相似性通过具有以下参数的BLASTn程序确定:字大小为28,过滤低复杂度区域,线性缺口成本和匹配/错配分数为1,-2,和

其中,独立地对于每个家族,所述每个家族的人工NA分子共有长度为至少80nt的序列,并且所述每个家族的至少两种人工NA分子相差至少80nt长度的至少另一个序列,和

其中,独立地对于每个家族,所述人工NA分子中每一种以预设的摩尔量存在;和

b)基于读长生成和分配执行NA测序,其中利用所述参照集的读长来生成参照读长分配;和

c)将步骤b)中产生的参照读长分配与参照集预期的读长分配进行比较,从而评估所述NA测序方法,

其中所述NA是RNA或DNA。

用于定量RNA转录物变体的方法和产物

发明领域

[0001] 本发明涉及转录组学、特别是全转录组鸟枪测序(“RNA-seq”)领域。更具体地,其涉及适合于通过RNA-seq或微阵列分析或定量PCR(qPCR)分析的样品中的RNA转录物变体的鉴定和定量的方法和产物。

背景技术

[0002] 当对核酸样品进行测序时,下一代测序(NGS)技术产生大量短的读长(read)。下一代测序中的一个重要步骤是文库制备(library preparation,或者简写为library prep)。该过程使用mRNA或cDNA作为输入并产生短cDNA片段的文库,每个片段对应于mRNA分子的一段。然后通过NGS测序仪对这些片段进行测序,通常不是全部,而是部分地在其起始和/或终止时。这导致称为读长的短核苷酸序列,并且最通常由NGS测序仪存储为代表遗传密码核碱基的一组四个ASCII字符(诸如A、C、G、T或0、1、2、3)的序列。为了推断哪些mRNA分子存在于原始样品中,将所述读长作图或比对到参照基因组或转录组上,或基于序列重叠从头组装。

[0003] 下一代测序已经用于各种基因组作图程序(US 2013/110410 A1)或DNA鉴定方法,例如,通过使用经作图的基因组将序列读长与某种生物体变体相关联(WO 2009/085412 A1)。

[0004] WO 2009/091798 A1描述了用于获得生物体的转录组谱的方法,所述方法包括:对一个或多个cDNA分子进行测序以获得测序读长;将每个测序读长与参照序列比对。

[0005] 然而,使用短序列读长的转录组分析的主要内在问题是在如下文段落中描述的转录物变体的情况下的比对步骤。通常难以将短序列读长正确地与一个转录物变体进行比对,特别是难以可靠地定量样品中存在的所有转录物变体。

[0006] EP 2 333 104 A1涉及对来源于潜在不同RNA分子库的核酸分子片段序列进行排序的RNA分析方法。基因不仅在一个转录物变体中表达,而且许多转录物同种型可以从给定的基因组区域转录(参见例如Nilsen和Graveley,2010;Wang等人,2009;Koscielny等人,2009),其外显子-内含子组成和转录起始(TSS)和终止位点(TES)有变化。转录物同种型也可以在其丰度上不同达六个数量级,增加了额外的复杂度层(Aird等人,2013)。Zhang等人的文献涉及合成的选择性剪接数据库。

[0007] 通过RNA-Seq分析转录组中的复杂度需要将短的读长与注释的参照基因组比对,并从独特的特征(诸如重叠群覆盖和告诉外显子-外显子连接)得到转录物类似物和假说(参见例如Wang等人,2009)。这些算法远不准确,遭受不足和不同的注释以及分辨相似特征并以相似水平表达的转录物变体的固有问题。不使用基因组序列和注释的转录组从头组装甚至更加困难和低效,并且主要应用于未充分表征的生物体。

[0008] 本发明的目的是提供允许样品中转录物变体的更准确评估(即鉴定和定量)的方法和产品。

[0009] 发明概述

[0010] 本发明提供了用于在一个或多个样品中受控鉴定和/或定量转录物变体的方法,

包括：

[0011] a)提供模拟转录物变体的人工核酸(NA)分子的参照集，包括至少一个、优选至少两个、更优选至少三个、特别是至少五个不同家族的NA分子，每个家族由至少两种、优选至少三种、更优选至少四种、特别是至少五种不同NA分子组成，

[0012] 其中，独立地对于每个家族，所述每个家族的所有NA分子是相同人工基因的参照转录物变体，和

[0013] 其中，独立地对于每个家族，所述每个家族的NA分子共有长度为至少80个核苷酸(nt)、优选至少100nt、更优选至少150nt、特别是至少200nt的序列，并且所述每个家族的至少两种NA分子相差至少80nt长度、优选至少100nt、更优选至少150nt、甚至更优选至少200nt、特别是至少300nt的至少另一个序列，和

[0014] 其中所述NA分子中至少两种、优选每种以预设的摩尔量存在；和

[0015] b)将所述参照集作为外部对照添加到包含转录物变体的一个或多个样品；和

[0016] c1)基于读长生成和分配进行NA测序，其中使用参照集的读长产生参照读长分配，并且所述参照读长分配用于控制、验证或修饰一个或多个样品的转录物变体的读长分配；或者

[0017] c2)对所述一个或多个样品进行NA检测或定量方法，优选微阵列分析或qPCR，其中至少一个探针结合参照集的至少一个NA分子，并且基于从至少一个探针结合参照集的至少一个NA分子产生的信号的测量结果用于控制、验证或修饰基于在所述NA检测或定量方法中一个或多个样品的转录物变体结合探针产生的信号的测量结果。

[0018] 本发明进一步提供了非常适合用于上述方法的人工NA分子的参照集，以及产生这样的参照集的方法，以及适合包含在这样的参照集中的NA分子。

[0019] 除非明确指出，否则以下详细描述和优选实施方案适用于本发明的所有方面，并且可以彼此组合而没有限制。优选实施方案和方面在权利要求中进一步限定。

[0020] 发明详细公开内容

[0021] 内部、外部、相对和绝对标准对于确定包含转录物变体(适用于几乎所有来自真核细胞的转录物样品)的样品和努力分析这样的复杂转录物样品的方法的不同质量度量是必要的。定量数据可以用相对或绝对术语表示。每种不同的方法(例如微阵列、qPCR或NGS)在关于标准化测量结果的数据分析中具有许多特性。

[0022] 对于微阵列和qPCR中的相对定量，使用内部或外部对照在样品之间比较RNA水平，以对样品浓度和上样的差异进行标准化。NGS实验使用不同的标准化程序来测定读长的数量，以及鉴定的转录物的长度。结果取决于许多变量，如基因注释的质量和状态，或文库制备与比对和装配算法的测序偏差之间的一致性。例如需要对照以补偿文库制备效率的差异。

[0023] 对照是在整个样品集中以恒定水平表达的内部基因(内部参照)或掺入的RNA(外部参照)。对于表示实验基因的表达水平的定量信号强度(荧光单位或读长计数)，外显子或标签与含有已知量或比率的标准相关，并且所述标准被定义为绝对或相对参照。

[0024] US 2004/009512 A1公开了使用内部对照探针分析mRNA剪接产物的方法(该文献的权利要求7，第[0097]和[0106]段)。没有公开代表具有本发明涉及的分子长度的变体的内部对照。

[0025] 市售有许多复杂RNA标准样品，例如通用人参照RNA和通用人脑参照RNA(Ambion，Life Technologies)。这些标准从多个供体和若干组织/脑区域汇集，因此旨在用于基因表达的广泛无偏和可再现的覆盖。对这些标准样品的实验提供参照数据，并用于验证和评价实验方法。为了将未知样品的测量与彼此和所述标准样品联结起来，需要内部或外标。

[0026] 内部RNA标准是在所有待分析的样品中以相对恒定的水平表达的基因。内标应在生物体的不同组织之间、在所有发育阶段以及对照和实验处理的细胞类型中同样地表达，并且通常称为“持家”基因。不幸的是，尽管在最广泛的实验条件下18S rRNA似乎接近是理想的内部对照，在所有这些情况下没有具有恒定表达水平的单一RNA。然而，rRNA的相对高丰度导致文库制备方法，其特异性耗尽rRNA以释放测序空间。

[0027] 因此，有必要为特定的实验问题确定合适的对照RNA，其将最可能是mRNA。这进而需要考虑mRNA同种型对标准的适用性的影响。虽然可以发现一些内标(β-肌动蛋白、甘油醛-3-磷酸脱氢酶(GAPDH)或亲环蛋白mRNA)，只有外标提供受控且可靠的参照值。来自其他物种的RNA样品的恒定来源可以用作外标，例如，细菌转录组加入到哺乳动物样品中。然而，因为甚至更简单的生物体如原核生物已经具有如此大量的转录物，在整个动态(浓度)范围内的平衡表示将浪费太多的测序空间。因此，以前开发了低复杂度但可比动态范围的外标，ERCC。

[0028] 由国家标准与技术研究所(NIST，美国)牵头并由37个实体组成的ERCC Consortium通过合成DNA序列或源自枯草芽孢杆菌(Bacillus subtilis)或深海通气孔微生物詹氏甲烷球菌(Methanocaldococcus jannaschii)基因组的DNA的体外转录合成对照RNA。这些转录物旨在是单外显子的(monoexonic)和非同种型的，即它们不代表剪接或其它转录物变体。该联合会决定在19-25个腺苷(23个腺苷中值)之间的多聚(A)尾长，长度为250-2000nt，GC含量为约30-55％。这些不同的序列显示内源转录物的至少一些性质，诸如GC含量和长度的多样性。ERCC RNA显示与来自测序的真核生物的内源转录物的最小序列同源性(External RNA Controls Consortium，2005a)。ERCC混合物的开发记录在特殊报告(External RNA Controls Consortium，2005)中。

[0029] Blomquist等人的文献涉及通过NGS进行的DNA测序，并且使用采用合成内标的方法(该文献的摘要和图1)。在RNA处理过程中，使用ERCC掺入对照内标(该文献的第4页左栏)。Devonshire等人的文献也涉及ERCC。

[0030] Ambion(Life Technologies的一部分)商业性提供92种ERCC转录物，其被以独立混合物(浓度跨越6个数量级)或2种混合物的形式设计为掺入应被比较差异基因表达的两种样品(测量测定倍数变化的准确性;User Guide:ERCC RNA Spike-In Control Mixes，Ambion)。

[0031] 虽然最初设想用于qPCR和微阵列系统，它们现在广泛应用于RNA-Seq NGS实验。这种不同的有意的目的使得目前使用ERCC是有问题的。

[0032] ERCC的限制在于它们i)其大小范围受限，ii)仅含有短的多聚(A)尾和iii)无帽结构。然而，ERCC的主要缺点是它们不含任何种类的转录物变体。因此，它们不适合于转录物变体的受控鉴定和/或定量，并且不适于在这方面评估测序方法(或其他分析方法)。另一个缺点是它们与已知序列(芽孢杆菌和甲烷球菌)具有相似性。

[0033] Sun等人的文献涉及选择性剪接转录物的定量。人端粒酶逆转录酶的剪接变体用

作对照。已知约20种剪接变体，其中4种在肿瘤中是常见的(该文献的第319页中间栏)。在该文献(该文献的第320页中间栏和图1；第321页左栏；表1)中已经研究了这些常见的4种。然而，该文献不涉及人工转录物变体，并且该文献的对照仅限于单个人类基因，不像本发明允许代表性且准确地模拟选择性剪接事件而不必依赖于天然序列(其依赖于天然序列实际上可能干扰实验)。

[0034] 本发明克服了这些缺点。在本发明的过程中，开发和表征了许多不同的方法和参照集，以便得出特别适合于解决鉴定和定量转录物变体的本发明问题的方法和产品。

[0035] 因此，在本发明的一个方面，提供了用于一个或多个样品中受控鉴定和/或定量转录物变体的方法，包括：

[0036] a)提供模拟转录物变体的人工核酸(NA)分子的参照集，包括至少一个、优选至少两个、更优选至少三个、特别是至少五个不同家族的NA分子，每个家族由至少两种、优选至少三种、更优选至少四种、特别是至少五种不同NA分子组成，

[0037] 其中，独立地对于每个家族，所述每个家族的所有NA分子是相同人工基因的参照转录物变体，和

[0038] 其中，独立地对于每个家族，所述每个家族的NA分子共有长度为至少80个核苷酸(nt)、优选至少100nt、更优选至少150nt、特别是至少200nt的序列，并且所述每个家族的至少两种NA分子相差至少80nt长度、优选至少100nt、更优选至少150nt、甚至更优选至少200nt、特别是至少300nt的至少另一个序列，和

[0039] 其中所述NA分子中至少两种、优选每种以预设的摩尔量存在(其使得参照集特别适用于本方法，因为其允许例如将样品读长分配相对参照(即对照)读长分配进行标准化)；和

[0040] b)将所述参照集作为外部对照添加到包含转录物变体的一个或多个样品中(所述参照集可以物理地添加到相同的样品容器中和/或到分开的容器中用于分析。此外或者备选地，它也可以在计算机实现的方法步骤中通过使用来自相同分析仪器、相同的分析仪器模型或其他分析仪器模型的参照集的先前测量而非物理地添加)；和

[0041] c1)基于读长生成(读长可以具有任何长度)和分配(即将读长作图到参照序列上)进行NA测序，其中使用参照集的读长产生参照读长分配，并且所述参照读长分配用于控制、验证或修饰一个或多个样品的转录物变体的读长分配；或者

[0042] c2)对所述一个或多个样品进行NA检测或定量方法，优选微阵列分析或qPCR，

[0043] 其中至少一个探针结合参照集的至少一个NA分子，并且基于从至少一个探针结合参照集的至少一个NA分子产生的信号的测量结果用于控制、验证或修饰基于在所述NA检测或定量方法中一个或多个样品的转录物变体结合探针产生的信号的测量结果。在qPCR中，探针可以是在PCR反应中延伸的引物或标记的DNA探针；在微阵列分析中，探针可以是固定在DNA芯片上的DNA探针。

[0044] NA可以是DNA或RNA。优选地，它是RNA。

[0045] 本领域技术人员可以自由选择何时应用参照集作为DNA或RNA。技术人员还知道如何制备用于NA测序或NA检测或定量方法的样品。有利地，在应用NA测序或NA检测或定量方法之前，在样品制备期间早期添加参照集，使得参照集在所有或大多数样品制备步骤期间存在。为此，其优选作为RNA加入，因为转录物变体(目的分子)通常是在样品制备的早期的

mRNA分子。

[0046] 如在本文全文中使用的“人工NA分子”或“人工基因”或“人工序列”中的术语“人工”是指称为不存在于天然生物有机体(诸如微生物、动物或植物)但是被人故意地思考和创造的人工实体。然而,诸如人工NA分子或人工基因的人工实体仍然可以在重组生物体中产生(例如引入天然存在的大肠杆菌(E.coli)细胞中并在天然存在的大肠杆菌细胞中表达)而不失去其是人工的质量。

[0047] 人工NA分子特别适合于本发明的方法,特别是当它们与已知NA序列不具有或仅具有可忽略的序列同源性时。这允许即使对于下一代测序读长中典型的短序列(例如在40-80nt之间或甚至在20-200nt之间),将读长明确分配为“参照读长”(即产生参照读长分配)。通常,转录物是来自一个基因(例如来自DNA模板)的转录产物(例如通过RNA聚合酶合成),其由从转录起始位点到转录终止位点的RNA序列组成。为了本发明的目的,转录物是包含至少一个外显子的NA分子。该词转录物描述的是单个分子或具有相同序列的所有分子的组。众所周知,在真核生物中,mRNA(转录物)被从前mRNA(也称为异源核核糖核酸)加工(特别是通过剪接)以得到成熟转录物。根据定义,从转录物剪接掉的序列区域称为内含子,保留在成熟转录物中的序列区域称为外显子。一个成熟转录物变体中的外显子可以是另一个成熟转录物变体的内含子(由于不存在于该变体中)。当所有转录物变体的序列已知时,技术人员显然清楚如何将基因序列区域注释为外显子和内含子。如本文所使用的,外显子是可以是在任何变体中是外显子的序列区域。它通常通过位于封闭的内含子区域的两端的相当保守的序列来进行表征,并且与相邻外显子形成所谓的外显子-外显子接头(junction),也参见表2。天然外显子可以是编码区的一部分(或反之亦然),然而,在本发明的人工NA分子的情况下,外显子优选不是人工蛋白质或天然蛋白质的编码区的一部分(或反之亦然),因为本发明的人工序列被设计为缺乏与生物体中存在的已知转录物的相似性并且不含有具有起始和终止密码子的阅读框或仅具有起始密码子的开放阅读框(ORF)。包含在本发明的人工NA分子中的外显子是人工外显子,因为它们包含人工序列。除非另有说明,否则本文中的词“转录物”应解释为表示“成熟转录物”。

[0048] 在最广义的术语中,转录物“变体”是基因的转录物,其中存在所述基因的至少两个转录物,其中转录物与至少两个转录物中的另一个转录物相差至少一个核苷酸(由“选择性转录事件”生成)。然而,在本发明方法的上下文中,每个(转录物)家族的人工NA分子对于每个家族独立地共有长度为至少80个核苷酸(优选至少100nt、更优选至少150nt、特别是至少200nt)的序列,并且每个家族的至少两个NA分子对于每个家族独立地与至少另一个序列相差至少80个核苷酸长度(优选至少100nt、更优选至少150nt、甚至更优选至少150nt、甚至更优选至少200nt、特别是至少300nt)。该家族的其他成员可以与其它成员仅差一个核苷酸,但是优选变体之间的更大差异——例如在家族的所有成员之间低至仅80nt或100nt或150nt或200nt的一段序列(stretch)的序列同一性。

[0049] 本文中,(人工基因的)“模拟转录物变体”是指具有代表天然存在的真核生物(优选动物或植物、更优选脊椎动物、甚至更优选哺乳动物、特别是人)基因的天然存在的真核生物(优选动物或植物、更优选脊椎动物、甚至更优选哺乳动物、特别是人)转录物。本领域技术人员熟悉转录物变体的这些典型特征。这些特征包括以下一种或多种:是一个或多个选择性剪接事件的结果(参见下文和表1),具有某些内含子剪接位点二核苷酸(参见下文和

表2)，具有选择性转录起始和终止位点(参见下文)，是反义转录物，与其他基因/转录物重叠，被多聚腺苷酸化(参见Wang等人，2008)。另外或者备选地，可以使用Wang等人，2008、特别是图2中定义的特征。有利地，参照集的NA(RNA或DNA)分子的整体具有前两句中所述的参照集中所述的特征中的至少一个、优选至少两个、更优选至少三个、甚至更优选至少四个、特别是至少五个，其中每个NA分子彼此独立地在至少一个或至少两个或至少三个或至少四个分开的实例中具有在前面句子中所述的特征中没有特征、有一个、两个、三个、四个、五个或六个特征。本发明的NA分子不必是RNA分子以模拟转录物变体。转录物变体的模拟也可能使用DNA或其他NA分子。

[0050] 为了本发明的目的，可以产生包含人工基因的人工基因组(在计算机中通过排列序列而在概念上产生)。该人工基因组的序列也可用于读长分配。人工基因具有从天然存在的基因已知的特征，诸如启动子、转录起始位点、转录区和转录终止位点(也称为终止子)。因为本发明涉及模拟人工基因的转录物变体(而不是人工基因或来自所述人工基因本身的相应蛋白的物理合成)，所以启动子区对于本发明的目的是不相关的。作为相同人工基因(即人工NA分子家族的成员)的参照转录物变体的人工NA分子以与天然存在的基因彼此相关并且与所述天然存在的基因相关的相同的方式彼此相关并与所述人工基因相关(通过参数诸如大小和序列)。它们的共同特征可以是转录物变体共有从它们转录自相同假设基因之间的外显子(或其部分)。对于本领域技术人员显而易见的是，对于本发明的目的，人工基因仅仅是定义人工NA分子的概念，并且不必超过定义人工NA分子所必需的进行定义(例如，如前所述，基因的启动子区不必定义)。

[0051] 有利地，模拟转录物变体的人工多核酸NA(RNA或DNA)分子的参照集具有在先前段落中提及的典型转录物特征的类似于(至少+/-50％、优选至少+/-25％、特别是至少+/-10％)真核生物(优选动物或植物、更优选脊椎动物、甚至更优选哺乳动物、特别是人)转录组中典型转录物特征的相应平均频率(例如如以下段落中所指定的)的频率，在至少一个或至少两个或至少三个或至少四个分开的实例中具有在参照集中存在的典型转录物特征中至少一个、优选至少两个，更优选至少三个、特别是至少四个特征，特别是所有典型转录物特征。

[0052] 选择性剪接事件(AS)：术语选择性剪接用于生物学中以描述其中初级转录物(前mRNA)可以以多于一种模式被剪接以产生多个不同的成熟mRNA的任何情况。最常见的选择性剪接事件类型示于表1中。在人类中，外显子跳读是发现的最常见剪接事件的~33％。选择性5'和3'剪接位点各约25％。此外，选择性剪接位点通常一起发生(Barbazuk等人，2008;Roy等人，2013)。脑组织和睾丸组织被发现拥有大量的AS事件(Roy等人，2013)。有利地，参照集的NA分子的整体具有表1中列举的特征中的至少一个、优选至少两个、更优选至少三个、甚至更优选至少四个、特别是至少五个，其中每个NA分子彼此独立地在至少一个或至少两个或至少三个或至少四个分开的实例中具有在前面句子中列举的特征中没有特征、有一个、两个、三个、四个、五个、六个或七个特征。

[0053] 表1|选择性剪接事件。该表显示了源自Ensembl基因注释的若干选择性剪接事件。Ensembl基因集包括自动和手动注释，其中所有转录物基于实验证据(也参见Wang等人，2008)。

[0054]

AS 模式类型	缩写	定义
盒式外显子(跳读的外显子)	CE	一个外显子与其侧翼内含子一起从初级转录物被剪接掉。
内含子保留	IR	序列被作为内含子剪接掉或保留在成熟 mRNA 转录物中。
相互排斥的外显子	MXE	是指以相互排斥的方式使用多个盒式外显子的情况。在最简单的情况下：两个连续的外显子，二者从不都被包括在成熟 mRNA 转录物中。
选择性 3'位点	A3SS	也称为选择性受体位点。在外显子的 5'端被识别的两个或更多个剪接位点。使用选择性 3'剪接接头（受体位点），改变下游外显子的 5'边界。
选择性 5'位点	A5SS	也称为选择性供体位点。在外显子的 3'端被识别的两个或更多个剪接位点。使用选择性 5'剪接接头（供体位点），改变上游外显子的 3'边界。
选择性第一个外显子	AFE	每个变体的第二个外显子具有相同的边界，但第一个外显子是相互排斥的。这是注释可能的选择性启动子使用。
选择性最后一个外显子	ALE	每个剪接变体的倒数第二个外显子具有相同的边界，但最后一个外显子是相互排斥的。这是为了允许注释可能的选择性多聚腺苷酸使用。

[0055] 反义转录物和重叠基因:设计单外显子的反义转录物以及重叠变体,因为后者构成了基因子集的所有转录物的显著共有部分(在人中为9%,在小鼠中为7.4%;Sanna等人,2008)。重叠变体可以是单外显子的或剪接的(例如只有末端外显子重叠的3个外显子)和有义或反义方向。反义导向的基因可以比在相同方向上的重叠基因的频繁10倍。有利地,参照集的NA分子的整体在有义和/或反义方向上包含至少一个、优选至少两个、更优选至少三个、甚至更优选至少五个重叠转录物。优选地,这样的转录物的频率是参照集中存在的所有转录物的约10%。两个人工转录物变体之间的反义重叠长度可以为10nt-500nt。

[0056] 选择性转录物起始位点和终止位点(TSS和TES):除了导致选择性第一个和/或最后一个外显子(AFE和ALE)的选择性剪接事件之外,还在注释外显子内或跨外显子的转录物的实际起始或终止位点的变异也是可能的。对于微观变异,与注释位点的精确偏差是有争议的,但通常小于20nt。此外,它们是功能上相似的,即取决于相同的启动子或相同的聚腺苷酸化信号,因此它们的调节共改变。对于宏观变异,这些选择性TSS和TES通常依赖于选择性启动子或多腺苷酸化信号,并且可以位于相同的第一个或最后一个外显子内或位于相邻的外显子中。它们的位置被分开得更远,即500nt可以作为启动子的参照距离(Xin等人,2008),并且40nt被视为多聚(A)位点测量中的调节距离(Yoon等人,2012)。因此,有利地,参照集的NA分子的整体包含至少一个、优选至少两个、更优选至少三个、甚至更优选至少五个TSS和/或TES。优选地,一个家族中的至少两个转录物变体在20nt、优选在10nt的长的5'或3'末端区域中相差至少1nt、优选2nt、3nt、4nt、5nt或更多。特别优选不同的nt在5'或3'末端本身。

[0057] 本文中,选择性剪接事件,选择性转录物起始位点和终止位点以及反义转录物和重叠基因被归入术语“选择性转录事件”。

[0058] 内含子剪接位点二核苷酸:大多数内含子在其5'和3'末端附近具有由剪接体组分识别的共同的共有序列,并且是剪接体形成所需的(图1)。对于主要类别,剪接接头对是高

度保守的，并且典型地包含内含子供体和受体序列GT-AG(注释的接头的98.70％)，接着是GC-AG和AT-AC的频率(表2)。在更一般的观点中，最常见的外显子-内含子序列可以描述为：外显子...AT(切割)GT...内含子...AG(切割)G...下一个外显子。在表2中，给出了供体-受体对的频率。为了说明这种保守和中度变异性，所有接头的97％是GT-AG，2％是GC-AG和1％是AT-AC。此模拟应允许对齐器(例如TopHat)使用和评估其现有接头表。外显子边界应当是5'AG和3'AT，其中它们不干扰更重要的内含子接头二核苷酸。有利地，参照集的NA分子的整体包含外显子的一个、优选两个、特别是所有内含子供体-受体二核苷酸(诸如选自GU-AG、GC-AG、AU-AC)，优选各自具有存在的所有内含子供体-受体二核苷酸的约97％、2％和1％的频率。

[0059] 表2|规范和非规范供体受体对。源自外显子坐标信息(ICE)数据库、10,803个人类基因的基因组剪接位点(SS)的剪接位点二核苷酸。从256个理论上可能的供体和受体二核苷酸对中，三个最具代表性的特异性对(GT-AG、GC-AG和AT-AC)覆盖所有情况的99.56％(91,846个中的91,022个)(Chong等人，2004)。

[0060]

#	二核苷酸	分数	#	二核苷酸	分数
1	**GT-AG**	**98.70%**	12	AT-AG	0.02%
2	**GC-AG**	**0.79%**	13	GC-CT	0.02%
3	**AT-AC**	**0.08%**	14	GT-CT	0.02%
4	GT-GG	0.06%	15	GT-TT	0.02%
5	GG-AG	0.04%	16	AG-AG	0.02%
6	GA-AG	0.03%	17	GC-GG	0.02%
7	GT-TG	0.03%	18	GC-TG	0.02%
8	AT-AT	0.03%	19	GT-GA	0.02%
9	GC-CA	0.03%	20	CA-AG	0.01%
10	GT-AT	0.02%	21	CC-AT	0.01%
11	AA-AG	0.02%	22	GG-CA	0.01%

[0061] 多聚腺苷酸化：已知成熟真核转录物具有多聚(A)尾。有利地，本发明或用于本发明方法的人工NA分子具有至少10个、优选至少20个、特别是至少30个腺苷的聚(A)尾，其支持实际转录物的近似模拟。此外，它确保(特别是用至少30个腺苷)适当寡聚(dT)珠纯化，并且还有助于平衡具有T7启动子和聚(A)结合引物的PCR扩增反应中5'/3'引物解链温度(Tm)，用于普遍扩增所有构建体。

[0062] 本发明的上述方法优选包括基于读长生成(读长可以具有任何长度)和分配(即将读长作图到参照序列上)进行NA测序，其中参照读长分配通过参照集的读长产生，所述参照读长分配用于控制、验证或修饰一个或多个样品的转录物变体的读长分配。本领域中已知如何使用外部对照来控制，验证或修饰读长分配(例如Jiang等人，2011)。

[0063] 在本发明的过程中发现，在容器中提供例如由样品本身溶解的干燥形式的人工NA分子的参照集而降低处理误差(也参见实施例8)。此外，NA分子(特别是RNA分子)在干燥时通常更稳定。因此，在特别优选的实施方案中，在容器中提供干燥、优选冷冻干燥的人工NA分子的参照集。通常，为每个样品提供具有参照集的分开容器。优选地，在干燥之前、期间或之后，特别是在干燥之前，将稳定剂(减少NA、特别是RNA的降解)添加到参照集中。这样的稳定剂包括抗氧化剂、EDTA、DDT、其他核酸酶或RNAse抑制剂(例如Promega的**RNAsin®**，Biomatrica的**RNAstable®**，GenTegra的**GenTegra®**-RNA)。通常，额外的稳定化对于RNA分子比对于DNA分子更重要。

[0064] 根据前一段，在另一个高度优选的实施方案中，通过将样品添加到所述容器中，从而将干燥的参照集溶解在样品中，来进行作为外部对照的参照集的添加。

[0065] 以下描述了如何控制、验证或修饰一个或多个样品的转录物变体的读长分配的实例：在该设置中，基因1(G1)具有两个转录物变体G1T1和G1T2，它们彼此不同在于一个仅保留内含子序列。当校准器使用编程的概率算法(其使用不同模型的加权预设或如起始位点分布、序列偏差、长度偏差和上述剪接位点二核苷酸注释(表2))在G1基因座内分布所产生的读长时，最终分配的读长计数并标准化为例如每百万经作图的片段的外显子的每千碱基片段(FPKM)，以获得G1T1和G1T2之间的相对转录物浓度和比率的一种量度。根据实验设置，FPKM值含有从非常相同的实验中的技术重复或从以前的参照实验估计的置信区间。如果对齐算法施加假偏差并产生假表达值，则G1T1和G1T2的结果仍然是错误的，而且当样本本身或实验条件改变时，结果可以是完全任意的。只有参照集Ref1T1和Ref1T2的具有相似复杂度(例如相似长度、该距离(proximity)处的内含子保留)的基础真实知识允许从文库生成、通过测序直到读长分配来评估特定实验的性能并计算类似复杂度的基因和转录物变体分布的置信区间。因此，参照读长分配可以用于调整或移动样品读长的统计读长分配，诸如基于标准化，优选基于FPKM值。可以由于参照集的已知组成和量(预定值，其可以适合于给定平台适当地选择)来校正参照集的读长分配中的错误，并且所述校正可以被应用以修饰样本读长分配。

[0066] 或者，本发明的上述方法优选包括对一个或多个样品进行NA检测或定量方法，优选微阵列分析或qPCR，其中至少一个探针结合参照集的至少一个NA分子，并且基于从至少一个探针结合参照集的至少一个NA分子产生的信号的测量结果用于控制、验证或修饰基于在所述NA检测或定量方法中一个或多个样品的转录物变体结合探针产生的信号的测量结果。在本领域中已知如何使用外部对照来控制、验证或修饰测量结果。参见例如Devonshire等人，2010。

[0067] 在本发明的过程中，出乎意料地发现，上述方法的适应性特别适合于评估NA测序方法。它也非常适合于评估NA测序方法，或用于评估NA检测或定量方法。因此，在本发明的另一方面，提供了一种用于评估NA测序方法或用于评估NA检测或定量方法的方法，包括：

[0068] a)提供模拟转录物变体的人工NA分子的参照集(如前所述)，包括至少一个、优选至少两个、更优选至少三个、特别是至少五个不同家族的NA分子，每个家族由至少两种、优选至少三种、更优选至少四个种、特别是至少五个不同NA分子组成，

[0069] 其中，独立地对于每个家族，所述每个家族的所有NA分子是相同人工基因的参照转录物变体，和

[0070] 其中，独立地对于每个家族，所述每个家族的NA分子共有长度为至少80nt、优选至少100nt、更优选至少150nt、特别是至少200nt的序列，并且所述每个家族的至少两种NA分子的区别在于至少80nt长度、优选至少100nt、更优选至少150nt、甚至更优选至少200nt、特别是至少300nt的至少另一个序列，和

[0071] 其中所述NA分子中至少两种，优选每种以预设的摩尔量存在；和

[0072] b1)对于评估NA测序方法，基于读长生成和分配执行NA测序，其中利用所述参照集的读长来生成参照读长分配；或者

[0073] b2)对于评估NA检测或定量方法，对参照集执行所述NA检测或定量方法，

[0074] 其中至少一种探针结合所述参照集的至少一个NA分子;和

[0075] c)将任意参照集的至少一种NA分子的步骤b)的输出结果,特别是输出摩尔量,输出浓度,和/或,在评估NA测序方法的情况下,分配读长的数量,和/或所述参照集的至少两种NA分子的上述结果的至少一个比率,与所述预设的摩尔量进行比较和/或,在评估NA测序方法的情况下与分配读长的数量,和/或由此计算或预期的比率和/或输出进行比较。

[0076] 本质上,本发明提供了"用基准测试"(或比较或评估)各种NA分析方法的方法,从而允许研究者(或NA分析方法和/或NA分析仪器的生产者)优化他们的方法,特别是关于能够可靠地鉴定和/或定量转录物变体(如对于复杂生物体的转录组是典型的)。

[0077] 从关于参照集的已知参数(例如浓度、存在的序列等-即参照集表示在这种情况下的已知对照),技术人员能够计算或预测预期结果(例如读长的数量、外推浓度等等)。通过将(实际)输出结果与预期结果进行比较,技术人员能够确定实际结果与预期结果之间的差异(divergence),从而评估核酸测序方法。

[0078] 值得注意的是,还可以通过(重复地)使用参照集的先前测序测量和(迭代地)改变测序方法的计算部分来评估核酸测序方法的计算方面,以便评估不同的计算方法部分(例如算法),或者以便改进方法部分(例如,一个或多个算法)。

[0079] 有利地,本发明的任何参照集(参见下文)适用于本发明的上述方法,特别是当所述参照集的至少两种、优选每种NA分子以预设的摩尔量存在时。

[0080] 在本发明的过程中,表征了许多不同的参照集(及其生产方法),并且最终找到了特别适合于前述方法的参照集(及其生产方法)。(然而,前述方法不限于使用本发明的参照集;其它参照集也可以是合适的(但是也比本发明的参照集更少))。

[0081] 因此,在本发明的另一方面,提供了产生模拟转录物变体的人工NA分子、优选RNA或DNA分子的参照集的方法,包括:

[0082] A)从天然存在的真核生物基因、优选动物或植物基因、更优选脊椎动物基因、甚至更优选哺乳动物基因、特别是人类基因的组选择至少一个、优选至少两个、更优选至少三个、特别是至少五个基因。在本领域中已知在哪儿找到这样的基因。优选地,该方法步骤是用软件实现的计算机执行的。例如,可以从公共可访问的数据库(诸如Ensembl、美国国家生物技术信息中心(NCBI)GenBank或其它NCBI数据库)获得它们(或它们的注释序列或其用于其他公共数据库的名称)。举例来说,对于人类基因,可以从以下NCBI搜索查询中选择基因:http://www.ncbi.nlm.nih.gov/gene/?term=Homo+sapiens[Orgn]

[0083] 备选地或另外,可以在Ensembl数据库(http://www.ensembl.org)中浏览基因组。

[0084] 优选地,该基因关于其转录物变体(转录物表)是良好注释的,并且注释了内含子/外显子。

[0085] B)为每个选择的基因选择至少两个、优选至少三个、更优选至少四个、特别是至少五个天然存在的mRNA转录物变体,其中每个转录物变体具有至少100nt的长度,并且包含至少一个外显子。优选地,该方法步骤是用软件实现的计算机执行的。举例来说,Ensembl数据库包含基因(例如人类基因)的良好注释的转录物变体(也称为转录物表)。例如:

[0086] http://www.ensembl.org/Homo_sapiens/Gene/Summary?g=ENSG00000139618;r=13:32889611-32973805显示基因BRCA2的转录物表。Ensembl还含有注释的剪接事件(ASE)(Wang等人,2008;Koscielny等人,2009)。序列注释,作为基于文本的格式的FASTA文

件表示纯核苷酸序列，并且通常与通常保存在GTF文件(通用传送格式)中的转录物变体注释一起使用，其包含所有相关信息，如seqname-染色体或支架的名称；染色体名称可以带有或不带有'chr'前缀；源-生成此特征的程序或数据源(数据库或项目名称)的名称；特征-特征类型名称，例如基因、变异、相似性；起始-特征的起始位置，序列编号从1开始；终止-特征的终止位置，序列编号从1开始；评分-浮点值；链-定义为+(正向)或-(反向)；框-'0'、'1'或'2'之一。'0'表示特征的第一个碱基是密码子的第一个碱基，'1'表示第二个碱基是密码子的第一个碱基，等等；属性-以分号分隔的标记值对列表，提供有关每个特征的附加信息。从GTF文件，不同的转录物可以通过具有缩放功能的程序显示，用于视觉检查。

[0087] C)提供每个所述选择的包含至少一个外显子的天然存在的mRNA转录物变体的序列，任选地其中所述序列被转换为另一种NA类型，诸如DNA序列。将RNA转换为DNA序列是微不足道的。优选地，该方法步骤是用软件实现的计算机执行的。有利地，mRNA转录物变体是成熟转录物。

[0088] D)通过以下步骤修饰步骤C)的每个序列：

[0089] 独立地对于每个外显子，将每个序列的每个外显子的序列替换为大约相同长度的序列(作为外显子序列)，

[0090] 其中所述大约相同长度的序列选自：

[0091] 病毒序列、噬菌体序列、其反向序列，任何其他反向的天然存在的序列(反向防止比对软件将序列与其原始基因座比对以及还与其原始互补序列杂交)，非天然存在的随机序列及其组合，优选所述大约相同长度的序列选自：

[0092] 病毒序列、噬菌体序列、其反向序列，非天然存在的随机序列及其组合，更优选所述大约相同长度的序列选自：

[0093] 病毒序列、噬菌体序列、其反向序列及其组合，

[0094] 优选其中所述大约相同长度的序列通过任意其它二核苷酸，优选通过GT、GC或AT替换至多3个、优选至多2个、特别是至多1个二核苷酸而相互独立地修饰，或通过任意其它二核苷酸，优选通过AG、AC或AT替换至多3个、优选至多2个、特别是至多1个二核苷酸，优选彼此独立地，优选条件是进行该二核苷酸交换，使得外显子编码的内含子接头二核苷酸的丰度是90-100％(GT-AG)、0-10％(GC-AC)和0-2％(AT-AT)，以反映天然存在的频率，如例如外显子坐标信息(ICE)数据库(Chong等人，2004)中给出的(一个序列中的外显子可以是另一个转录物的内含子，通过不存在于所述另一个转录物中)。

[0095] 从而获得人工转录序列(包含至少一个人工外显子)集，

[0096] 条件是从相同选择的基因的所选择的天然存在的mRNA转录物变体的序列所获得的人工转录物序列共有长度至少为80nt的序列，其优选包含在单个外显子序列中，和

[0097] 优选条件是当步骤C)的序列的外显子序列与步骤C)的序列的另一个外显子序列相同时，外显子序列和另一个外显子序列被大约相同长度的同一所述序列替换。

[0098] 优选地，该方法步骤是用软件实现的计算机执行的。该步骤(和所有随后的优选计算步骤)可以例如用广泛使用的软件CLC Main Workbench(QIAGEN)、Bioconductor package、UCSC Genome Browser或其他来执行。

[0099] 序列也可以组合以形成大约相同长度的序列，特别是如果病毒序列、噬菌体序列、其反向序列，任何其他反向天然存在的序列或非天然存在的随机序列序列太短而不能填充

整个外显子。

[0100] 有利地，病毒序列、噬菌体序列、其反向序列或任何其他反向天然存在的序列或非天然存在的随机序列的长度为至少10nt、优选至少20nt、更优选至少50nt、特别是至少100nt，特别是为了避免组合太多的短序列段从而无意中产生与真核序列太同源的序列。优选地，通过序列的拼接(concatenation)进行组合。

[0101] 有利地，通过引入单点突变从人工转录序列中去除某些限制性位点(例如去除XhoI和NsiI的限制性位点)，以允许在克隆中更好的操作。

[0102] E)任选地复制步骤D)的集中的至少一个人工转录物序列，并将所述复制的序列添加到所述集中，从而获得包括用于步骤F)-K)中的一个或多个中的选择性修饰的拷贝的集。

[0103] 此复制允许模拟应当存在于参照集中的转录物变异事件(因为参照集更适合则关于选择性转录事件其获得的更全面)，但不与所选择的基因一起发生。优选地，该方法步骤是用软件实现的计算机执行的。

[0104] F)任选地将至少一个序列插入所述集中至少一个人工转录物序列，

[0105] 其中所述至少一个插入的序列中的每一个彼此独立地相同于步骤D)中的任何人工转录序列的相同长度的有义或反义序列(即反向互补序列)并优选具有5nt至10000nt之间的长度，特别是10nt至1000nt之间的长度。

[0106] 有利地，每个人工转录物序列进行至多5个、优选至多4个、更优选至多3个、特别是至多2个插入。优选地，该方法步骤是用软件实现的计算机执行的。

[0107] G)任选地从所述集中至少一个人工转录物序列中去除至少一个长度范围为1nt至10000nt的序列，

[0108] 其中所述一个或多个人工转录序列中的每一个保持在至少100nt的大小并且保持包含至少一个外显子序列。

[0109] 有利地，每个人工转录物序列进行至多五次、优选至多四次、更优选至多三次、特别是至多两次去除。优选地，该方法步骤是用软件实现的计算机执行的。

[0110] 通过步骤E-G的组合，可能包括不存在于所选择的天然存在的mRNA转录物中的额外的选择性转录事件。优选地，该方法步骤是用软件实现的计算机执行的。

[0111] H)任选地通过5'截短序列直到5'末端是鸟苷，通过将第一碱基改变为鸟苷或通过在5'末端添加鸟苷，建立每个人工转录序列的第一核苷酸为鸟苷，优选通过5'截短序列直到5'末端是鸟苷或通过将第一碱基改变为鸟苷，特别是通过5'截短序列直到5'末端是鸟苷。

[0112] 具有作为第一碱基的鸟苷允许通过T7聚合酶的有效转录。优选地，该方法步骤是用软件实现的计算机执行的。

[0113] I)任选地修饰所述集中的至少一个人工转录物序列，使得所述人工转录物序列集具有基本上随机分布出现的5'起始三核苷酸，所述5'起始三核苷酸选自GAA、GAC、GAG、GAT、GCA、GCC、GCG、GCT、GGA、GGC、GGG、GGT、GTA、GTC、GTG、GTT，或者5'起始二核苷酸，所述5'起始二核苷酸选自AA、AC、AG、AT、CA、CC、CG、CT、GA、GC、GG、GT、TA、TC、TG、TT，和/或3'终止二核苷酸，所述3'终止二核苷酸选自AC、AG、AT、CC、CG、CT、GC、GG、GT、TC、TG、TT。优选地，该方法步骤是用软件实现的计算机执行的。这使得所产生的参照集兼容并且特别适合于WO 2011/095501 A1中描述的复杂度降低方法。

[0114] 在本文中，以及在整个发明的上下文中，具有“基本上随机分布出现”(为了本发明的目的)(其可以是“基本上均匀分布出现”)是指-当将广泛使用的卡方检验(如由皮尔森开发)应用于出现，其中离散均匀分布(即每个事件同样可能)为拟合分布-所得到的p值(通常相对于卡方值制表)大于0.1、优选大于0.2、更优选大于0.3、甚至更优选大于0.5、特别是大于0.8。如何应用卡方检验在本领域中是众所周知的。参见关于如何应用卡方检验的实施例4。

[0115] J)优选将多聚(A)尾序列添加到该集中人工转录物序列中的一个或多个、优选全部人工转录物序列，优选由至少10个、特别是至少20个腺苷组成。优选地，该方法步骤是用软件实现的计算机执行的。任选地，在多聚(A)尾后将索引序列(DNA条形码或序列标记)添加到该集中人工转录物序列中的一个或多个、优选全部人工转录物序列。索引序列使得在参照集的制备期间能够使用选择性定量和验证方法，但是在作为参照集应用期间需要被盲化(blind out)。可以通过将索引序列置于多聚尾以外的索引序列来实现盲化，所述索引序列由特定的后续工作流程(RNA测序操作方案包括多聚(A)引发)不可见，或者索引序列必须在任何潜在读长和在参照注释中被掩蔽。优选地，该方法步骤是用软件实现的计算机执行的。

[0116] K)或优选步骤E-J中的至少两个的任何组合，优选其中每个方法步骤仅进行一次；和

[0117] L)对于所述集中的每个人工转录物序列：

[0118] 物理合成包含完整人工转录物序列的NA分子。在本领域中已知如何合成NA，特别是DNA和RNA分子。DNA和RNA可以通过体内(在重组细胞、例如大肠杆菌中表达)或体外生物化学方法(例如，通过DNA/RNA聚合酶的合成/扩增，例如聚合酶链式反应-PCR)以及化学合成而产生。如果人工NA是DNA，则其优选通过从头DNA合成并通过PCR扩增而合成。通过克隆入质粒、转化入微生物、序列验证和转化的微生物的生长来进行体内扩增也是可能的。可以通过用T7RNA聚合酶从DNA模板转录来合成RNA。优选地，如果NA是RNA，则其从DNA转录，特别是通过T7RNA聚合酶转录；

[0119] M)优选地，如果步骤L)的NA分子是RNA分子，则向RNA分子物理添加5’帽结构。这实现了更接近真实的真核转录物的模拟。mRNA的加帽可以酶促进行，例如通过牛痘加帽系统(New England BioLabs,Inc.)。参见例如WO 2009/058911 A2；

[0120] 从而物理地获得模拟转录物变体的人工NA分子的参照集，优选是RNA或DNA分子的参照集。

[0121] 在优选的实施方案中，进行步骤D)-G)，优选所有步骤，条件是人工NA分子的参照集应当模拟真核生物基因(优选为动物或植物基因、更优选为脊椎动物基因、甚至更优选为哺乳动物基因、特别是人类基因)的天然存在的选择性转录事件，并且所述事件优选选自：

[0122] 选择性转录物起始位点(TSS)、选择性转录物终止位点(TES)、反义转录物、重叠转录物，并且选择性剪接事件选自跳读的盒式外显子(CE)、内含子保留(IR)、相互排斥的外显子(MXE)、选择性3’剪接位点(A3SS)、选择性5’剪接位点(A5SS)、选择性第一个外显子(AFE)、选择性最后一个外显子(ALE)和反式剪接。

[0123] 在另一个优选的实施方案中，人工NA分子的参照集模拟选自以下的至少一种、优选至少两种、更优选至少三种、甚至更优选至少五种、特别是所有的选择性转录事件：

[0124] 选择性转录物起始位点(TSS)、选择性转录物终止位点(TES)、反义转录物、重叠转录物，并且选择性剪接事件选自跳读的盒式外显子(CE)、内含子保留(IR)、相互排斥的外显子(MXE)、选择性3'剪接位点(A3SS)、选择性5'剪接位点(A5SS)、选择性第一个外显子(AFE)、选择性最后一个外显子(ALE)和反式剪接。

[0125] 在另一个优选的实施方案中，人工NA分子的参照集的所有外显子序列内的所有内含子起始二核苷酸的至少50％、优选至少75％、特别是至少95％是GT，其中每个所述内含子起始二核苷酸是在参照集的另一种人工NA分子中不存在并从而代表所述另一种人工NA分子的内含子的序列的5'末端二核苷酸，和/或(优选"和")在人工NA分子的参照集的所有外显子序列内的所有内含子末端二核苷酸的至少50％、优选至少75％、特别是至少95％是AT，其中每个所述内含子末端二核苷酸是在参照集的另一种人工NA分子中不存在并从而代表所述另一种人工NA分子的内含子的序列的5'末端二核苷酸。

[0126] 在另一个优选的实施方案中，人工NA分子的参照集具有500nt至2000nt、优选750nt至1500nt、特别是1000nt至1400nt的平均序列长度；并且优选具有300nt至1200nt、优选600nt至900nt、特别是700nt至800nt的标准偏差；其最小大小为至少100nt；并且优选具有10000nt的最大大小。

[0127] 在另一个优选的实施方案中，人工NA分子的参照集具有基本上随机分布出现的5'起始三核苷酸，所述5'起始三核苷酸选自GAA、GAC、GAG、GAT、GCA、GCC、GCG、GCT、GGA、GGC、GGG、GGT、GTA、GTC、GTG、GTT，或者5'起始二核苷酸，所述5'起始二核苷酸选自AA、AC、AG、AT、CA、CC、CG、CT、GA、GC、GG、GT、TA、TC、TG、TT，和/或3'终止二核苷酸，所述3'终止二核苷酸选自AC、AG、AT、CC、CG、CT、GC、GG、GT、TC、TG、TT。这使得所产生的参照集兼容并且特别适合于WO 2011/095501 A1中描述的复杂度降低方法。

[0128] 在另一个优选的实施方案中，参照集的至少50％、优选全部人工NA分子具有25％至55％的平均GC含量。优选地，平均GC含量被选择为与其所选自的天然存在的基因的物种(或系统发生组)的转录物的平均GC含量相同。

[0129] 在另一个优选的实施方案中，参照集的每个人工NA分子具有鸟苷作为5'起始核苷酸。

[0130] 在另一个优选的实施方案中，参照集的至少一个、优选每个人工NA分子(如果其是RNA分子)具有5'帽结构。

[0131] 在另一个优选的实施方案中，所述方法还包括提供人工NA分子的参照集，其中参照集的至少两种、优选每种NA分子以预设的摩尔量存在，优选存在于相同的容器中。有利地，其以可随时使用的试剂盒的形式提供。优选地，至少两种NA分子的各自的摩尔量相差至少两个量级，优选至少三个量级，更优选至少五个量级，特别是至少六个量级，并且特别是其中至少提供溶解于液体中或准备溶解或稀释于液体中的两种NA分子，其中它们各自的浓度或最终浓度范围介于0.01阿托摩尔(attomole)/μl与100飞普托摩尔(femtomole)/μl之间或介于100仄普托摩尔(zeptomole)/μl与1飞普托摩尔/μl之间。

[0132] 如上所述，稳定化和降低处理误差是重要的。因此，在高度优选的实施方案中，本发明的方法包括干燥(优选冷冻干燥)物理获得的参照集，优选在容器中，优选与稳定剂一起的步骤。

[0133] 在另一个优选的实施方案中，人工NA分子的参照集的序列与其NCBI GenBank数据

库登录号在表3中列出的序列不具有相似性(即,与大多数已知真核序列不具有相似性),优选与在表3和表4任何一个序列不具有相似性(即,与大多数已知的真核和大多数已知的原核/病毒序列不具有相似性),特别是与2014年6月15日的NCBI GenBank数据库版本202的所有序列不具有相似性,具有统计显著性阈值(期望阈值)小于10^{-1},优选小于1,特别是小于10。相似性通过具有以下参数的BLASTn程序确定:字大小为28,过滤低复杂度区域,线性缺口成本和匹配/错配分数为1,-2。参见Karlin和Altschul,1990,对统计显著性阈值的解释,和Benson等人,2013,对GenBank的介绍。该实施方案特别非常适合于解决本发明的问题,因为其允许参照集的序列的明确鉴定(假定它们具有例如30nt的最小长度,其例如通过RNA-seq容易可实现)即使将其加入到复杂样品中。当前GenBank版本可免费下载:ftp://ftp.ncbi.nlm.nih.gov/genbank/,BLAST软件可免费下载:ftp://ftp.ncbi.nlm.nih.gov/blast/executables/blast+/。易于使用的GenBank的BLAST搜索也可以在http://blast.ncbi.nlm.nih.gov/Blast.cgi(核苷酸blast,选择的数据库核苷酸集合(nr/nt),高度相似的序列(megablast))进行。

[0134] 本发明还提供了可通过本发明的上述方法的任何实施方案(特别是通过本文明确提及的实施方案)获得的模拟转录物变体的人工NA分子的参照集。

[0135] 表3-已发表的动物或植物染色体序列的GenBank登录号(包括条目版本号".N";GenBank数据库版本202,2014年6月15日)

[0136]

AAAA00000000.2	CM000247.2	CM001262.1	CM002663.1	NC_006468.3	NC_015778.1
AAAB00000000.1	CM000248.2	CM001263.1	CM002664.1	NC_006469.3	NC_015779.1
AABR00000000.6	CM000249.2	CM001264.1	CM002665.1	NC_006470.3	NC_015867.2
AABS00000000.1	CM000250.2	CM001265.1	CM002666.1	NC_006471.3	NC_015868.2
AABU00000000.1	CM000251.2	CM001266.1	CM002667.1	NC_006472.3	NC_015869.2
AACN000000000.1	CM000276.2	CM001267.1	CM002668.1	NC_006473.3	NC_015870.2
AACV00000000.1	CM000277.2	CM001268.1	CM002669.1	NC_006474.3	NC_015871.2
AACZ00000000.3	CM000278.2	CM001269.1	CM002670.1	NC_006475.3	NC_016089.1
AADA00000000.1	CM000279.1	CM001270.1	CM002671.1	NC_006476.3	NC_016090.1
AADC00000000.1	CM000280.2	CM001271.1	CM002672.1	NC_006477.3	NC_016091.1
AADD00000000.1	CM000281.2	CM001272.1	CM002693.1	NC_006478.3	NC_016093.1
AADE00000000.1	CM000282.2	CM001273.1	CM002694.1	NC_006479.3	NC_016099.1
AADG00000000.6	CM000283.2	CM001276.1	CM002706.1	NC_006480.3	NC_016100.1
AADN00000000.3	CM000284.2	CM001277.1	CM002707.1	NC_006481.3	NC_016105.1
AAEU00000000.2	CM000285.2	CM001278.1	CM002708.1	NC_006482.3	NC_016118.1
AAEX00000000.3	CM000288.1	CM001279.1	CM002709.1	NC_006483.3	NC_016125.1
AAFC00000000.3	CM000289.1	CM001280.1	CM002710.1	NC_006484.3	NC_016131.1
AAFR00000000.3	CM000290.1	CM001281.1	CM002711.1	NC_006485.3	NC_016132.1
AAFS00000000.1	CM000291.1	CM001282.1	CM002712.1	NC_006486.3	NC_016133.1
AAGH00000000.1	CM000292.1	CM001283.1	CM002713.1	NC_006487.3	NC_016134.1
AAGL00000000.1	CM000293.1	CM001284.1	CM002714.1	NC_006488.2	NC_016135.1
AAGM00000000.1	CM000294.1	CM001285.1	CM002715.1	NC_006489.3	NC_016145.1
AAGN00000000.1	CM000295.1	CM001286.1	CM002716.1	NC_006490.3	NC_016407.1
AAGW00000000.2	CM000296.1	CM001287.1	CM002717.1	NC_006491.3	NC_016408.1
AAHX00000000.1	CM000297.1	CM001288.1	CM002718.1	NC_006492.3	NC_016409.1
AAHY00000000.1	CM000298.1	CM001289.1	CM002719.1	NC_006583.3	NC_016410.1
AAJJ00000000.1	CM000299.1	CM001290.1	CM002720.1	NC_006584.3	NC_016411.1
AANG00000000.2	CM000300.1	CM001291.1	CM002721.1	NC_006585.3	NC_016412.1
AANI00000000.1	CM000301.1	CM001292.1	CM002722.1	NC_006586.3	NC_016413.1
AANU00000000.1	CM000302.1	CM001293.1	CM002723.1	NC_006587.3	NC_016414.1

[0137]

AAPN00000000.1	CM000303.1	CM001294.1	CM002724.1	NC_006588.3	NC_016433.2
AASR00000000.1	CM000304.1	CM001295.1	CM002725.1	NC_006589.3	NC_016668.1
AASS00000000.1	CM000305.1	CM001296.1	CM002726.1	NC_006590.3	NC_016734.1
AAST00000000.1	CM000306.1	CM001378.1	CM002727.1	NC_006591.3	NC_016927.1
AASU00000000.1	CM000307.1	CM001379.1	CM002728.1	NC_006592.3	NC_017602.1
AASV00000000.1	CM000308.1	CM001380.1	CM002729.1	NC_006593.3	NC_017835.1
AASW00000000.1	CM000314.2	CM001381.1	CM002730.1	NC_006594.3	NC_017929.1
AAWR00000000.2	CM000315.2	CM001382.1	CM002731.1	NC_006595.3	NC_018152.1
AAWZ00000000.2	CM000316.2	CM001383.1	CM002732.1	NC_006596.3	NC_018153.1
AAXL00000000.1	CM000317.2	CM001384.1	CM002733.1	NC_006597.3	NC_018154.1
AAXM00000000.1	CM000318.2	CM001385.1	CM002734.1	NC_006598.3	NC_018155.1
AAXN00000000.1	CM000319.2	CM001386.1	CM002735.1	NC_006599.3	NC_018156.1
AAXO00000000.1	CM000320.2	CM001387.1	CM002736.1	NC_006600.3	NC_018157.1
AAXP00000000.1	CM000321.3	CM001388.1	CM002737.1	NC_006601.3	NC_018158.1
AAZX00000000.1	CM000322.3	CM001389.1	CM002738.1	NC_006602.3	NC_018159.1
AB042240.3	CM000323.2	CM001390.1	CM002739.1	NC_006603.3	NC_018160.1
AB042432.1	CM000324.2	CM001391.1	CM002740.1	NC_006604.3	NC_018161.1
AB042861.1	CM000325.2	CM001392.1	CM002741.1	NC_006605.3	NC_018162.1
AB073400.1	CM000326.2	CM001393.1	CM002742.1	NC_006606.3	NC_018163.1
ABBA00000000.1	CM000327.2	CM001394.1	CM002743.1	NC_006607.3	NC_018164.1
ABGA00000000.1	CM000328.2	CM001395.1	CM002744.1	NC_006608.3	NC_018165.1
ABKP00000000.2	CM000329.2	CM001396.1	CM002745.1	NC_006609.3	NC_018166.1
ABKQ00000000.2	CM000330.2	CM001404.1	CM002746.1	NC_006610.3	NC_018167.1
ABKV00000000.1	CM000331.2	CM001405.1	CM002747.1	NC_006611.3	NC_018168.1
ABQF00000000.1	CM000332.2	CM001406.1	CM002748.1	NC_006612.3	NC_018169.1
ABRL00000000.2	CM000333.2	CM001407.1	CM002759.1	NC_006613.3	NC_018170.1
ABSL00000000.1	CM000334.3	CM001408.1	CM002760.1	NC_006614.3	NC_018171.1
ABXC00000000.1	CM000335.2	CM001409.1	CM002761.1	NC_006615.3	NC_018172.1
AC_000023.1	CM000336.2	CM001410.1	CM002762.1	NC_006616.3	NC_018348.1
AC_000024.1	CM000356.1	CM001411.1	CM002763.1	NC_006617.3	NC_018424.1
AC_000025.1	CM000357.1	CM001412.1	CM002764.1	NC_006618.3	NC_018425.1
AC_000026.1	CM000358.1	CM001413.1	CM002765.1	NC_006619.3	NC_018426.1
AC_000027.1	CM000359.1	CM001414.1	CM002766.1	NC_006620.3	NC_018427.1
AC_000028.1	CM000360.1	CM001415.1	CM002767.1	NC_006621.3	NC_018428.1
AC_000029.1	CM000361.1	CM001416.1	CM002768.1	NC_006853.1	NC_018429.1
AC_000030.1	CM000362.1	CM001417.1	CM002769.1	NC_006914.1	NC_018430.1
AC_000031.1	CM000363.1	CM001418.1	CM002770.1	NC_006915.1	NC_018431.1
AC_000032.1	CM000364.1	CM001419.1	CM002771.1	NC_007070.3	NC_018432.1
AC_000033.1	CM000365.1	CM001420.1	CM002772.1	NC_007071.3	NC_018433.1
AC_000034.1	CM000366.1	CM001421.1	CM002773.1	NC_007072.3	NC_018434.1
AC_000035.1	CM000367.2	CM001422.1	CM002774.1	NC_007073.3	NC_018435.1
AC_000036.1	CM000368.1	CM001423.1	CM002775.1	NC_007074.3	NC_018436.1
AC_000037.1	CM000369.1	CM001424.1	CM002776.1	NC_007075.3	NC_018437.1
AC_000038.1	CM000370.1	CM001425.1	CM002777.1	NC_007076.3	NC_018438.1
AC_000039.1	CM000371.1	CM001426.1	CM002784.1	NC_007077.3	NC_018439.1
AC_000040.1	CM000372.1	CM001427.1	CM002785.1	NC_007078.3	NC_018440.1
AC_000041.1	CM000373.1	CM001428.1	CM002786.1	NC_007079.3	NC_018441.1
AC_000042.1	CM000374.1	CM001429.1	CM002787.1	NC_007080.3	NC_018442.1
AC_000043.1	CM000375.1	CM001430.1	CM002788.1	NC_007081.3	NC_018443.1
AC_000068.1	CM000376.1	CM001431.1	CM002789.1	NC_007082.3	NC_018444.1
AC_000069.1	CM000377.2	CM001432.1	CM002790.1	NC_007083.3	NC_018445.1
AC_000070.1	CM000378.2	CM001444.1	CM002791.1	NC_007084.3	NC_018446.1
AC_000071.1	CM000379.2	CM001445.1	CM002792.1	NC_007085.3	NC_018447.1
AC_000072.1	CM000380.2	CM001446.1	CM002797.1	NC_007112.5	NC_018554.1
AC_000073.1	CM000381.2	CM001447.1	CP000581.1	NC_007113.5	NC_018723.1
AC_000074.1	CM000382.2	CM001448.1	CP000582.1	NC_007114.5	NC_018724.1
AC_000075.1	CM000383.2	CM001449.1	CP000583.1	NC_007115.5	NC_018725.1
AC_000076.1	CM000384.2	CM001450.1	CP000584.1	NC_007116.5	NC_018726.1
AC_000077.1	CM000385.2	CM001451.1	CP000585.1	NC_007117.5	NC_018727.1
AC_000078.1	CM000386.2	CM001452.1	CP000586.1	NC_007118.5	NC_018728.1
AC_000079.1	CM000387.2	CM001453.1	CP000587.1	NC_007119.5	NC_018729.1
AC_000080.1	CM000388.2	CM001454.1	CP000588.1	NC_007120.5	NC_018730.1
AC_000081.1	CM000389.2	CM001455.1	CP000589.1	NC_007121.5	NC_018731.1
AC_000082.1	CM000390.2	CM001456.1	CP000590.1	NC_007122.5	NC_018732.1
AC_000083.1	CM000391.2	CM001457.1	CP000591.1	NC_007123.5	NC_018733.1
AC_000084.1	CM000392.2	CM001458.1	CP000592.1	NC_007124.5	NC_018734.1
AC_000085.1	CM000393.2	CM001459.1	CP000593.1	NC_007125.5	NC_018735.1
AC_000086.1	CM000394.2	CM001460.1	CP000594.1	NC_007126.5	NC_018736.1
AC_000087.1	CM000395.2	CM001461.1	CP000595.1	NC_007127.5	NC_018737.1
AC_000088.1	CM000396.2	CM001462.1	CP000596.1	NC_007128.5	NC_018738.1
AC_000089.1	CM000397.2	CM001463.1	CP000597.1	NC_007129.5	NC_018739.1
AC_000092.1	CM000398.2	CM001464.1	CP000598.1	NC_007130.5	NC_018740.1
AC_000133.1	CM000399.2	CM001465.1	CP000599.1	NC_007131.5	NC_018741.1
AC_000134.1	CM000400.2	CM001491.1	CP000600.1	NC_007132.5	NC_018766.1
AC_000135.1	CM000401.2	CM001492.1	CP000601.1	NC_007133.5	NC_018890.1
AC_000136.1	CM000402.2	CM001493.1	CP001323.1	NC_007134.5	NC_018891.1
AC_000137.1	CM000403.2	CM001494.1	CP001324.1	NC_007135.5	NC_018892.1

[0138]

AC_000138.1	CM000404.2	CM001495.1	CP001325.1	NC_007136.5	NC_018893.1
AC_000139.1	CM000405.2	CM001496.1	CP001326.1	NC_007235.1	NC_018894.1
AC_000140.1	CM000406.2	CM001497.1	CP001327.1	NC_007236.1	NC_018895.1
AC_000141.1	CM000407.2	CM001498.1	CP001328.1	NC_007237.1	NC_018896.1
AC_000142.1	CM000408.2	CM001499.1	CP001329.1	NC_007299.5	NC_018897.1
AC_000143.1	CM000409.1	CM001500.1	CP001330.1	NC_007300.5	NC_018898.1
AC_000144.1	CM000410.1	CM001501.1	CP001331.1	NC_007301.5	NC_018899.1
AC_000145.1	CM000411.1	CM001502.1	CP001332.1	NC_007302.5	NC_018900.1
AC_000146.1	CM000412.1	CM001503.1	CP001333.1	NC_007303.5	NC_018901.1
AC_000147.1	CM000413.1	CM001504.1	CP001334.1	NC_007304.5	NC_018902.1
AC_000148.1	CM000414.1	CM001505.1	CP001335.1	NC_007305.5	NC_018903.1
AC_000149.1	CM000415.1	CM001506.1	CP001574.1	NC_007306.5	NC_018904.1
AC_000150.1	CM000416.1	CM001507.1	CP001575.1	NC_007307.5	NC_018905.1
AC_000151.1	CM000417.1	CM001508.1	CP001576.1	NC_007308.5	NC_018906.1
AC_000152.1	CM000418.1	CM001509.1	CP001577.1	NC_007309.5	NC_018907.1
AC_000153.1	CM000419.1	CM001510.1	CP002684.1	NC_007310.5	NC_018908.1
AC_000154.1	CM000420.1	CM001511.1	CP002685.1	NC_007311.5	NC_018909.1
AC_000155.1	CM000421.1	CM001516.2	CP002686.1	NC_007312.5	NC_018910.1
AC_000156.1	CM000422.1	CM001517.2	CP002687.1	NC_007313.5	NC_018911.1
AC_000158.1	CM000423.1	CM001518.2	CP002688.1	NC_007314.4	NC_018912.2
AC_000159.1	CM000424.1	CM001519.2	CR954199.2	NC_007315.5	NC_018913.2
AC_000160.1	CM000425.1	CM001520.2	CR954200.2	NC_007316.5	NC_018914.2
AC_000161.1	CM000426.1	CM001521.2	CU651604.3	NC_007317.5	NC_018915.2
AC_000162.1	CM000427.1	CM001582.1	CU651605.3	NC_007318.5	NC_018916.2
AC_000163.1	CM000462.1	CM001583.1	CU651606.3	NC_007319.5	NC_018917.2
AC_000164.1	CM000463.1	CM001584.1	CU651607.3	NC_007320.5	NC_018918.2
AC_000165.1	CM000464.1	CM001585.1	CU651608.3	NC_007324.5	NC_018919.2
AC_000166.1	CM000465.1	CM001586.1	CU651609.3	NC_007325.5	NC_018920.2
AC_000167.1	CM000466.1	CM001587.1	CU651610.3	NC_007326.5	NC_018921.2
AC_000168.1	CM000467.1	CM001588.1	CU651611.3	NC_007327.5	NC_018922.2
AC_000169.1	CM000468.1	CM001589.1	CU651612.3	NC_007328.4	NC_018923.2
AC_000170.1	CM000469.1	CM001590.1	CU651613.3	NC_007329.5	NC_018924.2
AC_000171.1	CM000470.1	CM001591.1	CU651614.3	NC_007330.5	NC_018925.2
AC_000172.1	CM000471.1	CM001592.1	CU651615.3	NC_007331.4	NC_018926.2
AC_000173.1	CM000472.1	CM001593.1	CU651616.3	NC_007416.2	NC_018927.2
AC_000174.1	CM000473.1	CM001594.1	CU651617.3	NC_007417.2	NC_018928.2
AC_000175.1	CM000474.1	CM001595.1	CU651618.3	NC_007418.2	NC_018929.2
AC_000176.1	CM000475.1	CM001596.1	CU651619.3	NC_007419.1	NC_018930.2
AC_000177.1	CM000476.1	CM001597.1	CU651620.3	NC_007420.2	NC_018931.2
AC_000178.1	CM000477.1	CM001598.1	CU651621.3	NC_007421.2	NC_018932.2
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AC_000180.1	CM000479.1	CM001600.1	CU651623.3	NC_007423.2	NC_018934.2
AC_000181.1	CM000480.1	CM001601.1	CU651624.3	NC_007424.2	NC_019458.1
AC_000182.1	CM000481.1	CM001602.1	CU651625.3	NC_007425.2	NC_019461.1
AC_000183.1	CM000482.1	CM001603.1	CU651626.3	NC_007579.1	NC_019462.1
AC_000184.1	CM000483.1	CM001604.1	CU651627.3	NC_007858.1	NC_019464.1
AC_000185.1	CM000484.1	CM001605.1	CU651628.3	NC_007859.1	NC_019465.1
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AC_000187.1	CM000491.1	CM001607.1	D00564.1	NC_007861.1	NC_019470.1
AC_000188.1	CM000492.1	CM001608.1	D38113.1	NC_007862.1	NC_019471.1
AC024175.3	CM000493.1	CM001609.2	D38114.1	NC_007863.1	NC_019472.1
AC093544.8	CM000494.1	CM001610.2	DAAA00000000.2	NC_007864.1	NC_019474.1
ACBE00000000.1	CM000495.1	CM001611.2	DAAB000000000.1	NC_007865.1	NC_019475.1
ACFV00000000.1	CM000496.1	CM001612.2	DG000001.5	NC_007866.1	NC_019477.1
ACIV000000000.1	CM000497.1	CM001613.2	DG000002.5	NC_007867.1	NC_019480.1
ACUP00000000.1	CM000498.1	CM001614.2	DG000003.5	NC_007868.1	NC_019481.1
ACYM00000000.1	CM000499.1	CM001615.2	DG000004.5	NC_007869.1	NC_019483.1
ADDD00000000.1	CM000500.1	CM001616.2	DG000005.5	NC_007870.1	NC_019484.1
ADDF00000000.2	CM000501.1	CM001617.2	DG000006.5	NC_007871.1	NC_019816.1
ADDN00000000.1	CM000502.1	CM001618.2	DG000007.5	NC_007872.1	NC_019817.1
ADFV00000000.1	CM000503.1	CM001619.2	DG000008.5	NC_007873.1	NC_019818.1
AE005172.1	CM000504.1	CM001620.2	DG000009.5	NC_007874.1	NC_019819.1
AE005173.1	CM000505.1	CM001621.2	DG000010.5	NC_007875.1	NC_019820.1
AE013599.4	CM000506.1	CM001622.2	DG000011.5	NC_007876.1	NC_019821.1
AE014134.5	CM000507.1	CM001623.2	DG000012.5	NC_007877.1	NC_019822.1
AE014135.3	CM000508.1	CM001624.2	DG000013.5	NC_007878.1	NC_019823.1
AE014296.4	CM000509.1	CM001625.2	DG000014.5	NC_007886.1	NC_019824.1
AE014297.2	CM000510.1	CM001626.2	DG000015.5	NC_007897.1	NC_019825.1
AE014298.4	CM000511.1	CM001627.2	DG000016.5	NC_007898.3	NC_019826.1
AECO00000000.1	CM000512.1	CM001628.2	DG000017.5	NC_007942.1	NC_019827.1
AEHK00000000.1	CM000513.1	CM001629.2	DG000018.5	NC_007957.1	NC_019828.1
AEHL00000000.1	CM000514.1	CM001630.2	DG000019.5	NC_007982.1	NC_019829.1
AEKE00000000.2	CM000515.1	CM001631.2	DG000020.5	NC_008066.1	NC_019830.1
AEKP00000000.1	CM000516.1	CM001634.1	DG000021.5	NC_008155.1	NC_019831.1
AEKQ00000000.2	CM000517.1	CM001635.1	DG000022.5	NC_008285.1	NC_019832.1
AEKR00000000.1	CM000518.1	CM001636.1	DG000023.5	NC_008289.1	NC_019833.1
AELG00000000.1	CM000519.1	CM001637.1	DG000024.5	NC_008290.1	NC_019834.1

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AEMH00000000.1	CM000520.1	CM001638.1	DG000025.1	NC_008332.1	NC_019835.1
AEMK00000000.1	CM000521.1	CM001639.1	DG000026.1	NC_008334.1	NC_019836.1
AENI00000000.1	CM000522.1	CM001640.1	DG000027.1	NC_008360.1	NC_019837.1
AEOM00000000.1	CM000523.1	CM001641.1	DG000028.1	NC_008394.4	NC_019838.1
AERX00000000.1	CM000524.1	CM001642.1	DG000029.1	NC_008395.2	NC_019839.1
AF010406.1	CM000525.1	CM001643.1	DG000030.1	NC_008396.2	NC_019840.1
AF034253.1	CM000526.1	CM001646.1	DG000031.1	NC_008397.2	NC_019841.1
AF200833.1	CM000527.1	CM001647.1	DG000032.1	NC_008398.2	NC_019859.1
AF216698.1	CM000528.1	CM001648.1	DG000033.1	NC_008399.2	NC_019860.1
AFAN00000000.1	CM000529.1	CM001649.1	DG000034.1	NC_008400.2	NC_019861.1
AFMZ00000000.1	CM000530.1	CM001650.1	DG000035.1	NC_008401.2	NC_019862.1
AFNA00000000.1	CM000531.1	CM001651.1	DG000036.1	NC_008402.2	NC_019863.1
AFNB00000000.1	CM000532.1	CM001652.1	DG000053.1	NC_008403.2	NC_019864.1
AFNC00000000.1	CM000533.1	CM001653.1	DG000054.1	NC_008404.2	NC_019865.1
AFYB00000000.1	CM000534.1	CM001654.1	DG000055.1	NC_008405.2	NC_019866.1
AGAT00000000.1	CM000535.1	CM001655.1	DG000056.1	NC_008465.2	NC_019867.1
AGRG00000000.1	CM000536.1	CM001656.1	DG000057.1	NC_008466.2	NC_019868.1
AGTO00000000.2	CM000537.1	CM001657.1	DG000058.1	NC_008602.1	NC_019869.1
AHAO00000000.1	CM000538.1	CM001658.1	DG000059.1	NC_008801.1	NC_019870.1
AHAP00000000.1	CM000539.1	CM001659.1	DG000060.1	NC_008802.1	NC_019871.1
AHAQ00000000.1	CM000540.1	CM001660.1	DG000061.1	NC_008803.1	NC_019872.1
AHAT00000000.1	CM000541.1	CM001661.1	DG000062.1	NC_008804.1	NC_019873.1
AHBB00000000.1	CM000542.1	CM001662.1	DG000063.1	NC_008805.1	NC_019874.1
AHGY00000000.2	CM000543.1	CM001663.1	DG000064.1	NC_008806.1	NC_019875.1
AHID00000000.1	CM000544.1	CM001664.1	DP000054.2	NC_008807.1	NC_019876.1
AHII00000000.1	CM000545.1	CM001665.1	DQ069713.1	NC_008808.1	NC_019877.1
AHIU00000000.1	CM000546.1	CM001666.1	DQ167399.1	NC_008809.1	NC_019878.1
AHZW00000000.1	CM000547.1	CM001667.1	DQ231548.1	NC_009005.2	NC_019879.1
AHZZ00000000.1	CM000548.1	CM001668.1	DQ317523.1	NC_009006.2	NC_019880.1
AJ002189.1	CM000549.1	CM001669.1	DQ347959.1	NC_009094.1	NC_019881.1
AJ270058.1	CM000550.1	CM001670.1	DQ422742.1	NC_009095.1	NC_019882.1
AJ270060.1	CM000551.1	CM001671.1	DQ424856.1	NC_009096.1	NC_020006.2
AJ312413.2	CM000552.1	CM001672.1	DQ645539.1	NC_009097.1	NC_020167.1
AJ421455.1	CM000553.1	CM001673.1	DQ864733.1	NC_009098.1	NC_020171.1
AJ508398.1	CM000554.1	CM001674.1	DQ874614.2	NC_009099.1	NC_020176.1
AJ517314.2	CM000555.1	CM001675.1	DQ886273.1	NC_009100.1	NC_020177.1
AJKK00000000.1	CM000556.1	CM001676.1	DQ984518.1	NC_009103.1	NC_020178.1
AJMI00000000.2	CM000557.1	CM001677.1	EAAA00000000.1	NC_009104.1	NC_020455.1
AJPS00000000.1	CM000558.1	CM001678.1	EF108342.1	NC_009105.1	NC_020492.1
AJPT00000000.1	CM000559.1	CM001679.1	EF115542.1	NC_009107.1	NC_020493.1
ALNU00000000.2	CM000560.1	CM001680.1	EU325680.1	NC_009108.1	NC_020495.1
ALNV00000000.2	CM000561.1	CM001681.1	EU366230.1	NC_009110.1	NC_020496.1
ALNW00000000.2	CM000562.1	CM001682.1	EU747728.2	NC_009111.1	NC_020497.1
ALXC00000000.1	CM000563.1	CM001683.1	EU835853.1	NC_009112.1	NC_021160.1
ALYE00000000.1	CM000564.1	CM001684.1	FJ858267.1	NC_009114.1	NC_021161.1
AM087200.3	CM000565.1	CM001685.1	FJ859351.1	NC_009115.1	NC_021162.1
AM292218.1	CM000566.1	CM001686.1	FJ899745.1	NC_009116.1	NC_021163.1
AM948965.1	CM000567.1	CM001687.1	FJ906803.1	NC_009118.1	NC_021164.1
AMGL00000000.1	CM000568.1	CM001688.1	FM179380.1	NC_009144.2	NC_021165.1
AMOP00000000.1	CM000569.1	CM001689.1	FN597015.1	NC_009145.2	NC_021166.1
AMYH00000000.2	CM000570.1	CM001690.1	FN597017.1	NC_009146.2	NC_021167.1
ANNZ00000000.1	CM000571.1	CM001691.1	FN597018.1	NC_009147.2	NC_021621.1
ANOA00000000.1	CM000572.1	CM001692.1	FN597020.1	NC_009148.2	NC_021671.1
ANPC00000000.1	CM000573.1	CM001693.1	FN597022.1	NC_009149.2	NC_021672.1
AOCR00000000.1	CM000663.2	CM001694.1	FN597024.1	NC_009150.2	NC_021673.1
AOCS00000000.1	CM000664.2	CM001695.1	FN597025.1	NC_009151.2	NC_021674.1
AOHF00000000.1	CM000665.2	CM001696.1	FN597027.1	NC_009152.2	NC_021675.1
AOIX00000000.1	CM000666.2	CM001697.1	FN597028.1	NC_009153.2	NC_021676.1
AP000423.1	CM000667.2	CM001698.1	FN597030.1	NC_009154.2	NC_021677.1
AP003321.1	CM000668.2	CM001699.1	FN597032.1	NC_009155.2	NC_021678.1
AP003322.1	CM000669.2	CM001701.1	FN597034.1	NC_009156.2	NC_021679.1
AP003323.1	CM000670.2	CM001702.1	FN597036.1	NC_009157.2	NC_021680.1
AP003428.1	CM000671.2	CM001703.1	FN597038.1	NC_009158.2	NC_021681.1
AP004421.1	CM000672.2	CM001704.1	FN597039.1	NC_009159.2	NC_021682.1
AP006444.1	CM000673.2	CM001705.1	FN597040.1	NC_009160.2	NC_021683.1
AP006728.1	CM000674.2	CM001706.1	FN597042.1	NC_009161.2	NC_021684.1
AP008207.2	CM000675.2	CM001707.1	FN597044.1	NC_009162.2	NC_021685.1
AP008208.2	CM000676.2	CM001708.1	FN597046.1	NC_009163.2	NC_021686.1
AP008209.2	CM000677.2	CM001709.1	FN645450.1	NC_009164.2	NC_021687.1
AP008210.2	CM000678.2	CM001710.1	FN673705.1	NC_009165.2	NC_021688.1
AP008211.2	CM000679.2	CM001711.1	FP885845.1	NC_009166.2	NC_021689.1
AP008212.2	CM000680.2	CM001712.1	FR714868.1	NC_009167.2	NC_021690.1
AP008213.2	CM000681.2	CM001713.1	FR853080.1	NC_009168.2	NC_021691.1
AP008214.2	CM000682.2	CM001714.1	FR853081.1	NC_009169.2	NC_021692.1
AP008215.2	CM000683.2	CM001715.1	FR853082.1	NC_009170.2	NC_021693.1
AP008216.2	CM000684.2	CM001716.1	FR853083.1	NC_009171.2	NC_021694.1
AP008217.2	CM000685.2	CM001717.1	FR853084.1	NC_009172.2	NC_021695.1

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AP008218.2	CM000686.2	CM001718.1	FR853085.1	NC_009173.2	NC_021696.1
AP008982.1	CM000695.1	CM001719.1	FR853086.1	NC_009174.2	NC_021697.1
AP011076.1	CM000696.1	CM001720.1	FR853087.1	NC_009175.2	NC_021698.1
APMJ00000000.1	CM000697.1	CM001721.1	FR853088.2	NC_009259.1	NC_021699.1
AQIA00000000.1	CM000698.1	CM001722.1	FR853089.1	NC_009355.1	NC_021700.1
AQIB00000000.1	CM000699.1	CM001723.1	FR853090.1	NC_009356.1	NC_021701.1
ARYA00000000.1	CM000700.1	CM001724.1	FR853091.1	NC_009357.1	NC_021702.1
ASJS00000000.1	CM000701.1	CM001725.1	FR853092.1	NC_009358.1	NC_021703.1
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AUUT00000000.1	CM000703.1	CM001727.1	FR853094.1	NC_009360.1	NC_022009.1
AUXG00000000.1	CM000704.1	CM001728.1	FR853095.1	NC_009361.1	NC_022010.1
AVCL00000000.1	CM000705.1	CM001729.1	FR853096.1	NC_009362.1	NC_022011.1
AWHD00000000.1	CM000706.1	CM001730.1	FR853097.1	NC_009363.1	NC_022012.1
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AY172581.1	CM000708.1	CM001732.1	FR853099.1	NC_009365.1	NC_022014.1
AY506529.1	CM000709.1	CM001733.1	FR853100.1	NC_009366.1	NC_022015.1
AY522329.1	CM000710.1	CM001734.1	FR853101.1	NC_009367.1	NC_022016.1
AY526085.1	CM000711.1	CM001735.1	FR853102.1	NC_009368.1	NC_022017.1
AY612638.1	CM000712.1	CM001736.1	FR853103.1	NC_009369.1	NC_022018.1
AY675564.1	CM000713.1	CM001737.1	FR874244.1	NC_009370.1	NC_022019.1
AYZS00000000.1	CM000760.1	CM001738.1	FR874245.1	NC_009371.1	NC_022020.1
AYZT00000000.1	CM000761.1	CM001739.1	FR874246.1	NC_009372.1	NC_022021.1
AYZU00000000.1	CM000762.1	CM001740.1	FR874247.1	NC_009373.1	NC_022022.1
AYZW00000000.1	CM000763.1	CM001741.1	FR874248.1	NC_009374.1	NC_022023.1
AYZX00000000.1	CM000764.1	CM001742.1	FR874249.1	NC_009375.1	NC_022024.1
AYZY00000000.1	CM000765.1	CM001743.1	FR874250.1	NC_010195.2	NC_022025.1
AZHG00000000.1	CM000766.1	CM001744.1	FR874251.1	NC_010339.1	NC_022026.1
BA000009.3	CM000767.1	CM001745.1	FR874252.1	NC_010443.4	NC_022027.1
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BA000029.3	CM000780.3	CM001748.1	FR874255.1	NC_010446.4	NC_022030.1
BA000046.3	CM000781.3	CM001749.1	FR874256.1	NC_010447.4	NC_022031.1
BA000047.1	CM000782.3	CM001750.1	FR874257.1	NC_010448.3	NC_022032.1
BAAE00000000.1	CM000784.3	CM001751.1	FR874258.1	NC_010449.4	NC_022033.1
BAAF00000000.4	CM000785.3	CM001752.1	FR874259.1	NC_010450.3	NC_022034.1
BAAG000000000.1	CM000786.3	CM001764.1	FR874260.1	NC_010451.3	NC_022035.1
BABO00000000.1	CM000790.1	CM001765.1	FR874261.1	NC_010452.3	NC_022036.1
BABP00000000.1	CM000791.1	CM001766.1	FR874262.1	NC_010453.4	NC_022199.1
BACJ00000000.1	CM000792.1	CM001767.1	FR874263.1	NC_010454.3	NC_022200.1
BL000001.2	CM000793.1	CM001768.1	FR874264.1	NC_010455.4	NC_022201.1
BX284601.5	CM000794.1	CM001769.1	GK000001.2	NC_010456.4	NC_022202.1
BX284602.5	CM000795.1	CM001770.1	GK000002.2	NC_010457.4	NC_022203.1
BX284603.4	CM000796.1	CM001771.1	GK000003.2	NC_010458.3	NC_022204.1
BX284604.4	CM000797.1	CM001778.1	GK000004.2	NC_010459.4	NC_022205.1
BX284605.5	CM000798.1	CM001779.1	GK000005.2	NC_010460.3	NC_022206.1
BX284606.5	CM000799.1	CM001780.1	GK000006.2	NC_010461.4	NC_022207.1
CAAA00000000.1	CM000800.1	CM001781.1	GK000007.2	NC_010462.2	NC_022208.1
CAAB00000000.2	CM000801.1	CM001782.1	GK000008.2	NC_010972.2	NC_022209.1
CAAP00000000.3	CM000802.1	CM001783.1	GK000009.2	NC_011032.1	NC_022210.1
CABD00000000.2	CM000803.1	CM001784.1	GK000010.2	NC_011033.1	NC_022211.1
CABG00000000.1	CM000804.1	CM001826.1	GK000011.2	NC_011088.1	NC_022212.1
CABZ00000000.1	CM000805.1	CM001827.1	GK000012.2	NC_011089.1	NC_022213.1
CACC00000000.1	CM000806.1	CM001828.1	GK000013.2	NC_011090.1	NC_022214.1
CAEC00000000.1	CM000807.1	CM001829.1	GK000014.2	NC_011091.1	NC_022215.1
CAIC00000000.1	CM000808.1	CM001830.1	GK000015.2	NC_011120.1	NC_022216.1
CAID00000000.1	CM000809.1	CM001831.1	GK000016.2	NC_011137.1	NC_022217.1
CAID01000001.1	CM000810.1	CM001832.1	GK000017.2	NC_011163.1	NC_022218.1
CAID01000002.1	CM000811.1	CM001833.1	GK000018.2	NC_011462.1	NC_022219.1
CAID01000003.1	CM000812.4	CM001879.1	GK000019.2	NC_011463.1	NC_022220.1
CAID01000004.1	CM000813.4	CM001880.1	GK000020.2	NC_011464.1	NC_022272.1
CAID01000005.1	CM000814.4	CM001881.1	GK000021.2	NC_011465.1	NC_022273.1
CAID01000006.1	CM000815.4	CM001882.1	GK000022.2	NC_011466.1	NC_022274.1
CAID01000007.1	CM000816.4	CM001883.1	GK000023.2	NC_011467.1	NC_022275.1
CAID01000008.1	CM000817.4	CM001884.1	GK000024.2	NC_011468.1	NC_022276.1
CAID01000009.1	CM000818.4	CM001885.1	GK000025.2	NC_011469.1	NC_022277.1
CAID01000010.1	CM000819.4	CM001886.1	GK000026.2	NC_011470.1	NC_022278.1
CAID01000011.1	CM000820.4	CM001887.1	GK000027.2	NC_011471.1	NC_022279.1
CAID01000012.1	CM000821.4	CM001888.1	GK000028.2	NC_011472.1	NC_022280.1
CAID01000013.1	CM000822.4	CM001919.1	GK000029.2	NC_011473.1	NC_022281.1
CAID01000014.1	CM000823.4	CM001920.1	GK000030.2	NC_011474.1	NC_022282.1
CAID01000015.1	CM000824.4	CM001921.1	GK000031.3	NC_011475.1	NC_022283.1
CAID01000016.1	CM000825.4	CM001922.1	GK000032.3	NC_011476.1	NC_022284.1
CAID01000017.1	CM000826.4	CM001923.1	GK000033.3	NC_011477.1	NC_022285.1
CAID01000018.1	CM000827.4	CM001924.1	GK000034.3	NC_011478.1	NC_022286.1
CAID01000019.1	CM000828.4	CM001925.1	GQ861354.1	NC_011479.1	NC_022287.1
CAID01000020.1	CM000829.4	CM001926.1	GU147934.1	NC_011480.1	NC_022288.1
CALO00000000.1	CM000830.4	CM001927.1	GU238433.1	NC_011481.1	NC_022289.1

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CALP000000000.1	CM000831.1	CM001928.1	GU295658.1	NC_011482.1	NC_022290.1
CH003448.1	CM000834.1	CM001929.1	HE601612.1	NC_011483.1	NC_022291.1
CH003449.1	CM000835.1	CM001930.1	HE601624.1	NC_011484.1	NC_022292.1
CH003450.1	CM000836.1	CM001931.1	HE601625.1	NC_011485.1	NC_022293.1
CH003451.1	CM000837.1	CM001932.1	HE601626.1	NC_011486.1	NC_022294.1
CH003452.1	CM000838.1	CM001933.1	HE601627.1	NC_011487.1	NC_022295.1
CH003453.1	CM000839.1	CM001934.1	HE601628.1	NC_011488.1	NC_022296.1
CH003454.1	CM000840.1	CM001935.1	HE601629.1	NC_011489.1	NC_022297.1
CH003455.1	CM000841.1	CM001936.1	HE601630.1	NC_011490.1	NC_022298.1
CH003456.1	CM000842.1	CM001937.1	HE601631.1	NC_011491.1	NC_022299.1
CH003457.1	CM000843.1	CM001938.1	HE602535.1	NC_011492.1	NC_022300.1
CH003458.1	CM000844.1	CM001939.1	HE602536.1	NC_011493.1	NC_022301.1
CH003459.1	CM000845.1	CM001940.1	HE602537.1	NC_011494.1	NC_022302.1
CH003460.1	CM000846.1	CM001941.2	HE602538.1	NC_011495.1	NC_022303.1
CH003461.1	CM000847.1	CM001942.1	HE602539.1	NC_011496.1	NC_022304.1
CH003462.1	CM000848.1	CM001943.2	HE602540.1	NC_012007.3	NC_022305.1
CH003463.1	CM000849.1	CM001944.2	HE602541.1	NC_012008.3	NC_022306.1
CH003464.1	CM000850.1	CM001945.1	HE602542.1	NC_012009.3	NC_022307.1
CH003465.1	CM000851.1	CM001946.1	HE602543.1	NC_012010.3	NC_022308.1
CH003466.1	CM000852.1	CM001947.1	HE602544.1	NC_012011.3	NC_022309.1
CH003467.1	CM000853.1	CM001948.2	HE602545.1	NC_012012.3	NC_022310.1
CH003468.1	CM000856.1	CM001949.2	HE602546.1	NC_012013.3	NC_022311.1
CH003469.1	CM000857.1	CM001950.2	HE602547.1	NC_012014.3	NC_022312.1
CH003470.1	CM000858.1	CM001951.2	HE602548.1	NC_012015.3	NC_022313.1
CH003471.1	CM000859.1	CM001952.2	HE602549.1	NC_012016.3	NC_022314.1
CH003496.1	CM000860.1	CM001953.2	HE602550.1	NC_012017.3	NC_022315.1
CH003497.1	CM000861.1	CM001954.1	HE602551.1	NC_012018.3	NC_022316.1
CH003498.1	CM000862.1	CM001955.2	HE602552.1	NC_012019.3	NC_022317.1
CH003499.1	CM000863.1	CM001956.2	HE602553.1	NC_012020.3	NC_022318.1
CH003500.1	CM000864.1	CM001957.1	HE602554.1	NC_012021.3	NC_022319.1
CH003501.1	CM000865.1	CM001958.2	HE602555.1	NC_012022.3	NC_022320.1
CH003502.1	CM000866.1	CM001959.2	HE602556.1	NC_012023.3	NC_022321.1
CH003503.1	CM000867.1	CM001960.2	HE813975.1	NC_012024.3	NC_022322.1
CH003504.1	CM000868.1	CM001961.2	HE813976.1	NC_012025.3	NC_022668.1
CH003505.1	CM000869.1	CM001962.2	HE813977.1	NC_012095.1	NC_023046.1
CH003506.1	CM000870.1	CM001963.2	HE813978.1	NC_012119.1	NC_023047.1
CH003507.1	CM000871.1	CM001964.1	HE813979.1	NC_012387.1	NC_023048.1
CH003508.1	CM000872.1	CM001965.2	HE813980.1	NC_012575.1	NC_023049.1
CH003509.1	CM000873.1	CM001966.2	HE813981.1	NC_012591.1	NC_023050.1
CH003510.1	CM000874.1	CM001967.1	HE813982.1	NC_012592.1	NC_023051.1
CH003511.1	CM000875.1	CM001968.1	HE813983.1	NC_012593.1	NC_023052.1
CH003512.1	CM000876.1	CM001969.1	HE813984.1	NC_012594.1	NC_023053.1
CH003513.1	CM000877.1	CM001970.2	HE813985.1	NC_012595.1	NC_023054.1
CH003514.1	CM000878.1	CM001971.1	HQ244500.2	NC_012596.1	NC_023164.1
CH003515.1	CM000879.1	CM001988.1	HQ325744.1	NC_012597.1	NC_023165.1
CH003516.1	CM000880.1	CM001989.1	HT000001.1	NC_012598.1	NC_023168.1
CH003517.1	CM000881.1	CM001990.1	HT000002.1	NC_012599.1	NC_023170.1
CH003518.1	CM000882.1	CM001991.1	HT000003.1	NC_012600.1	NC_023171.1
CH003519.1	CM000883.1	CM001992.1	HT000004.1	NC_012601.1	NC_023179.1
CM000001.3	CM000884.1	CM001993.1	HT000005.1	NC_012602.1	NC_023180.1
CM000002.3	CM000885.1	CM001994.1	HT000006.1	NC_012603.1	NC_023181.1
CM000003.3	CM000886.1	CM001995.1	HT000007.1	NC_012604.1	NC_023182.1
CM000004.3	CM000887.1	CM001996.1	HT000008.1	NC_012605.1	NC_023183.1
CM000005.3	CM000888.1	CM001997.1	HT000009.1	NC_012606.1	NC_023184.1
CM000006.3	CM000889.1	CM001998.1	HT000010.1	NC_012607.1	NC_023185.1
CM000007.3	CM000890.1	CM001999.1	HT000011.1	NC_012608.1	NC_023186.1
CM000008.3	CM000891.1	CM002000.1	HT000012.1	NC_012609.1	NC_023187.1
CM000009.3	CM000892.1	CM002001.1	HT000013.1	NC_012610.1	NC_023188.1
CM000010.3	CM000893.1	CM002002.1	HT000014.1	NC_012611.1	NC_023189.1
CM000011.3	CM000894.1	CM002003.1	HT000188.1	NC_012612.1	NC_023190.1
CM000012.3	CM000895.1	CM002004.1	J01415.2	NC_012613.1	NC_023191.1
CM000013.3	CM000896.1	CM002005.1	JAQD00000000.1	NC_012614.1	NC_023192.1
CM000014.3	CM000897.1	CM002006.1	JAQJ00000000.1	NC_012643.1	NC_023193.1
CM000015.3	CM000898.1	CM002007.1	JF274081.1	NC_012670.1	NC_023194.1
CM000016.3	CM000899.1	CM002008.1	JF275060.1	NC_012825.1	NC_023195.1
CM000017.3	CM000900.1	CM002009.1	JF345175.1	NC_012870.1	NC_023196.1
CM000018.3	CM000901.1	CM002010.1	JF920285.1	NC_012871.1	NC_023197.1
CM000019.3	CM000902.1	CM002011.1	JF920286.1	NC_012872.1	NC_023198.1
CM000020.3	CM000903.1	CM002012.1	JFZQ00000000.1	NC_012873.1	NC_023199.1
CM000021.3	CM000904.1	CM002013.1	JJMF00000000.1	NC_012874.1	NC_023200.1
CM000022.3	CM000905.1	CM002014.1	JJNN00000000.1	NC_012875.1	NC_023201.1
CM000023.3	CM000906.1	CM002015.1	JJOQ00000000.1	NC_012876.1	NC_023202.1
CM000024.3	CM000907.1	CM002016.1	JMKK00000000.1	NC_012877.1	NC_023203.1
CM000025.3	CM000908.1	CM002017.1	JN005831.1	NC_012878.1	NC_023204.1
CM000026.3	CM000909.1	CM002018.1	JN005832.1	NC_012879.1	NC_023205.1
CM000027.3	CM000910.1	CM002019.1	JN637766.2	NC_012920.1	NC_023206.1
CM000028.3	CM000911.1	CM002020.1	JNHC00000000.1	NC_013038.1	NC_023207.1

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CM000029.3	CM000915.2	CM002081.1	JQ396171.1	NC_013039.1	NC_023616.1
CM000030.3	CM000916.2	CM002082.1	JX463295.1	NC_013040.1	NC_023617.1
CM000031.3	CM000917.2	CM002083.1	JX946196.2	NC_013041.1	NC_023618.1
CM000032.3	CM000918.2	CM002084.1	KC757404.1	NC_013042.1	NC_023619.1
CM000033.3	CM000919.2	CM002085.1	KF293721.1	NC_013043.1	NC_023620.1
CM000034.3	CM000937.1	CM002086.1	KF428978.1	NC_013044.1	NC_023621.1
CM000035.3	CM000938.1	CM002087.1	KF765450.1	NC_013045.1	NC_023622.1
CM000036.3	CM000939.1	CM002088.1	KF874616.1	NC_013046.1	NC_023623.1
CM000037.3	CM000940.1	CM002089.1	KJ460033.1	NC_013047.1	NC_023624.1
CM000038.3	CM000941.1	CM002090.1	L06178.1	NC_013048.1	NC_023625.1
CM000039.3	CM000942.1	CM002091.1	L20934.1	NC_013049.1	NC_023642.1
CM000054.5	CM000943.1	CM002092.1	M11163.1	NC_013050.1	NC_023643.1
CM000055.5	CM000944.1	CM002093.1	NC_000001.11	NC_013051.1	NC_023644.1
CM000056.5	CM000945.1	CM002094.1	NC_000002.12	NC_013052.1	NC_023645.1
CM000057.5	CM000946.1	CM002095.1	NC_000003.12	NC_013053.1	NC_023646.1
CM000058.5	CM000947.1	CM002096.1	NC_000004.12	NC_013054.1	NC_023647.1
CM000059.5	CM000948.1	CM002288.1	NC_000005.10	NC_013663.1	NC_023648.1
CM000060.5	CM000949.1	CM002289.1	NC_000006.12	NC_013669.1	NC_023649.1
CM000061.5	CM000962.1	CM002290.1	NC_000007.14	NC_013670.1	NC_023650.1
CM000062.5	CM000963.1	CM002291.1	NC_000008.11	NC_013671.1	NC_023651.1
CM000063.5	CM000964.1	CM002292.1	NC_000009.12	NC_013672.1	NC_023652.1
CM000064.5	CM000965.1	CM002293.1	NC_000010.11	NC_013673.1	NC_023653.1
CM000065.5	CM000966.1	CM002294.1	NC_000011.10	NC_013674.1	NC_023654.1
CM000066.5	CM000967.1	CM002295.1	NC_000012.12	NC_013675.1	NC_023655.1
CM000067.5	CM000968.1	CM002296.1	NC_000013.11	NC_013676.1	NC_023656.1
CM000068.5	CM000969.1	CM002297.1	NC_000014.9	NC_013677.1	NC_023657.1
CM000069.5	CM000970.1	CM002298.1	NC_000015.10	NC_013678.1	NC_023658.1
CM000070.3	CM000971.1	CM002312.1	NC_000016.10	NC_013679.1	NC_023659.1
CM000071.3	CM000972.1	CM002313.1	NC_000017.11	NC_013680.1	NC_023660.1
CM000072.4	CM000973.1	CM002314.1	NC_000018.10	NC_013681.1	NC_023661.1
CM000073.4	CM000974.1	CM002315.1	NC_000019.10	NC_013682.1	NC_023662.1
CM000074.4	CM000975.1	CM002316.1	NC_000020.11	NC_013683.1	NC_023663.1
CM000075.4	CM000976.1	CM002317.1	NC_000021.9	NC_013684.1	NC_023664.1
CM000076.4	CM000977.1	CM002318.1	NC_000022.11	NC_013685.1	NC_023665.1
CM000077.4	CM000978.1	CM002319.1	NC_000023.11	NC_013686.1	NC_023666.1
CM000078.4	CM000979.1	CM002320.1	NC_000024.10	NC_013687.1	NC_023667.1
CM000079.4	CM000980.1	CM002321.1	NC_000067.6	NC_013688.1	NC_023668.1
CM000080.4	CM000981.1	CM002322.1	NC_000068.7	NC_013689.1	NC_023669.1
CM000081.4	CM000982.1	CM002323.1	NC_000069.6	NC_013690.1	NC_023670.1
CM000082.4	CM000983.1	CM002324.1	NC_000070.6	NC_013816.1	NC_023671.1
CM000083.4	CM000984.1	CM002325.1	NC_000071.6	NC_013896.1	NC_023672.1
CM000084.4	CM000985.1	CM002326.1	NC_000072.6	NC_013897.1	NC_023749.1
CM000085.4	CM000986.1	CM002327.1	NC_000073.6	NC_013898.1	NC_023750.1
CM000086.4	CM000987.1	CM002328.1	NC_000074.6	NC_013899.1	NC_023751.1
CM000087.4	CM000988.1	CM002329.1	NC_000075.6	NC_013900.1	NC_023752.1
CM000088.4	CM000989.1	CM002349.1	NC_000076.6	NC_013901.1	NC_023753.1
CM000089.4	CM000990.1	CM002350.1	NC_000077.6	NC_013902.1	NC_023754.1
CM000090.4	CM000991.1	CM002351.1	NC_000078.6	NC_013903.1	NC_023755.1
CM000091.4	CM000992.1	CM002352.1	NC_000079.6	NC_013904.1	NC_023756.1
CM000092.4	CM000993.1	CM002353.1	NC_000080.6	NC_013905.1	NC_023757.1
CM000093.3	CM000994.2	CM002354.1	NC_000081.6	NC_013906.1	NC_023758.1
CM000094.3	CM000995.2	CM002355.1	NC_000082.6	NC_013907.1	NC_023759.1
CM000095.3	CM000996.2	CM002356.1	NC_000083.6	NC_013908.1	NC_023798.1
CM000096.3	CM000997.2	CM002357.1	NC_000084.6	NC_013909.1	NC_023890.1
CM000097.3	CM000998.2	CM002358.1	NC_000085.6	NC_013910.1	NC_024126.1
CM000098.3	CM000999.2	CM002359.1	NC_000086.7	NC_013911.1	NC_024127.1
CM000099.3	CM001000.2	CM002360.1	NC_000087.7	NC_013912.1	NC_024128.1
CM000100.3	CM001001.2	CM002361.1	NC_000845.1	NC_013913.1	NC_024129.1
CM000101.3	CM001002.2	CM002362.1	NC_000891.1	NC_013914.1	NC_024130.1
CM000102.3	CM001003.2	CM002363.1	NC_000932.1	NC_013915.1	NC_024131.1
CM000103.3	CM001004.2	CM002364.1	NC_001284.2	NC_013916.1	NC_024132.1
CM000104.3	CM001005.2	CM002373.1	NC_001320.1	NC_013917.1	NC_024133.1
CM000105.3	CM001006.2	CM002374.1	NC_001322.1	NC_013918.1	NC_024218.1
CM000106.3	CM001007.2	CM002375.1	NC_001323.1	NC_013919.1	NC_024219.1
CM000107.3	CM001008.2	CM002376.1	NC_001328.1	NC_013993.1	NC_024220.1
CM000108.3	CM001009.2	CM002377.1	NC_001400.1	NC_014426.1	NC_024221.1
CM000109.3	CM001010.2	CM002378.1	NC_001566.1	NC_014427.1	NC_024222.1
CM000110.3	CM001011.2	CM002379.1	NC_001640.1	NC_014428.1	NC_024223.1
CM000111.3	CM001012.2	CM002380.1	NC_001643.1	NC_014429.1	NC_024224.1
CM000112.3	CM001013.2	CM002381.1	NC_001645.1	NC_014430.1	NC_024225.1
CM000113.3	CM001014.2	CM002382.1	NC_001665.2	NC_014431.1	NC_024226.1
CM000114.3	CM001026.1	CM002383.1	NC_001666.2	NC_014432.1	NC_024227.1
CM000115.3	CM001027.1	CM002384.1	NC_001700.1	NC_014433.1	NC_024228.1
CM000116.3	CM001028.1	CM002385.1	NC_001709.1	NC_014434.1	NC_024229.1
CM000117.3	CM001029.1	CM002386.1	NC_001751.1	NC_014435.1	NC_024230.1
CM000118.3	CM001030.1	CM002387.1	NC_001776.1	NC_014436.1	NC_024231.1
CM000119.3	CM001031.1	CM002388.1	NC_001941.1	NC_014437.1	NC_024232.1

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CM000120.2	CM001032.1	CM002389.1	NC_002008.4	NC_014438.1	NC_024233.1
CM000121.3	CM001033.1	CM002390.1	NC_002083.1	NC_014439.1	NC_024234.1
CM000122.3	CM001034.1	CM002391.1	NC_002084.1	NC_014440.1	NC_024235.1
CM000123.3	CM001035.1	CM002392.1	NC_002333.2	NC_014441.1	NC_024238.1
CM000124.3	CM001036.1	CM002393.1	NC_002511.2	NC_014442.1	NT_033777.2
CM000126.1	CM001037.1	CM002394.1	NC_002545.1	NC_014443.1	NT_033778.3
CM000127.1	CM001038.1	CM002476.1	NC_002762.1	NC_014444.1	NT_033779.4
CM000128.1	CM001039.1	CM002477.1	NC_003070.9	NC_014445.1	NT_037436.3
CM000129.1	CM001040.1	CM002478.1	NC_003071.7	NC_014676.2	NT_078265.2
CM000130.1	CM001041.1	CM002479.1	NC_003074.8	NC_014692.1	NT_078266.2
CM000131.1	CM001042.1	CM002480.1	NC_003075.7	NC_014776.1	NT_078267.5
CM000132.1	CM001053.1	CM002481.1	NC_003076.8	NC_014777.1	NT_078268.4
CM000133.1	CM001054.1	CM002482.1	NC_003081.2	NC_014778.1	NT_167061.1
CM000134.1	CM001055.1	CM002483.1	NC_003119.6	NC_014779.1	NT_167062.1
CM000135.2	CM001056.1	CM002484.1	NC_003279.8	NC_014780.1	NT_167063.1
CM000136.1	CM001057.1	CM002485.1	NC_003280.10	NC_014781.1	NT_167064.1
CM000137.1	CM001058.1	CM002486.1	NC_003281.10	NC_014782.1	NT_167065.1
CM000138.1	CM001059.1	CM002487.1	NC_003282.8	NC_014783.1	NT_167066.1
CM000139.1	CM001061.2	CM002488.1	NC_003283.11	NC_014784.1	NT_167067.1
CM000140.1	CM001064.1	CM002489.1	NC_003284.9	NC_014785.1	NT_167068.1
CM000141.1	CM001065.1	CM002490.1	NC_004299.1	NC_014786.1	NW_001471666.1
CM000142.1	CM001066.1	CM002491.1	NC_004353.3	NC_014787.1	NW_003722731.1
CM000143.1	CM001067.1	CM002492.1	NC_004354.3	NC_014788.1	NW_003722735.1
CM000144.1	CM001068.1	CM002493.1	NC_004387.1	NC_015011.1	NW_003722737.1
CM000145.1	CM001069.1	CM002494.1	NC_004447.2	NC_015012.1	NW_003722738.1
CM000146.1	CM001070.1	CM002495.1	NC_004744.1	NC_015013.1	NW_003722739.1
CM000147.1	CM001071.1	CM002496.1	NC_004818.2	NC_015014.1	NW_003722740.1
CM000148.1	CM001072.1	CM002497.1	NC_004946.1	NC_015015.1	NW_003722741.1
CM000149.1	CM001073.1	CM002498.1	NC_005044.2	NC_015016.1	NW_003722744.1
CM000157.2	CM001074.1	CM002499.1	NC_005089.1	NC_015017.1	NW_003722745.1
CM000158.2	CM001075.1	CM002500.1	NC_005100.3	NC_015018.1	NW_003722746.1
CM000159.2	CM001155.2	CM002501.1	NC_005101.3	NC_015019.1	NW_003722747.1
CM000160.2	CM001169.1	CM002502.1	NC_005102.3	NC_015020.1	NW_003722749.1
CM000161.2	CM001170.1	CM002503.1	NC_005103.3	NC_015021.1	NW_003722750.1
CM000162.2	CM001171.1	CM002504.1	NC_005104.3	NC_015022.1	NW_004080165.1
CM000163.1	CM001172.1	CM002505.1	NC_005105.3	NC_015023.1	NW_004080166.1
CM000164.1	CM001173.1	CM002506.1	NC_005106.3	NC_015024.1	NW_004080169.1
CM000165.1	CM001174.1	CM002507.1	NC_005107.3	NC_015025.1	NW_004080172.1
CM000166.1	CM001175.1	CM002508.1	NC_005108.3	NC_015026.1	NW_004080173.1
CM000167.1	CM001176.1	CM002509.1	NC_005109.3	NC_015027.1	NW_004080175.1
CM000168.1	CM001177.1	CM002510.1	NC_005110.3	NC_015028.1	NW_004080179.1
CM000177.5	CM001178.1	CM002511.1	NC_005111.3	NC_015029.1	NW_004080182.1
CM000178.5	CM001179.1	CM002512.1	NC_005112.3	NC_015030.1	NW_004080184.1
CM000179.5	CM001180.1	CM002513.1	NC_005113.3	NC_015031.1	NW_004080185.1
CM000180.5	CM001181.1	CM002514.1	NC_005114.3	NC_015032.1	NW_004080188.1
CM000181.5	CM001182.1	CM002515.1	NC_005115.3	NC_015033.1	NW_004190323.1
CM000182.5	CM001183.1	CM002516.1	NC_005116.3	NC_015034.1	NW_004190325.1
CM000183.5	CM001184.1	CM002517.1	NC_005117.3	NC_015035.1	NW_004190326.1
CM000184.5	CM001185.1	CM002518.1	NC_005118.3	NC_015036.1	NW_004190327.1
CM000185.5	CM001186.1	CM002519.1	NC_005119.3	NC_015037.1	NW_004190329.1
CM000186.5	CM001187.1	CM002520.1	NC_005120.3	NC_015038.1	NW_004190330.1
CM000187.5	CM001188.1	CM002521.1	NC_005781.1	NC_015039.1	NW_004190331.1
CM000188.5	CM001189.1	CM002522.1	NC_005943.1	NC_015040.1	NW_004190332.1
CM000189.5	CM001190.1	CM002523.1	NC_005973.1	NC_015041.1	NW_004190336.1
CM000190.5	CM001191.1	CM002524.1	NC_006088.3	NC_015042.1	NW_004440457.1
CM000191.5	CM001192.1	CM002525.1	NC_006089.3	NC_015099.1	NW_004440460.1
CM000192.4	CM001193.1	CM002526.1	NC_006090.3	NC_015139.1	NW_006267373.1
CM000193.5	CM001217.1	CM002527.1	NC_006091.3	NC_015206.1	NW_006267376.1
CM000194.5	CM001218.1	CM002528.1	NC_006092.3	NC_015438.1	NW_006267377.1
CM000195.5	CM001219.1	CM002529.1	NC_006093.3	NC_015439.1	NW_006267379.1
CM000196.5	CM001220.1	CM002530.1	NC_006094.3	NC_015440.1	NW_006267382.1
CM000197.5	CM001221.1	CM002531.1	NC_006095.3	NC_015441.1	NW_006267383.1
CM000198.5	CM001222.1	CM002532.1	NC_006096.3	NC_015442.1	NW_006267384.1
CM000199.6	CM001223.1	CM002533.1	NC_006097.3	NC_015443.1	NZ_AAAB00000000.1
CM000200.5	CM001224.1	CM002534.1	NC_006098.3	NC_015444.1	NZ_AABU00000000.1
CM000201.5	CM001241.2	CM002535.1	NC_006099.3	NC_015445.1	NZ_AADE00000000.1
CM000202.5	CM001242.1	CM002639.1	NC_006100.3	NC_015446.1	NZ_AAEU00000000.2
CM000203.5	CM001243.2	CM002640.2	NC_006101.3	NC_015447.1	NZ_AAGH00000000.1
CM000204.5	CM001244.2	CM002641.2	NC_006102.3	NC_015448.1	NZ_AANI00000000.1
CM000205.5	CM001245.2	CM002642.2	NC_006103.3	NC_015449.1	NZ_ABXC00000000.1
CM000206.4	CM001246.2	CM002643.2	NC_006104.3	NC_015762.1	U20753.1
CM000231.2	CM001247.2	CM002644.1	NC_006105.3	NC_015763.1	U37541.1
CM000232.2	CM001248.2	CM002645.1	NC_006106.3	NC_015764.1	U96639.2
CM000233.2	CM001249.2	CM002646.2	NC_006107.3	NC_015765.1	X03240.1
CM000234.2	CM001250.2	CM002647.1	NC_006108.3	NC_015766.1	X15901.1
CM000235.2	CM001251.2	CM002648.1	NC_006109.3	NC_015767.1	X52392.1
CM000236.2	CM001252.2	CM002649.1	NC_006110.3	NC_015768.1	X54252.1

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CM000237.2	CM001253.1	CM002650.1	NC_006111.3	NC_015769.1	X79547.1
CM000238.2	CM001254.1	CM002655.1	NC_006112.2	NC_015770.1	X83427.1
CM000239.2	CM001255.1	CM002656.1	NC_006113.3	NC_015771.1	X86563.2
CM000240.1	CM001256.1	CM002657.1	NC_006114.3	NC_015772.1	X93347.1
CM000241.2	CM001257.1	CM002658.1	NC_006115.3	NC_015773.1	X97707.1
CM000242.1	CM001258.1	CM002659.1	NC_006119.2	NC_015774.1	Y08501.2
CM000243.2	CM001259.1	CM002660.1	NC_006126.3	NC_015775.1	
CM000245.1	CM001260.1	CM002661.1	NC_006127.3	NC_015776.1	
CM000246.2	CM001261.1	CM002662.1	NC_006299.1	NC_015777.1	

[0145] 表4-已公开的原核生物染色体和质粒序列和病毒序列的GenBank登录号(包括条目版本号".N";GenBank数据库版本202,2014年6月15日)

[0146]

	NC_021002.1	NC_017330.1	NC_017447.1	NC_017982	NC_023865
NC_009641.1	NC_014921.1	NC_017329.1	NC_017444.1	NC_003982	NC_019542
NC_022593.1	NC_008781.1	NC_017320.1	NZ_CM002178.1	NC_003983	NC_019522
NC_002737.1	NC_013716.1	NC_017319.1	NZ_CM002179.1	NC_023882	NC_020201
NC_007297.1	NC_008025.1	NC_004943.1	NC_009425.1	NC_003748	NC_012118
NC_022658.1	NC_009253.1	NC_004253.1	NC_021492.1	NC_017862	NC_016161
NC_022659.1	NC_013949.1	NC_004252.1	NC_015063.1	NC_020085	NC_001837
NZ_CM001848.1	NC_010337.2	NC_015066.1	NC_015062.1	NC_020084	NC_020484
NC_017196.1	NC_016011.1	NC_015053.1	NC_003270.1	NC_020501	NC_020481
NZ_CM001793.1	NC_013891.1	NC_017220.1	NC_003267.1	NC_012664	NC_020482
NC_015844.1	NZ_CM001051.1	NC_017222.1	NC_003240.1	NC_015553	NC_020483
NC_021894.1	NC_008555.1	NC_006298.1	NC_003276.1	NC_010352	NC_005985
NC_008512.1	NC_008228.1	NZ_CM001987.1	NC_003241.1	NC_009549	NC_005286
NC_018414.1	NC_015931.1	NC_005128.1	NC_003273.1	NC_009559	NC_007017
NC_018415.1	NC_009767.1	NZ_CM001801.1	NC_019685.1	NC_006951	NC_005285
NC_018416.1	NC_016640.1	NC_012923.1	NC_019677.1	NC_011765	NC_013262
NC_018417.1	NZ_CM001632.1	NC_008712.1	NC_008539.1	NC_009014	NC_003649
NC_018418.1	NC_009437.1	NC_008713.1	NC_008538.1	NC_019932	NC_003650
NC_009937.1	NC_009138.1	NC_009084.1	NC_008537.1	NC_023557	NC_003651
NC_020419.1	NC_012779.2	NC_009083.1	NC_009453.1	NC_023579	NC_007915
NC_022115.1	NC_014752.1	NC_010605.1	NC_018532.1	NC_022744	NC_022897
NC_012730.1	NC_007964.1	NC_010606.1	NC_016634.1	NC_016767	NC_007218
NC_012960.1	NC_007406.1	NC_011585.1	NC_008320.1	NC_023610	NC_011545
NZ_CM001047.1	NC_007716.1	NC_010403.1	NC_008573.1	NC_019926	NC_014977
NC_015155.1	NC_007722.1	NC_010402.1	NC_009475.1	NC_015292	NC_014978
NC_015153.1	NC_009615.1	NC_010404.1	NC_005229.1	NC_011811	NC_007539
NC_014497.1	NC_017218.1	NC_010401.1	NC_005231.1	NC_019929	NC_007540
NC_017293.1	NC_020517.1	NC_020525.1	NC_005230.1	NC_015295	NC_007541
NC_015736.1	NC_014328.1	NC_017848.1	NC_005232.1	NC_019504	NC_007542
NC_018219.1	NC_018721.1	NC_020524.1	NC_020296.1	NC_019510	NC_007221
NC_018149.1	NC_014230.1	NC_017164.1	NC_020290.1	NC_019514	NC_007223
NC_016112.1	NC_010184.1	NC_017163.1	NC_020289.1	NC_001977	NC_007222
NC_017025.1	NC_008268.1	NC_017165.1	NC_020298.1	NC_004913	NC_005977
NC_000868.1	NC_007292.1	NC_017166.1	NC_020297.1	NC_022323	NC_005976
NZ_CM001973.1	NC_007109.1	NC_017172.1	NC_020288.1	NC_019725	NC_007147
NZ_CM001975.1	NC_009092.1	NC_021728.1	NC_020287.1	NC_016570	NC_004067
NZ_CM001979.1	NC_008048.1	NC_021727.1	NC_007949.1	NC_013594	NC_004096
NZ_CM001983.1	NC_007908.1	NC_021734.1	NC_007950.1	NC_016158	NC_004101
NZ_CM001984.1	NC_007614.1	NC_021730.1	NC_020548.1	NC_016160	NC_001369
NC_018581.1	NC_008344.1	NC_021731.1	NC_008147.1	NC_018859	NC_001359
NC_020505.1	NC_009776.1	NC_021732.1	NC_008703.1	NC_023593	NC_004192
NC_021555.1	NC_007969.1	NC_019985.2	NC_008704.1	NC_018854	NC_016984
NC_022575.1	NC_007514.1	NC_023031.1	NC_014841.1	NC_021344	NC_010619
NC_021919.1	NC_007181.1	NC_010398.1	NC_014840.1	NC_008720	NC_010618
NC_021024.1	NC_020247.1	NC_010395.1	NC_014839.1	NC_018846	NC_000882
NC_022588.1	NC_020246.1	NC_010396.1	NC_014842.1	NC_019452	NC_010235
NZ_CM001773.1	NC_023069.1	NZ_AEOY01000096.1	NC_014838.1	NC_019445	NC_003630
NC_023002.1	NC_009009.1	NZ_AEOY01000095.1	NC_019728.1	NC_019442	NC_001517
NC_023030.1	NC_007681.1	NZ_AEOZ01000236.1	NC_019752.1	NC_017969	NC_003670
NC_023030.1	NC_009376.1	NZ_AEPA01000395.1	NC_019727.1	NC_020079	NC_003669
NC_023062.1	NC_007350.1	NZ_AEPA01000396.1	NC_017193.1	NC_023743	NC_008393
NC_022906.1	NC_009828.1	NZ_AFDA02000006.1	NC_022111.1	NC_019520	NC_015050
NC_022905.1	NC_010525.1	NZ_AFDA02000007.1	NC_015579.1	NC_007804	NC_011918

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NC_022907.1	NC_014623.1	NZ_AFDA02000008.1	NC_015582.1	NC_011041	NC_020236
NC_022908.1	NC_015634.1	NZ_AFDA02000009.1	NC_015583.1	NC_015933	NC_008284
NC_002163.1	NC_016023.1	NZ_AFDA02000010.1	NC_019690.1	NC_019505	NC_008283
NC_003912.7	NC_012796.1	NZ_AFDA02000011.1	NC_019428.1	NC_012749	NC_014327
NC_008787.1	NC_010397.1	NZ_AFDB02000003.1	NC_019429.1	NC_016518	NC_005347
NC_009707.1	NC_018150.1	NZ_AFDB02000004.1	NC_019440.1	NC_016517	NC_020803
NC_009839.1	NC_021282.1	NZ_AFDB02000005.1	NC_019747.1	NC_004068	NC_003113
NC_017279.1	NC_013457.1	NZ_AFCZ02000004.1	NC_020051.1	NC_010738	NC_000936
NC_017280.1	NC_013456.1	NZ_AFCZ02000003.1	NC_019759.1	NC_004515	NC_019024
NZ_AASL01000001.1	NC_016613.1	NZ_AFDO01000021.1	NC_019746.1	NC_003556	NC_016648
NC_014802.1	NC_016614.1	NZ_AFDK01000004.1	NC_019760.1	NC_005319	NC_018272
NC_017281.1	NC_014323.1	NZ_ALAL01000013.1	NC_019742.1	NC_008305	NC_018271
NC_018709.2	NC_014012.1	NZ_AFDL01000006.1	NC_019739.1	NC_008304	NC_017989
NC_018521.1	NC_014319.1	NZ_AFDL01000007.1	NC_019761.1	NC_014630	NC_017988
NC_021834.1	NC_009720.1	NZ_AFDL01000008.1	NC_019743.1	NC_012553	NC_023983
NC_022362.1	NC_010530.1	NZ_AFDL01000005.1	NC_019762.1	NC_012554	NC_018381
NC_022529.1	NC_010528.1	NZ_AFDM01000010.1	NC_019740.1	NC_012639	NC_004573
NC_022351.1	NC_008340.1	NZ_ALII01000018.1	NC_019741.1	NC_003412	NC_007749
NC_022353.1	NC_008726.1	NZ_ALII01000020.1	NC_010374.1	NC_009527	NC_007754
NC_022352.1	NC_007426.1	NZ_ALII01000019.1	NC_010373.1	NC_009528	NC_007757
NZ_CM000854.1	NC_008553.1	NZ_AFDN01000003.1	NC_003065.3	NC_002615	NC_007748
NZ_CM000855.1	NC_008789.1	NC_006297.1	NC_003064.2	NC_017940	NC_007750
NC_007492.2	NC_009483.1	NC_006873.1	NC_008242.1	NC_013108	NC_007751
NC_012660.1	NC_009484.1	NC_007607.1	NC_008244.1	NC_013105	NC_007755
NC_016830.1	NC_008009.1	NC_009344.1	NC_008243.1	NC_013106	NC_007752
NC_017911.1	NC_007645.1	NC_006365.1	NC_007801.1	NC_013107	NC_007756
NZ_CM001025.1	NC_014483.1	NC_006366.1	NC_008697.1	NC_003702	NC_007753
NZ_CM001513.1	NC_014622.1	NC_018141.1	NC_008765.1	NC_003707	NC_006383
NZ_CM001512.1	NC_017542.1	NC_020522.1	NC_008766.1	NC_003697	NC_003678
NZ_CM001558.1	NC_023037.1	NC_009346.1	NC_009517.1	NC_003706	NC_018713
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NC_003902.1	NC_009441.1	NC_007385.1	NC_021668.1	NC_003700	NC_021333
NC_007086.1	NC_015856.1	NC_016834.1	NC_021669.1	NC_003701	NC_010392
NC_010688.1	NC_013861.1	NC_016824.1	NC_010335.1	NC_003703	NC_010393
NC_017271.1	NC_008578.1	NC_016823.1	NC_010333.1	NC_003704	NC_006938
NC_003197.1	NC_007677.1	NC_016833.1	NC_010542.1	NC_003705	NC_010295
NC_003198.1	NC_014032.1	NC_008500.1	NC_010543.1	NC_003696	NC_023678
NC_004631.1	NC_010001.1	NC_008501.1	NC_010539.1	NC_023881	NC_013999
NC_006511.1	NC_008709.1	NC_007595.1	NC_010541.1	NC_023880	NC_009991
NC_016856.1	NC_007759.1	NC_009035.1	NC_011721.1	NC_013097	NC_009383
NC_006905.1	NC_015677.1	NC_009037.1	NC_011723.1	NC_013096	NC_018074
NC_011294.1	NC_009636.1	NC_009036.1	NC_011727.1	NC_013095	NC_018075
NC_011274.1	NC_008698.1	NC_009038.1	NC_011732.1	NC_013098	NC_018076
NC_011080.1	NC_009972.1	NC_009661.1	NC_011737.1	NC_013094	NC_009551
NC_012125.1	NC_011899.1	NC_011668.1	NC_011730.1	NC_013099	NC_008367
NC_010067.1	NC_010482.1	NC_011664.1	NC_011738.1	NC_013100	NC_004062
NC_010102.1	NC_009379.1	NC_011665.1	NC_011733.1	NC_013101	NC_003634
NC_011083.1	NC_010531.1	NC_009999.1	NC_011734.1	NC_003558	NC_007069
NC_011094.1	NC_012526.1	NC_009998.1	NC_011882.1	NC_003565	NC_013220
NC_011149.1	NC_008570.1	NC_010000.1	NC_011885.1	NC_003567	NC_013221
NC_011205.1	NC_021290.1	NC_017572.1	NC_011880.1	NC_003564	NC_006447
NC_011147.1	NC_014215.1	NC_017570.1	NC_013160.1	NC_003566	NC_006439
NC_016854.1	NC_011831.1	NC_016905.1	NC_013167.1	NC_003563	NC_013797
NC_016857.1	NC_009718.1	NC_017580.1	NC_013168.1	NC_003562	NC_017916
NC_016810.1	NC_008701.1	NC_017577.1	NC_013163.1	NC_003561	NC_024015
NC_016863.1	NC_008027.1	NC_017578.1	NC_014502.1	NC_003560	NC_024011
NC_016831.1	NC_009434.1	NC_015701.1	NC_014535.1	NC_003559	NC_024010
NC_016832.1	NC_017532.1	NC_015698.1	NC_014533.1	NC_023437	NC_024014
NC_017046.1	NC_015740.1	NC_015700.1	NC_014503.1	NC_011183	NC_015626
NC_017623.1	NC_018028.1	NC_015699.1	NC_014534.1	NC_013590	NC_019850
NC_016860.1	NC_018177.1	NC_021504.1	NC_014504.1	NC_022249	NC_014648
NC_020307.1	NC_019936.1	NC_021497.1	NC_015390.1	NC_017823	NC_010178
NC_021151.1	NC_008593.1	NC_021498.1	NC_022602.1	NC_022800	NC_022365
NC_021176.1	NC_021314.1	NC_021495.1	NC_022601.1	NC_001481	NC_009020
NC_021812.2	NC_008610.1	NC_021503.1	NC_022607.1	NC_001871	NC_005897
NC_021810.1	NC_009486.1	NC_021496.1	NC_022603.1	NC_001482	NC_005894
NC_021818.1	NC_008343.1	NC_006462.1	NC_022608.1	NC_002306	NC_015639
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NC_021844.1	NC_008212.1	NC_017273.1	NC_015498.1	NC_022802	NC_003219

[0148]

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NC_022544.1	NC_008347.1	NC_017435.1	NC_012252.1	NC_005084	NC_003779
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NZ_CM001151.1	NC_010623.1	NC_020979.1	NC_012247.1	NC_015495	NC_001445
NZ_CM001153.1	NC_009901.1	NC_020947.1	NC_013930.1	NC_015229	NC_002593
NZ_CM001274.1	NC_009952.1	NC_020962.1	NC_015679.1	NC_003554	NC_008349
NZ_CM001471.1	NC_011898.1	NC_020989.1	NC_013419.1	NC_007163	NC_006579
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NC_005810.1	NC_009033.1	NC_020956.1	NC_020196.1	NC_007160	NC_014406
NC_008149.1	NC_010506.1	NC_020983.1	NC_022551.1	NC_007158	NC_014407
NC_008150.1	NC_009439.1	NC_020957.1	NC_013857.1	NC_007154	NC_005343
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NC_017154.1	NC_009832.1	NC_021049.1	NC_013855.1	NC_007159	NC_023674
NC_017160.1	NC_010676.1	NC_023057.1	NC_013856.1	NC_007155	NC_019494
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NC_017265.1	NC_009719.1	NC_020986.1	NC_013858.1	NC_007923	NC_023636
NC_017168.1	NC_011566.1	NC_020958.1	NZ_CM001370.1	NC_006356	NC_023673
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NC_007793.1	NC_009900.1	NC_020949.1	NC_015974.1	NC_021221	NC_003436
NC_009487.1	NC_016931.1	NC_020981.1	NC_016747.1	NC_001720	NC_007732
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NC_009632.1	NC_009712.1	NC_020953.1	NC_022536.1	NC_000899	NC_011829
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NC_017337.1	NC_010168.1	NC_006578.1	NC_018696.1	NC_006567	NC_009640
NC_016941.1	NC_010163.1	NC_008598.1	NZ_AMRX01000008.1	NC_013117	NC_003987
NC_016928.1	NC_010085.1	NC_014172.1	NZ_APAS01000019.1	NC_014546	NC_021203
NC_017349.1	NC_013926.1	NC_017199.1	NZ_ANIN01000003.1	NC_014064	NC_021204
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NC_016912.1	NC_016751.1	NC_017212.1	NC_020910.1	NC_018091	NC_023878
NC_017343.1	NC_015730.1	NC_017206.1	NC_020909.1	NC_018090	NC_003985
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NC_021554.1	NC_010644.1	NC_017209.1	NC_020053.1	NC_001403	NC_008605
NC_021670.1	NZ_ABCY02000001.1	NC_017207.1	NC_019730.1	NC_023879	NC_003632
NC_022222.1	NC_011144.1	NC_017205.1	NC_019763.1	NC_020469	NC_022799
NC_022226.1	NC_009613.3	NC_018487.1	NC_019732.1	NC_006937	NC_022798
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NC_017673.1	NC_010524.1	NC_018489.1	NZ_ASXA01000016.1	NC_023680	NC_003724
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NC_002976.3	NC_010718.1	NC_018512.1	NC_020553.1	NC_023892	NC_001361
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[0149]

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NC_017949.1	NC_010694.1	NC_018511.1	NC_021918.1	NC_002577	NC_001616
NC_017486.1	NC_011666.1	NC_018685.1	NC_022782.1	NC_016440	NC_016136
NC_017492.1	NC_011529.1	NC_018687.1	NC_022783.1	NC_003557	NC_002048
NC_019435.1	NC_010581.1	NC_018694.1	NZ_CM002284.1	NC_003375	NC_002049
NC_020450.1	NC_012108.1	NC_018684.1	NZ_CM002283.1	NC_003376	NC_004644
NC_022369.1	NC_010424.1	NC_018688.1	NZ_CM002282.1	NC_022961	NC_004638
NC_004722.1	NC_012489.1	NC_018686.1	NZ_CM002281.1	NC_004012	NC_001934
NC_003909.8	NC_012490.1	NC_018689.1	NZ_CM002286.1	NC_001800	NC_001935
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NC_011658.1	NC_019567.1	NC_018882.1	NC_016028.1	NC_012136	NC_000939
NC_011772.1	NC_005363.1	NC_018879.1	NC_016037.1	NC_020252	NC_023849
NC_011773.1	NC_005362.1	NC_018881.1	NC_016029.1	NC_023612	NC_003687
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NC_016779.1	NC_022909.1	NC_018878.1	NC_018606.1	NC_006558	NC_013110
NC_016771.1	NC_014033.1	NC_020243.1	NC_009340.1	NC_003555	NC_020847
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NZ_CM000714.1	NC_005877.1	NC_020241.1	NC_009341.1	NC_010306	NC_020878
NZ_CM000741.1	NC_014000.1	NC_020239.1	NZ_AQHN01000096.1	NC_010356	NC_015280
NZ_CM000715.1	NC_007413.1	NC_020240.1	NZ_AQHN01000095.1	NC_008922	NC_015284
NZ_CM000716.1	NC_007294.1	NC_020249.1	NC_017858.1	NC_008877	NC_015283
NZ_CM000717.1	NC_006142.1	NC_020250.1	NC_014144.1	NC_008878	NC_006883
NZ_CM000718.1	NC_017066.1	NC_020392.1	NC_016115.1	NC_008936	NC_021559
NZ_CM000719.1	NC_017062.1	NC_020382.1	NC_016110.1	NC_008879	NC_006884
NZ_CM000720.1	NC_006908.1	NC_020383.1	NZ_BAWN01000094.1	NC_008880	NC_015290
NZ_CM000721.1	NC_006512.1	NC_020379.1	NC_019002.1	NC_008881	NC_020835
NZ_CM000722.1	NC_021286.1	NC_020393.1	NZ_AZLZ01002924.1	NC_008849	NC_020874
NZ_CM000723.1	NC_013385.1	NC_020384.1	NZ_CM000956.1	NC_008882	NC_006882
NZ_CM000724.1	NC_006177.1	NC_020377.1	NZ_CM002260.1	NC_008883	NC_015288
NZ_CM000725.1	NC_008260.1	NC_020390.1	NZ_CM001862.1	NC_008935	NC_015285
NZ_CM000726.1	NC_009633.1	NC_020380.1	NZ_AZLY01000050.1	NC_008919	NC_007150
NZ_CM000727.1	NC_007512.1	NC_020391.1	NZ_AZME01000385.1	NC_008920	NC_024018
NZ_CM000728.1	NC_008687.1	NC_020378.1	NC_020538.1	NC_008921	NC_018851
NZ_CM000729.1	NC_008686.1	NC_020381.1	NC_020567.1	NC_008876	NC_018847
NZ_CM000730.1	NC_006510.1	NC_020385.1	NC_020565.1	NC_008906	NC_003460
NZ_CM000731.1	NC_014970.1	NC_020394.1	NC_020531.1	NC_008923	NC_018842
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[0150]

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NC_020557.1	NC_017538.1	NZ_AKVW01000005.1	NC_023556	NC_008903	NC_016764
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NC_008816.1	NC_015578.1	NC_009726.1	NC_001729	NC_008897	NC_022091
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NC_008819.1	NC_013205.1	NC_011526.1	NC_006152	NC_008899	NC_016571
NC_008820.1	NC_017167.1	NC_010258.1	NC_006260	NC_008851	NC_023700
NC_009091.1	NC_012522.1	NC_008502.1	NC_006261	NC_008900	NC_007808
NC_009840.1	NC_012792.1	NC_011352.1	NC_021247	NC_008901	NC_011373
NC_009976.1	NC_012791.1	NC_017476.1	NC_004690	NC_008902	NC_015294
NC_000907.1	NC_014931.1	NC_017475.1	NC_005038	NC_008918	NC_022967
NC_007146.2	NC_022247.1	NC_020057.1	NC_011423	NC_008904	NC_022970
NC_009566.1	NC_022234.1	NC_021722.1	NC_007557	NC_008905	NC_022986
NC_009567.1	NC_012962.1	NC_005863.1	NC_007558	NC_008852	NC_022966
NC_017451.1	NC_015714.1	NC_008741.1	NC_007551	NC_008853	NC_011810
NC_017452.1	NC_013922.1	NC_017311.1	NC_007556	NC_008854	NC_001628
NC_014920.1	NC_011313.1	NZ_ANIP01000001.1	NC_007552	NC_008939	NC_023006
NC_014922.1	NC_011312.1	NC_009136.1	NC_007553	NC_004003	NC_023005
NC_016809.1	NC_014002.1	NC_010683.1	NC_007554	NC_018482	NC_008294
NC_022356.1	NC_011295.1	NC_012851.1	NC_007555	NC_018483	NC_011107
NC_000962.3	NC_011297.1	NC_012855.1	NC_007548	NC_017979	NC_011105
NC_002755.2	NC_011296.1	NC_012849.1	NC_007550	NC_003054	NC_022096
NC_009525.1	NC_014541.1	NC_017468.1	NC_007549	NC_004800	NC_019913
NC_009565.1	NC_014248.1	NC_020277.1	NC_012636	NC_005036	NC_005884
NC_012943.1	NC_012559.1	NC_017228.1	NC_004285	NC_001701	NC_004466
NC_022350.1	NC_012997.1	NC_017239.1	NC_012932	NC_018105	NC_001331
NC_016768.1	NC_022663.1	NC_017230.1	NC_007669	NC_016435	NC_001418
NC_018078.1	NC_014377.1	NC_017227.1	NC_007674	NC_015720	NC_021062
NC_017524.1	NC_013422.1	NC_017231.1	NC_007673	NC_016434	NC_011756
NC_017523.1	NC_012917.1	NC_017232.1	NC_007672	NC_016166	NC_023596

[0151]

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NC_020559.1	NC_013421.1	NC_017233.1	NC_007666	NC_013012	NC_013638
NC_021054.1	NC_012912.1	NC_017225.1	NC_007671	NC_012120	NC_004174
NC_021192.1	NZ_CM001858.1	NC_017236.1	NC_008208	NC_011805	NC_004175
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NC_021194.1	NC_014506.1	NC_017234.1	NC_005135	NC_018384	NC_004171
NC_021251.1	NC_013715.1	NC_017224.1	NC_015251	NC_018383	NC_004170
NC_021740.1	NC_014106.1	NC_017241.1	NC_005260	NC_015492	NC_004172
NC_016934.1	NC_020990.1	NC_017240.1	NC_020879	NC_015493	NC_015208
NZ_CM000787.2	NC_013416.1	NC_008566.1	NC_019543	NC_015782	NC_012091
NZ_CM000788.2	NC_013597.1	NC_008565.1	NC_019538	NC_012484	NC_012092
NZ_CM000789.2	NC_017846.1	NC_008273.1	NC_023688	NC_015220	NC_012093
NZ_CM001043.1	NC_016513.1	NC_008274.1	NC_014635	NC_003621	NC_016762
NZ_CM001044.1	NC_016632.1	NC_008567.1	NC_014636	NC_003622	NC_003716
NZ_CM001045.1	NC_013118.1	NC_008568.1	NC_019528	NC_017938	NC_003714
NZ_CM001225.1	NC_013119.1	NC_008564.1	NC_009542	NC_017939	NC_003715
NZ_CM001226.1	NC_013851.1	NC_008569.1	NC_019527	NC_019493	NC_003300
NZ_CM001227.1	NC_014632.1	NC_011794.1	NC_001467	NC_003623	NC_003299
NZ_CM001515.1	NC_013741.1	NC_011651.1	NC_001468	NC_003615	NC_003301
NZ_CM002022.1	NC_014964.1	NC_011650.1	NC_022519	NC_003203	NC_003278
NZ_CM002048.1	NC_014011.1	NC_011788.1	NC_004763	NC_003347	NC_022971
NZ_CM002049.1	NC_014537.1	NC_011787.1	NC_010820	NC_017918	NC_015264
NZ_CM002050.1	NC_017455.1	NC_011793.1	NC_006017	NC_016509	NC_005045
NZ_CM002051.1	NC_014166.1	NC_011789.1	NC_006016	NC_011702	NC_004629
NZ_CM002052.1	NC_014816.1	NC_011649.1	NC_005996	NC_007448	NC_023601
NZ_CM002053.1	NC_014817.1	NC_011790.1	NC_006009	NC_004667	NC_023718
NZ_CM002054.1	NC_014393.1	NC_011647.1	NC_006021	NC_016416	NC_012418
NZ_CM002055.1	NC_014122.1	NC_011786.1	NC_006019	NC_016081	NC_017971
NZ_CM002057.1	NC_013156.1	NC_011648.1	NC_006012	NC_016417	NC_017864
NZ_CM002056.1	NC_014364.1	NC_011792.1	NC_006018	NC_016436	NC_017865
NZ_CM002058.1	NC_013532.1	NC_011791.1	NC_006011	NC_022002	NC_019918
NZ_CM002059.1	NC_014378.1	NC_011758.1	NC_006020	NC_004724	NC_023575
NZ_CM002060.1	NC_014962.1	NC_011760.1	NC_012519	NC_001948	NC_019813
NZ_CM002061.1	NC_014394.1	NC_012810.1	NC_001659	NC_021480	NC_016765
NZ_CM002062.1	NC_014972.1	NC_012807.1	NC_021202	NC_015784	NC_019492
NZ_CM002063.1	NC_013407.1	NC_012809.1	NC_019547	NC_003604	NC_005264
NZ_CM002064.1	NZ_CM001376.1	NC_012811.1	NC_003434	NC_003602	NC_023734
NZ_CM002065.1	NC_013921.1	NC_012989.1	NC_022127	NC_011106	NC_020841
NZ_CM002066.1	NC_013959.1	NC_012987.1	NC_022129	NC_018458	NC_020070
NZ_CM002067.1	NC_014410.1	NC_012624.1	NC_022128	NC_014531	NC_010946
NZ_CM002068.1	NC_019970.1	NC_013770.1	NC_014746	NC_014524	NC_021864
NZ_CM002069.1	NC_012982.1	NC_010502.1	NC_014744	NC_014523	NC_005224
NZ_CM002070.1	NC_012969.1	NC_010504.1	NC_012557	NC_014530	NC_005223
NZ_CM002073.1	NC_014313.1	NC_010510.1	NC_014645	NC_014522	NC_005225
NZ_CM002071.1	NC_021172.1	NC_010518.1	NC_020889	NC_014525	NC_023894
NZ_CM002072.1	NC_014209.1	NC_010509.1	NC_006384	NC_014526	NC_005872
NZ_CM002076.1	NC_014471.1	NC_010517.1	NC_005046	NC_014527	NC_009597
NZ_CM002077.1	NC_014008.1	NC_010514.1	NC_023443	NC_014528	NC_016403
NZ_CM002079.1	NC_011740.1	NC_010507.1	NC_007067	NC_014529	NC_012671
NZ_CM002074.1	NZ_CM001142.1	NZ_AVAB01000114.1	NC_004090	NC_003876	NC_009889
NZ_CM002075.1	NC_018073.1	NZ_AVAB01000116.1	NC_010812	NC_005965	NC_011704
NZ_CM002078.1	NC_022246.1	NZ_AVAB01000115.1	NC_003414	NC_004018	NC_017083
NZ_CM002080.1	NC_022237.1	NZ_AVAB01000112.1	NC_002981	NC_004019	NC_001266
NZ_CM002127.1	NZ_CM001889.1	NZ_AVAB01000113.1	NC_004627	NC_004020	NC_001543
NZ_CM002126.1	NC_017765.1	NZ_AVAB01000111.1	NC_003403	NC_006444	NC_008580
NZ_CM002125.1	NC_020895.1	NZ_AVAB01000110.1	NC_004626	NC_006445	NC_001542
NZ_CM002124.1	NC_014216.1	NC_009466.1	NC_013597	NC_006446	NC_023845
NZ_CM002122.1	NC_013849.1	NC_011836.1	NC_019519	NC_006264	NC_004323
NZ_CM002121.1	NC_014153.1	NC_015407.1	NC_005903	NC_007920	NC_010239
NZ_CM002120.1	NC_013642.1	NC_018423.1	NC_011345	NC_001484	NC_010238
NZ_CM002123.1	NC_012804.1	NC_018422.1	NC_005839	NC_003620	NC_010710
NZ_CM002119.1	NC_014205.1	NC_018421.1	NC_007921	NC_003614	NC_010709
NZ_CM002114.1	NC_013740.1	NC_023143.1	NC_015451	NC_003619	NC_023586
NZ_CM002116.1	NC_014658.1	NC_023141.1	NC_015450	NC_015467	NC_015297
NZ_CM002118.1	NC_015514.1	NC_023139.1	NC_015452	NC_015468	NC_009382
NZ_CM002115.1	NC_015671.1	NC_023142.1	NC_001918	NC_015469	NC_011201
NZ_CM002117.1	NC_015675.1	NC_023148.1	NC_018465	NC_003603	NC_023736
NZ_CM002113.1	NC_012691.1	NC_023138.1	NC_018460	NC_002738	NC_022917
NZ_CM002111.1	NZ_CM000770.1	NC_023140.1	NC_018459	NC_009240	NC_022915

[0152]

NZ_CM002109.1	NC_013799.1	NC_020907.1	NC_009895	NC_005077	NC_010811
NZ_CM002112.1	NC_017161.1	NC_006842.1	NC_009894	NC_005082	NC_008574
NZ_CM002108.1	NC_012883.1	NC_011185.1	NC_009896	NC_020502	NC_011399
NZ_CM002110.1	NC_015943.1	NC_009496.1	NC_002531	NC_001998	NC_019548
NZ_CM002107.1	NC_015948.1	NC_009700.1	NC_001662	NC_008521	NC_008575
NZ_CM002106.1	NC_023010.2	NC_010379.1	NC_002024	NC_018401	NC_021866
NZ_CM002105.1	NC_023013.1	NC_010418.1	NC_002025	NC_017091	NC_021862
NZ_CM002104.1	NC_013790.1	NC_010680.1	NC_001495	NC_022788	NC_005131
NZ_CM002102.1	NC_012214.1	NC_012657.1	NC_010736	NC_022789	NC_010792
NZ_CM002103.1	NC_017390.1	NC_012654.1	NC_004355	NC_001358	NC_010791
NZ_CM002101.1	NC_014306.1	NC_017298.1	NC_010947	NC_013443	NC_021930
NZ_CM002100.1	NC_012121.1	NC_015427.1	NC_024009	NC_021786	NC_008211
NZ_CM002098.1	NC_012846.1	NC_015419.1	NC_012211	NC_004827	NC_008210
NZ_CM002099.1	NC_014448.1	NC_015417.1	NC_010253	NC_001697	NC_008191
NZ_CM002097.1	NC_017519.1	NC_015418.1	NC_010249	NC_003315	NC_008190
NC_000913.3	NC_016829.1	NC_015426.1	NC_001678	NC_019455	NC_010345
NC_002695.1	NC_019552.1	NC_012946.1	NC_001676	NC_016418	NC_010343
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NC_011415.1	NC_013894.1	NC_009671.1	NC_010990	NC_021537	NC_014598
NC_013654.1	NC_014100.1	NC_009669.1	NC_010989	NC_003345	NC_014607
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NC_008253.1	NC_014371.1	NC_001852.1	NC_010251	NC_017089	NC_014602
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NC_009801.1	NC_014644.1	NC_001857.2	NC_009944	NC_021319	NC_014604
NC_009800.1	NC_017456.1	NC_001856.1	NC_009947	NC_021327	NC_014606
NC_012967.1	NC_014643.1	NC_001849.2	NC_009946	NC_004927	NC_008585
NC_010468.1	NZ_CM001774.1	NC_001851.2	NC_009945	NC_021328	NC_005267
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NC_017656.1	NC_014844.1	NC_017399.1	NC_003468	NC_005074	NC_021560
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NZ_AKVX01000001.1	NC_010572.1	NC_017402.1	NC_023426	NC_003094	NC_003801
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[0153]

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NC_017376.1	NC_015949.1	NC_011866.1	NC_005173	NC_011540	NC_003733
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NC_017926.1	NC_014315.1	NC_011862.1	NC_005169	NC_007914	NC_003765
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[0154]

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NC_010380.1	NC_015978.1	NC_012156.1	NC_018856	NC_001526	NC_007543
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NZ_CP006980.1	NC_015945.1	NC_010160.1	NC_003478	NC_008960	NC_011802
NZ_CP006981.1	NZ_CM001158.1	NZ_CM001018.1	NC_003481	NC_008968	NC_016763
NZ_CP006982.1	NC_015559.1	NZ_CM001019.1	NC_021481	NC_008958	NC_022752
NZ_CP006983.1	NC_015573.1	NZ_CM001016.1	NC_004666	NC_008949	NC_009232
NZ_CP006985.1	NC_014924.1	NZ_CM001017.1	NC_003680	NC_008964	NC_022754
NZ_CM001020.1	NC_014532.1	NZ_CM000914.1	NC_002160	NC_008956	NC_016073
NC_004459.3	NC_015558.1	NC_017725.1	NC_004750	NC_008961	NC_019910
NC_004460.2	NZ_AEUT02000001.1	NC_017804.1	NC_002991	NC_008962	NC_019417
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NC_005140.1	NZ_CM001475.1	NC_011855.1	NC_001786	NC_008965	NC_019545
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NZ_CM001800.1	NC_016629.1	NC_011859.1	NC_015932	NC_008977	NC_018843
NZ_CM001799.1	NC_015954.1	NC_011860.1	NC_016895	NC_008978	NC_014900
NC_006360.1	NC_013501.1	NC_011861.1	NC_021206	NC_008979	NC_004313
NC_007295.1	NC_015966.1	NC_011854.1	NC_008315	NC_008986	NC_004348
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NC_017509.1	NC_014550.1	NC_011840.1	NC_010436	NC_008995	NC_015271
NC_021283.1	NC_015388.1	NC_011848.1	NC_014470	NC_001493	NC_015296
NC_021831.1	NC_014720.1	NC_011875.1	NC_022103	NC_018629	NC_004775
NC_012926.1	NC_015735.1	NC_011871.1	NC_020881	NC_009028	NC_011976
NC_009442.1	NC_021057.1	NC_011867.1	NC_018382	NC_003625	NC_013059
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NC_022516.1	NC_013441.1	NC_014797.1	NC_022005	NC_001933	NC_015069
NC_022665.1	NC_013440.1	NC_019392.1	NC_004047	NC_003093	NC_006554
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NC_009085.1	NC_013510.1	NC_010935.1	NC_004042	NC_004178	NC_018466
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NC_011586.1	NC_013523.1	NC_017510.1	NC_001438	NC_001652	NC_003785
NC_010410.1	NC_013524.1	NC_017963.1	NC_003369	NC_001915	NC_003786
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NC_017162.1	NC_013595.1	NC_017024.1	NC_018071	NC_006500	NC_003400
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[0157]

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NC_022784.1	NC_014151.1	NC_019394.1	NC_004452	NC_004912	NC_015939
NC_022760.1	NC_014158.1	NC_021709.1	NC_006460	NC_004908	NC_022896
NC_006322.1	NC_014165.1	NC_021718.1	NC_002766	NC_004909	NC_023598
NC_006270.3	NC_014210.1	NC_021711.1	NC_011557	NC_004906	NC_013015
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NC_014125.1	NC_013174.1	NC_015716.1	NC_003513	NC_007366	NC_011349
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NC_017526.1	NC_013131.1	NC_018148.1	NC_003694	NC_007368	NC_005236
NC_018140.1	NC_013202.1	NC_018147.1	NC_003693	NC_007373	NC_005237
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NC_010609.1	NC_022440.1	NC_017126.1	NC_018574	NC_006310	NC_004658
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NC_021494.1	NZ_CM002309.1	NC_017130.1	NC_014325	NC_006306	NC_014446
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NC_017272.1	NZ_CM001484.1	NC_017112.1	NC_023305	NC_008187	NC_014130
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[0160]

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[0161]

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NZ_CM000657.1	NC_021500.1	NC_007960.1	NC_003500	NC_006367	NC_002486
NZ_CM000658.1	NC_015061.1	NC_007720.1	NC_003498	NC_010246	NC_008033
NZ_CM000604.1	NC_003272.1	NC_007719.1	NC_001265	NC_016993	NC_011050
NZ_CM000659.1	NC_019676.1	NC_007717.1	NC_003531	NC_011542	NC_019416
NZ_CM000660.1	NC_019684.1	NC_007718.1	NC_003530	NC_003626	NC_011589

[0162]

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[0164]

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[0165]

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[0166]

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[0168]

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[0169]

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NC_020819.1	NC_010940.1	NC_019772.1	NC_019485	NC_008377	NC_003313
NC_020064.1	NC_002128.1	NC_019775.1	NC_019524	NC_014067	NC_006294
NC_020211.1	NC_002127.1	NC_019773.1	NC_019423	NC_014066	NC_005083
NC_004829.2	NC_017659.1	NC_020157.1	NC_023561	NC_005051	NC_013651
NC_017502.1	NC_018660.1	NC_019774.1	NC_011045	NC_004673	NC_023605
NC_017503.1	NC_018666.1	NC_020056.1	NC_015249	NC_001721	NC_020863
NC_018406.1	NC_018659.1	NC_017792.1	NC_022968	NC_003674	NC_023569
NC_018407.1	NC_011749.1	NC_017791.1	NC_000924	NC_003671	NC_016567
NC_018408.1	NC_011739.1	NC_017793.1	NC_011040	NC_003673	NC_020850
NC_018409.1	NC_011408.1	NC_017806.1	NC_004813	NC_013920	NC_020868
NC_018410.1	NC_011416.1	NC_017805.1	NC_001426	NC_006939	NC_020848
NC_018411.1	NC_011413.1	NC_017771.1	NC_019500	NC_022962	NC_016162
NC_018412.1	NC_011419.1	NC_019976.1	NC_019920	NC_010250	NC_012757
NC_018413.1	NC_011407.1	NC_019975.1	NC_014662	NC_010248	NC_021562
NC_005061.1	NC_011411.1	NC_016624.1	NC_021315	NC_003348	NC_004736
NC_005090.1	NC_013655.1	NC_016623.1	NC_010583	NC_005062	NC_023568
NC_005085.1	NC_013354.1	NC_016587.1	NC_006949	NC_005029	NC_004456
NZ_AABW01000001.1	NC_013365.1	NC_016586.1	NC_011042	NC_001513	NC_005879
NC_008095.1	NC_013370.1	NC_016585.1	NC_004301	NC_007563	NC_005891
NC_011025.1	NC_013367.1	NC_016588.1	NC_001420	NC_007559	NC_009016
NC_005213.1	NC_013366.1	NC_017670.1	NC_002166	NC_007568	NC_012662
NC_005126.1	NC_013368.1	NC_017669.1	NC_019768	NC_007560	NC_021776
NC_005125.1	NC_007941.1	NC_019972.1	NC_019710	NC_007561	NC_022747
NC_005303.2	NC_009838.1	NC_018021.1	NC_019717	NC_007562	NC_003327
NC_007947.1	NC_009837.1	NC_019967.1	NC_019714	NC_007564	NC_005949
NC_007644.1	NC_009786.1	NC_019963.1	NC_019769	NC_007565	NC_005948
NC_010556.1	NC_009789.1	NC_018023.1	NC_019767	NC_007566	NC_002362
NC_006055.1	NC_009790.1	NC_018022.1	NC_019724	NC_007567	NC_002363
NC_022583.1	NC_009787.1	NC_018745.1	NC_019711	NC_004049	NC_003907
NC_008148.1	NC_009788.1	NC_018744.1	NC_019723	NC_004052	NC_020488
NC_009664.2	NC_009791.1	NC_018742.1	NC_019719	NC_004053	NC_021068
NC_007354.1	NC_010487.1	NC_018749.1	NC_002167	NC_004054	NC_004306
NC_014117.1	NC_010486.1	NC_018743.1	NC_018855	NC_006060	NC_001956
NC_014118.1	NC_010485.1	NC_020292.1	NC_019922	NC_013439	NC_021067
NC_014119.1	NC_010488.1	NC_019941.1	NC_001332	NC_009609	NC_021073
NC_014539.1	NC_011351.1	NC_016113.1	NC_007856	NC_009608	NC_010275
NC_014540.1	NC_011350.1	NC_017585.1	NC_007817	NC_005336	NC_021070
NC_015137.1	NC_013010.1	NC_023144.1	NC_014260	NC_010276	NC_021529
NC_015136.1	NC_013942.1	NC_023145.1	NC_019501	NC_001875	NC_019529
NC_016625.1	NC_011747.1	NZ_CM001399.1	NC_001954	NC_019409	NC_020846
NC_016589.1	NC_011602.1	NC_018675.1	NC_002014	NC_005776	NC_021534
NC_016590.1	NC_011603.1	NC_018674.1	NC_007291	NC_005775	NC_021561
NC_017921.1	NC_017627.1	NC_018698.1	NC_019419	NC_005777	NC_019518
NC_017922.1	NC_013362.1	NC_018699.1	NC_012741	NC_011588	NC_019722

[0171]

NC_017920.1	NC_013369.1	NC_022879.1	NC_010105	NC_007649	NC_019713
NC_021288.1	NC_013363.1	NC_022884.1	NC_012740	NC_007647	NC_007149
NC_021294.1	NC_014543.1	NC_022881.1	NC_008152	NC_014412	NC_007241
NC_021287.1	NC_016903.1	NC_022880.1	NC_007637	NC_014413	NC_007242
NC_009254.1	NC_016904.1	NC_022883.1	NC_007456	NC_005881	NC_007648
NC_009256.1	NC_017629.1	NC_016079.1	NC_015719	NC_014766	NC_000855
NC_009255.1	NC_017630.1	NZ_CM001372.1	NC_019707	NC_020852	NC_001452
NC_005861.1	NC_017636.1	NZ_CM001374.1	NC_003287	NC_013288	NC_009539
NC_008825.1	NC_017637.1	NZ_CM001375.1	NC_001417	NC_014789	NC_022559
NC_006085.1	NC_017722.1	NC_023136.1	NC_010237	NC_010191	NC_022556
NC_014039.1	NC_017721.1	NC_023146.1	NC_000929	NC_020071	NC_022554
NC_017534.1	NC_017724.1	NC_017041.1	NC_001901	NC_020066	NC_022555
NC_017535.1	NC_017723.1	NZ_AKVZ01000059.1	NC_018835	NC_011069	NC_022562
NC_017550.1	NC_017640.1	NC_017055.1	NC_005856	NC_011068	NC_022553
NC_016516.1	NC_017645.1	NC_017998.1	NC_001895	NC_011070	NC_022561
NC_016512.1	NC_017643.1	NC_016637.1	NC_002371	NC_004037	NC_022560
NC_016511.1	NC_017642.1	NC_017959.1	NC_001609	NC_007015	NC_022557
NC_018707.1	NC_017639.1	NC_017958.1	NC_001421	NC_007646	NC_022558
NC_021085.1	NZ_AGTD01000006.1	NC_017957.2	NC_009821	NC_001511	NC_023440
NC_007168.1	NZ_AGTD01000002.1	NC_017966.1	NC_010324	NC_002513	NC_001867
NC_007984.1	NZ_AGTD01000005.1	NC_016907.1	NC_005340	NC_004560	NC_004541
NC_009504.1	NZ_AGTD01000003.1	NZ_AGFM01000123.1	NC_001890	NC_022980	NC_003355
NC_009505.1	NZ_AGTD01000004.1	NZ_AGFM01000122.1	NC_012638	NC_021558	NC_003709
NC_022347.1	NC_017647.1	NC_018657.1	NC_014467	NC_021865	NC_003708
NC_022660.1	NC_017648.1	NC_017965.1	NC_008515	NC_005994	NC_006262
NC_022132.1	NC_017649.1	NZ_AMSD01000003.1	NC_007023	NC_005992	NC_003832
NC_012039.1	NC_017650.1	NC_016750.1	NC_005066	NC_005988	NC_003841
NC_013967.1	NC_017658.1	NC_019388.1	NC_012635	NC_005987	NC_003843
NC_014760.1	NC_017653.1	NC_019387.1	NC_004928	NC_005993	NC_018270
NC_015725.1	NC_017654.1	NC_018069.1	NC_007603	NC_005989	NC_012735
NC_018077.1	NC_017657.1	NZ_CM001468.1	NC_004831	NC_005991	NC_016575
NC_012440.1	NC_017655.1	NC_017081.1	NC_015269	NC_005986	NC_016576
NC_015713.1	NC_017661.1	NC_021594.1	NC_012223	NC_005995	NC_009942
NC_012438.1	NC_017662.1	NC_017784.1	NC_005841	NC_005990	NC_001563
NC_010803.1	NC_017665.1	NC_017811.1	NC_003444	NC_019858	NC_003908
NC_009337.1	NC_017903.1	NC_017797.1	NC_012868	NC_019855	NC_016961
NC_013971.1	NC_017907.1	NC_017818.1	NC_005833	NC_019856	NC_017828
NC_013961.1	NC_018651.1	NC_017786.1	NC_003298	NC_019857	NC_003326
NZ_CBVU010000001.1	NC_018654.1	NC_017815.1	NC_000866	NC_014252	NC_009805
NZ_CBVU010000004.1	NC_018652.1	NC_017795.1	NC_005859	NC_021858	NC_001886
NZ_CBVU010000002.1	NC_018663.1	NC_017816.1	NC_001604	NC_022098	NC_012931
NZ_CBVU010000008.1	NC_018662.1	NC_017777.1	NC_009540	NC_003847	NC_002350
NZ_CBVU010000006.1	NC_022651.1	NC_017787.1	NC_020414	NC_002598	NC_002349
NZ_CBVU010000007.1	NC_022661.1	NC_017775.1	NC_000902	NC_001647	NC_011533
NZ_CBVU010000003.1	NC_022650.1	NC_017801.1	NC_007821	NC_003521	NC_008516
NZ_CBVU010000005.1	NC_022649.1	NC_017796.1	NC_011356	NC_019454	NC_006276
NZ_CBVT010000007.1	NC_022662.1	NC_017800.1	NC_001330	NC_015585	NC_006275
NZ_CBVT010000005.1	NC_007414.1	NC_017822.1	NC_009514	NC_014707	NC_021094
NZ_CBVT010000004.1	NZ_DS999999.1	NC_017810.1	NC_022750	NC_009555	NC_021095
NZ_CBVT010000008.1	NZ_AFET01000005.1	NC_017794.1	NC_019503	NC_005321	NC_003820
NZ_CBVT010000002.1	NZ_AHAU01000167.1	NC_017798.1	NC_001416	NC_005844	NC_016991
NZ_CBVT010000003.1	NZ_AWFJ01000122.1	NC_017814.1	NC_019706	NC_023292	NC_010700
NZ_CBVT010000006.1	NZ_AWFJ01000135.1	NC_017779.1	NC_019708	NC_004706	NC_010703
NZ_CBVT010000001.1	NC_002142.1	NC_017789.1	NC_019704	NC_004147	NC_016995
NZ_CBVS010000004.1	NC_010720.1	NC_017778.1	NC_019716	NC_005028	NC_004426
NZ_CBVS010000006.1	NC_010719.1	NC_017819.1	NC_019709	NC_018449	NC_009744
NZ_CBVS010000002.1	NZ_AETX01000217.1	NC_017812.1	NC_019705	NC_001748	NC_015780
NZ_CBVS010000001.1	NZ_AFYG01000108.1	NC_017783.1	NC_010106	NC_001785	NC_010951
NZ_CBVS010000003.1	NZ_AFVX01000096.1	NC_017788.1	NC_003356	NC_007653	NC_010948
NZ_CBVS010000005.1	NC_008087.1	NC_017780.1	NC_001422	NC_018450	NC_007216
NZ_CBVS010000008.1	NC_011334.1	NC_017782.1	NC_019517	NC_017716	NC_011639
NZ_CBVS010000007.1	NC_011499.1	NC_017802.1	NC_014792	NC_004106	NC_004107
NC_016620.1	NC_017383.1	NC_017809.1	NC_019399	NC_006430	NC_009424
NC_010554.1	NC_014556.1	NC_017817.1	NC_019403	NC_009924	NC_020205
NC_022000.1	NC_017356.1	NC_017774.1	NC_019404	NC_009923	NC_019933
NC_010981.1	NC_017364.1	NC_017781.1	NC_019718	NC_000852	NC_001396
NC_016612.1	NC_017363.1	NC_017813.1	NC_019526	NC_009899	NC_007709
NC_018106.1	NC_017373.1	NC_017776.1	NC_019720	NC_008603	NC_007710
NC_009617.1	NC_014257.1	NC_017785.1	NC_019715	NC_009898	NC_009543
NC_008536.1	NC_017377.1	NC_017821.1	NC_019721	NC_010756	NC_004902
NC_009792.1	NC_017380.1	NC_017820.1	NC_018086	NC_010761	NC_007024

[0172]

NC_009778.1	NC_017064.1	NC_017799.1	NC_017732	NC_003691	NC_012742
NC_017933.1	NC_017734.1	NC_023497.1	NC_012419	NC_003692	NC_017981
NC_020260.1	NC_017919.1	NC_018288.1	NC_015270	NC_005854	NC_020903
NC_023032.1	NC_017369.1	NC_018291.1	NC_023551	NC_005848	NC_010955
NC_011059.1	NC_017370.1	NC_018287.1	NC_023595	NC_005849	NC_002331
NC_006138.1	NC_019562.1	NZ_AMWZ01000014.1	NC_009904	NC_016561	NC_004197
NC_009879.1	NC_019561.1	NC_017736.1	NC_013696	NC_003628	NC_022982
NC_016929.1	NC_019565.1	NC_017738.1	NC_013646	NC_022089	NC_022987
NC_009881.1	NC_019564.1	NC_020305.1	NC_013643	NC_018226	NC_013599
NC_013929.1	NC_020556.1	NC_019700.1	NC_013648	NC_018576	NC_008094
NC_009925.1	NC_002253.1	NC_019694.1	NC_013644	NC_018530	NC_005179
NC_011060.1	NC_002252.1	NC_019758.1	NC_001612	NC_014411	NC_002642
NC_008554.1	NC_004555.1	NC_020050.1	NC_001472	NC_008292	NC_016441
NC_008346.1	NC_011878.1	NC_019744.1	NC_002058	NC_015552	NC_019412
NC_007796.1	NC_017257.1	NC_019737.1	NC_001430	NC_014790	NC_004752
NC_007520.2	NC_017258.1	NC_019755.1	NC_001859	NC_012786	NC_022895
NC_007575.1	NC_017261.1	NC_019756.1	NC_021220	NC_012787	NC_002031
NC_007404.1	NC_017260.1	NC_019733.1	NC_004441	NC_008193	NC_022801
NC_006300.1	NC_017286.1	NC_019735.1	NC_003988	NC_001368	NC_004176
NC_006361.1	NC_002490.1	NC_019736.1	NC_013695	NC_002036	NC_004168
NC_006371.1	NC_002489.3	NC_019734.1	NC_010415	NC_003854	NC_008694
NC_006370.1	NC_004554.1	NC_019754.1	NC_024073	NC_003629	NC_004745
NC_006624.1	NC_010579.1	NC_019765.1	NC_004994	NC_003853	NC_005069
NC_012778.1	NC_017561.1	NC_019749.1	NC_004136	NC_023154	NC_023715
NC_012028.1	NZ_AXBS01000046.1	NC_020052.1	NC_004137	NC_023156	NC_011038
NC_012029.1	NC_018746.1	NC_019750.1	NC_018875	NC_023158	NC_019911
NC_008740.1	NC_019906.1	NC_019766.1	NC_003083	NC_023157	NC_004777
NC_017067.1	NZ_CM001836.1	NC_022739.1	NC_011065	NC_023155	NC_016163
NC_012115.1	NC_011987.1	NC_008042.1	NC_011066	NC_023160	NC_019909
NC_006513.1	NC_011994.1	NC_008043.1	NC_011067	NC_023159	NC_019919
NC_007929.1	NC_011990.1	NC_021056.1	NC_013401	NC_023161	NC_001271
NC_017481.1	NZ_AFSD01000008.1	NZ_CM001166.1	NC_013404	NC_001671	NC_015960
NC_006582.1	NZ_AFSD01000007.1	NZ_CM002272.1	NC_013403	NC_004995	NC_005039
NC_006677.1	NC_020801.1	NZ_CM002274.1	NC_013402	NC_023310	NC_004422
NC_019396.1	NC_020798.1	NZ_CM002275.1	NC_013398	NC_023297	NC_007665
NC_007498.2	NC_020797.1	NC_015223.1	NC_013400	NC_023296	NC_007664
NC_021089.1	NZ_CM002270.1	NC_015221.1	NC_013399	NC_023308	NC_007663
NC_021084.1	NZ_CM002269.1	NC_002608.1	NC_013397	NC_023309	NC_007662
NC_009655.1	NC_021277.1	NC_001869.1	NC_013405	NC_023303	NC_007658
NC_011988.1	NC_009506.1	NC_018225.1	NC_013396	NC_023298	NC_007657
NC_011989.1	NC_007323.3	NC_020563.2	NC_004195	NC_023311	NC_007656
NC_014219.1	NC_007322.2	NC_010476.1	NC_001491	NC_009892	NC_007661
NC_009614.1	NC_012577.1	NC_010474.1	NC_001650	NC_011552	NC_007659
NC_014121.1	NC_012579.1	NC_010478.1	NC_001844	NC_001634	NC_007660
NC_018079.1	NC_012656.1	NC_010479.1	NC_017826	NC_003668	NC_015325
NC_016514.1	NC_012655.1	NC_010480.1	NC_011644	NC_003672	NC_022990
NC_018405.1	NC_017726.1	NC_010477.1	NC_002532	NC_002600	NC_011560
NC_021046.1	NC_017727.1	NC_019681.1	NC_010327	NC_002039	NC_012532
NC_008609.1	NC_003980.1	NC_019691.1	NC_002201	NC_002038	NC_005047
NC_008700.1	NC_003981.1	NC_019692.1	NC_001450	NC_002040	NC_005874
NC_007954.1	NZ_AMDT01000056.1	NC_017446.1	NC_012123	NC_003855	NC_003878
NC_008345.1	NC_004851.1	NC_017443.1	NC_020500	NC_004723	NC_023175
NC_013892.1	NC_017321.1	NC_017442.1	NC_020902	NC_018837	NC_003224
NC_014228.1					NC_006059
NC_014147.1					NC_003874

[0173] 在本发明的另一方面，提供了模拟转录物变体、优选RNA分子或DNA分子、特别是RNA分子的人工NA分子的参照集，其包含至少一个、优选至少两个、更优选至少三个、特别是至少五个家族的NA分子，每个家族由至少两种、优选至少三种、更优选至少四种、特别是至少五种不同的NA分子组成，

[0174] 其中，独立地对于每个家族，所述每个家族的所有NA分子是相同人工基因的参照转录物变体，和

[0175] 其中，独立地对于每个家族，所述每个家族的NA分子共有长度为至少80nt、优选至少100nt、更优选至少150nt、特别是至少200nt的序列和所述每个家族的至少两个NA分子相差至少80nt、优选至少100nt、更优选至少150nt、甚至更优选至少200nt、特别是至少300nt的至少另一个序列。

[0176] 在本发明的过程中，发现人工NA分子的参照集，其对于本发明的目的而言是特别

合适的。这些分子被称为SIRV(掺入RNA变体)，并且对于本发明这些分子被公开于SEQ ID NO:1-148中(参见实施例1)。因此，在另一方面，本发明提供了NA分子、优选DNA分子或RNA分子，其包含与选自SEQ ID NO:1-148的完整序列具有至少50％、优选至少60％、更优选至少70％、甚至更优选至少80％、还甚至更优选至少90％或至少95％、特别是100％同一性的序列。这些序列的大变异是可能的，因为鉴于序列仅用作NA分析方法中的参照序列，不需要保留生物学功能。优选地，如上所述，这些SEQ ID NO的变体与表3的序列不具有相似性。这些变体可以通过上述方法获得。

[0177] 由于SIRV的外显子本身非常适合于本发明的目的，即使它们包括在另一序列中，本发明还提供了NA分子、优选DNA分子或RNA分子，其包含序列与选自SEQ ID NO:156-334的完整序列具有至少50％、优选至少60％、更优选至少70％、甚至更优选至少80％、还甚至更优选至少90％或至少95％、特别是100％同一性的序列。

[0178] 此外，当它们包括在另一NA分子中时，SIRV的片段也可用于本发明的目的。因此，本发明还提供了包含至少80个、优选至少150个、优选至少200个、更优选至少300个、特别是至少400个连续核苷酸的序列的NA分子、优选DNA分子或RNA分子，其序列与具有选自SEQ ID NO:1-148的序列的序列片段具有至少50％、优选至少60％、更优选至少70％、甚至更优选至少80％、还甚至更优选至少90％或至少95％、特别是100％的同一性，所述序列的最小大小为至少80nt、优选至少150nt、优选至少200nt、更优选至少300nt、特别是至少400nt。

[0179] 在优选的实施方案中，本发明的NA分子作为模拟转录物变体的人工NA分子的参照集提供，其包含至少一个、优选至少两个、更优选至少三个、特别是至少五个家族的NA分子，每个家族由本发明的至少两种、优选至少三种、更优选至少四种、特别是至少五种不同的NA分子组成，其中独立地对于每个家族，所述每个家族的所有NA分子是相同人工基因的参照转录物变体，并且其中独立地对于每个家族，所述每个家族的NA分子共有长度为至少80nt、优选至少100nt、更优选至少150nt、特别是至少200nt的序列，并且所述每个家族的至少两种NA分子相差至少80nt长度、优选至少100nt、更优选至少150nt、甚至更优选至少200nt、特别是至少300nt的至少另一个序列。

[0180] 优选地，本发明的任何参照集模拟选自以下的至少一种、优选至少两种、更优选至少三种、甚至更优选至少五种、特别是所有的选择性转录事件：

[0181] 选择性转录物起始位点(TSS)、选择性转录物终止位点(TES)、反义转录物、重叠转录物，并且选择性剪接事件选自跳读的盒式外显子(CE)、内含子保留(IR)、相互排斥的外显子(MXE)、选择性3’剪接位点(A3SS)、选择性5’剪接位点(A5SS)、选择性第一个外显子(AFE)、选择性最后一个外显子(ALE)和反式剪接。

[0182] 在本发明的任何参照集的另一个优选实施方案中，人工NA分子的参照集的所有外显子序列内的所有内含子起始二核苷酸的至少50％、优选至少75％、特别是至少95％是GT，其中每个所述内含子起始二核苷酸是在参照集的另一种人工NA分子中不存在并从而代表所述另一种人工NA分子的内含子的序列的5’末端二核苷酸，和/或(优选“和”)在人工NA分子的参照集的所有外显子序列内的所有内含子末端二核苷酸的至少50％、优选至少75％、特别是至少95％是AT，其中每个所述内含子末端二核苷酸是在参照集的另一种人工NA分子中不存在并从而代表所述另一种人工NA分子的内含子的序列的5’末端二核苷酸。

[0183] 在另一个优选的实施方案中，本发明的任何参照集具有500nt至2000nt、优选

750nt至1500nt、特别是1000nt至1400nt的平均序列长度;并且优选具有300nt至1200nt、优选600nt至900nt、特别是700nt至800nt的标准偏差;其最小大小为至少100nt;并且优选具有10000nt的最大大小。

[0184] 在另一个优选的实施方案中,本发明的任何参照集具有25%至55%的平均GC含量。

[0185] 在另一个优选的实施方案中,本发明的任何参照集具有基本上随机分布出现的5'起始三核苷酸,所述5'起始三核苷酸选自GAA、GAC、GAG、GAT、GCA、GCC、GCG、GCT、GGA、GGC、GGG、GGT、GTA、GTC、GTG、GTT,或者5'起始二核苷酸,所述5'起始二核苷酸选自AA、AC、AG、AT、CA、CC、CG、CT、GA、GC、GG、GT、TA、TC、TG、TT,和/或3'终止二核苷酸,所述3'终止二核苷酸选自AC、AG、AT、CC、CG、CT、GC、GG、GT、TC、TG、TT。

[0186] 在另一个优选的实施方案中,本发明的任何参照集的每个人工NA分子具有鸟苷作为5'起始核苷酸。

[0187] 在另一个优选的实施方案中,如果是RNA分子,则本发明任何参照集中的至少一个、优选每个人工NA分子具有5'帽结构和/或具有多聚(A)尾的至少10、优选至少20、特别是至少30个腺苷。优选地,本发明的任何参照集的序列与其NCBI GenBank数据库登录号在表3中列出的序列不具有相似性,优选与在表3和表4任何一个序列不具有相似性,特别是与2014年6月15日的NCBI GenBank数据库版本202的所有序列不具有相似性,具有统计显著性阈值(期望阈值)小于10^{-1},优选小于1,特别是小于10,其中相似性通过具有以下参数的BLASTn程序确定:字大小为28,过滤低复杂度区域,线性缺口成本和匹配/错配分数为1,-2。

[0188] 在特别优选的实施方案中,提供本发明的任何参照组的人工NA分子,其中至少两种、优选每种NA分子以预设的摩尔量存在,优选存在于相同的容器中;并且优选其中至少两种NA分子的各自的摩尔量相差至少两个量级,优选至少三个量级,更优选至少五个量级,特别是至少六个量级,并且特别是其中至少提供溶解于液体中或准备溶解或稀释于液体中的两种NA分子,其中它们各自的浓度或最终浓度范围介于0.01阿托摩尔(attomole)/μl与100飞普托摩尔(femtomole)/μl之间或介于100仄普托摩尔(zeptomole)/μl与1飞普托摩尔/μl之间。具有大范围的浓度允许例如更好地评估仪器和方法(例如在RNA-seq中),因为开发具有高动态检测范围的仪器和方法更具挑战性。

[0189] 如上所述,稳定化和降低处理误差是重要的。因此,在另一个特别优选的实施方案中,本发明的人工NA分子的参照集以在容器中干燥(优选冷冻干燥),优选与稳定剂一起提供。

[0190] 可以将DNA序列转换为RNA序列(核苷酸的交换:T→U),反之亦然(核苷酸的交换:U→T)。因此,每当序列作为本文(包括序列表)的DNA序列给出时,它也应当作为其各自的RNA序列阅读,反之亦然。如本文所用,RNA通常是单链的,而DNA分子通常是双链的。然而,本发明还要求保护双链/单链形式的相应RNA/DNA,以及与所要求保护的序列互补的序列(例如cDNA)。

[0191] 至少一个或多个、例如所有NA分子可以是例如100至1000000核苷酸,优选130至100000个核苷酸或150至10000个核苷酸。

[0192] 在优选的实施方案中,天然存在的或人工的基因编码蛋白质(例如mRNA),但也规定了非蛋白质编码的转录物,诸如调节或催化性RNA,包括微RNA、snoRNA或rRNA,以及它们

的前体,特别是前微RNA或前-rRNA。

[0193] 如本文所用,“基因”涉及具有被转录以形成一个或多个转录物的序列的基因核苷酸。

[0194] 如本文所用,“同种型”或“转录物变体”用于涉及转录物的特定变体。

[0195] 本文所用的“约”可以指与给定值相同的值或相差+/-10%的值。

[0196] 本文使用的“包含”应理解为开放的定义,允许如在包含中的其它成员。另一方面,“由……组成”被认为是不含所组成的定义特征的另外元素的封闭定义。因此,“包含”是更宽的定义并且包含“由……组成”定义。本文使用“包含”语言的任何定义也可以在本发明的特定实施例中用所组成的限制来阅读。

[0197] 核酸测序步骤可以通过本领域已知的任何方法进行,诸如PCR测序。此类方法包括Maxam-Gilbert测序、链终止法、鸟枪测序、桥式PCR、大规模平行指纹测序(MPSS)、Polony测序、焦磷酸测序、Illumina(Solexa)测序、SOLiD测序、离子半导体测序、DNA纳米球测序、Heliscope单分子测序、单分子实时(SMRT)测序、纳米孔DNA测序、通过杂交的测序、使用质谱的测序、微流体Sanger测序、基于显微镜技术、RNAP测序、体外病毒高通量测序。

[0198] 如本文所使用的,“数量级”是指“十进制数量级”,例如跨越“六个数量级”(在本文中也称为“六个数量级”)意味着跨越例如从1至1×10^{6}或从2×10^{-7}至0.2的值。

[0199] 除非明确排除,否则任何本发明的方法或步骤可以作为计算机实现的方法执行。甚至测序和合成NA分子的通常湿化学步骤也可以通过计算机辅助,例如来控制和获得来自自动或半自动序列阅读器的数据。计算机程序产品或存储器设备还可以设置有读长生成组件,其从诸如测序仪(优选地包括计算机组件的测序仪)的样品获得短读长。例如,计算机可读介质可以包括但不限于磁存储设备(例如硬盘、软盘、磁条.....)、光盘(例如压缩盘(CD)、数字通用盘(DVD).....)、智能卡和闪存设备(例如卡、棒、钥匙驱动器.....)。

[0200] 相对于参照核苷酸序列的序列“同一性百分比(%)”定义为在比对序列并在必要时引入缺口之后,候选序列中与参照序列中的核苷酸相同的核苷酸的百分比,以实现最大序列同一性百分比,并且不考虑任何保守取代作为序列同一性的一部分。缺口导致缺乏同一性。用于确定核苷酸序列同一性百分比的比对可以以本领域技术内的各种方式实现,例如使用可公开获得的计算机软件,诸如BLAST、BLAST-2、ALIGN、ALIGN-2、Megalign(DNASTAR)或EMBOSS软件包的“针”成对序列比对应用。本领域技术人员可以确定用于比对序列的适当参数,包括在被比较序列的全长上实现最大比对所需的任何算法。然而,为了本文的目的,使用EMBOSS软件包的计算机程序“针”(可从欧洲分子生物学实验室公开获得;Rice等人,EMBOSS:the European Molecular Biology Open Software Suite,Trends Genet.2000Jun;16(6):276-7,PMID:10827456)的序列比对计算核苷酸序列同一性%值。

[0201] 针程序可以在网站http://www.ebi.ac.uk/Tools/psa/emboss_needle/nucleotide.html下访问,或者作为EMBOSS包的一部分从http://emboss.sourceforge.net/下载用于本地安装。它运行在许多广泛使用的UNIX操作系统上,诸如Linux。

[0202] 为了比对两个核苷酸序列,针程序优选用以下参数运行:

[0203] 命令行:needle-auto-stdout-asequence SEQUENCE_FILE_A-bsequence SEQUENCE_FILE_B-datafile EDNAFULL-gapopen 10.0-gapextend 0.5-endopen 10.0-

endextend 0.5-aformat3 pair-snucleotide1-snucleotide2(Align_format:pair Report_file:stdout)

[0204] 给定核苷酸序列A对、与、相对给定核苷酸序列B的核苷酸序列同一性%(或者可以表示为给定核苷酸序列A具有或包含与给定核苷酸序列A对、与、相对给定的核苷酸序列B的某一核苷酸序列同一性%)计算如下：

[0205] 100倍的分数X/Y

[0206] 其中X是通过序列比对程序针在序列A和B的比对中评分为相同匹配的核苷酸数目，并且其中Y是B中核苷酸的总数。应当理解，当核苷酸序列A的长度不等于核苷酸序列B的长度，A对B的核苷酸序列同一性%将不等于B对A的核苷酸序列同一性%。在其中“A的序列与B的整个序列具有至少N%同一性”的情况下，Y是B的全长。除非另有特别说明，否则本文使用的所有核苷酸序列同一性%值均如上一段所述使用针计算机程序获得。

[0207] “序列相似性”、“序列同一性”、“共有序列”和类似术语也应适用于序列的反向互补序列，即表述“序列A与序列B具有80%的同一性”也应当对于如果“序列A与序列B的反向互补序列(或反义序列)具有80%的同一性”是真的。

[0208] 本文中，关于NA序列的术语“插入”也可以指直接在5’或3’端插入(即在5’或3’端添加)。

[0209] 示例性实施方案

[0210] 本发明方法的特别优选的实施方案是：

[0211] 一种用于在一个或多个样品中受控鉴定和/或定量转录物变体的方法，包括：

[0212] a)提供模拟转录物变体的人工NA分子的参照集，包括至少三个不同家族的NA分子，每个家族由至少三种不同的NA分子组成，

[0213] 其中，独立地对于每个家族，所述每个家族的所有NA分子是相同人工基因的参照转录物变体，和

[0214] 其中，独立地对于每个家族，所述每个家族的NA分子共有长度为至少80个核苷酸(nt)、优选至少100nt、更优选至少150nt、特别是至少200nt的序列，并且所述每个家族的至少两种NA分子相差至少80nt长度、优选至少100nt、更优选至少150nt、甚至更优选至少200nt、特别是至少300nt的至少另一个序列，和

[0215] 其中每种人工NA分子以预设的摩尔量存在；和进一步

[0216] 其中每种人工NA分子：

[0217] -具有至少100nt的长度并且包含至少一个人工外显子，其中所述共有序列包含在单个人工外显子序列中，和

[0218] 其中所述NA分子的参照集：

[0219] -具有25%至55%的平均GC含量，和

[0220] -模拟至少五个选择性转录事件，所述选择性转录事件选自：

[0221] 选择性转录物起始位点(TSS)、选择性转录物终止位点(TES)、反义转录物、重叠转录物，并且选择性剪接事件选自跳读的盒式外显子(CE)、内含子保留(IR)、相互排斥的外显子(MXE)、选择性3’剪接位点(A3SS)、选择性5’剪接位点(A5SS)、选择性第一个外显子(AFE)、选择性最后一个外显子(ALE)和反式剪接，和

[0222] 其中所述人工NA分子的参照集的外显子序列的所有5’起始二核苷酸的至少75%

是GT,并且所述人工NA分子的参照集的外显子序列的所有3'终止二核苷酸的至少75％是AT,和

[0223] 其中所述参照集的序列与其NCBI GenBank数据库登录号在表3和表4中的任一个中列出具有小于10的统计显著性阈值(预期阈值)的序列不具有相似性,

[0224] 其中所述相似性由具有以下参数的BLASTn程序确定:字大小为28,具有过滤低复杂度区域,线性缺口成本和匹配/错配分数为1,-2;和

[0225] b)将所述参照集作为外部对照添加到包含转录物变体的一个或多个样品;和

[0226] c)基于读长生成和分配进行NA测序,其中使用参照集的读长产生参照读长分配,并且所述参照读长分配用于控制、验证或修饰所述一个或多个更多样品的转录物变体的读长分配。

[0227] 参考文献

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[0259] 通过下面的附图和实施例进一步说明本发明,但不限于本发明的这些实施方案,其中每个元素可与本发明的任何其它实施方案组合。

[0260] 附图:

[0261] 图1:SIRV设计原理的示意图。

[0262] 图2:DNA合成后所选择的SIRV的质粒线性化的示例性结果。SIRV具有正确的大小并且可以用于通过T7聚合酶的RNA转录。

[0263] 图3:对于所选择的SIRV和条件,通过T7聚合酶的转录产量的示例性结果。转录在大多数所选择的条件下成功。o/n,过夜。

[0264] 图4:KLK5和SIRV1家族比对。该图显示了SIRV1和相应参照基因的转录物比对。注意,SIRV1-100是主转录物。SIRV1-101-105是规范转录物(类似于KLK5转录物)。转录物SIRV1-106-109是人工转录物,其中后三个是重叠(反义)转录物。MT＝主转录物。

[0265] 图5:LDHD和SIRV2家族比对。该图显示了SIRV2和相应的参照基因的转录物比对。注意,SIRV2-100是主转录物。SIRV2-201-204是规范转录物(类似于LDHD转录物)。转录物SIRV2-205和206是人工单外显子反义转录物。MT＝主转录物。

[0266] 图6:LGALS17A和SIRV3家族比对。该图显示了SIRV3和相应的参照基因的转录物比对。注意,SIRV3-100是主转录物。SIRV3-301-306是规范转录物(类似于LGALS17A转录物)。转录物SIRV3-307-311是人工转录物,其中后者是单外显子反义转录物。转录物SIRV3-308-310是重叠反义转录物。MT＝主转录物。

[0267] 图7:DAPK3和SIRV4家族比对。该图显示了SIRV4和相应的参照基因的转录物比对。注意,SIRV4-100是主转录物。SIRV4-401-407是规范转录物(类似于DAPK3转录物)。转录物SIRV4-408-410是人工转录物,其中后两者是重叠反义转录物。MT＝主转录物。

[0268] 图8:HAUS5和SIRV5家族比对。该图显示了SIRV5和相应参照基因的转录物比对。注意,SIRV5-100是主转录物。SIRV5-501-510是规范转录物(类似于HAUS5HAUS转录物)。转录物SIRV5-511和512是人工转录物,其中后者是单外显子反义转录物。MT＝主转录物。

[0269] 图9:USF2和SIRV6家族比对。该图显示了SIRV6和相应的参照基因的转录物比对。注意,SIRV6-100是主转录物。SIRV6-601-615是规范转录物(类似于USF2转录物)。转录物SIRV6-616-618是人工转录物,其中后两种是单外显子反义转录物。MT＝主转录物。

[0270] 图10:TESK2和SIRV7家族比对。该图显示了SIRV7和相应的参照基因的转录物比对。注意,SIRV7-100是主转录物。SIRV7-701-707是规范转录物(类似于TESK2转录物)。转录物SIRV7-708是人工转录物。MT＝主转录物。

[0271] 图11:SIRV布局。所有SIRV盒从XhoI限制位点开始,随后是T7启动子、鸟苷和SIRV mRNA主体。每个SIRV在其3'末端具有30个腺苷的多聚(A)尾部以及NsiI限制性位点以使得

能够进行run-off转录。

[0272] 图12:FPKM相关性图。样品1和样品2的FPKM值相对于彼此进行绘制。

[0273] 图13:显示人工基因SIRV1覆盖的Genome browser屏幕截图。所有具有SIRV1标记的转录物都对应于给定的注释。Cufflinks另外导出五个转录物变体命名为Cuff.8和.9,其引入误差。

[0274] 图14:SIRV混合方案以获得混合物E0、E1和E2。A)中,8个预混合物含有6至11个长度不同的SIRV,使得SIRV可以在Bioanalyzer曲线中明确地鉴定。两个预混合物各自以相等的比例组合以总共产生四个子混合物。然后进而将这些以确定的比例混合以获得最终混合物E0、E1和E2。测量的迹线以红色显示,从预混合物迹线计算以验证子混合物和最终混合物的迹线以蓝色显示。

[0275] 图15:具有对照的RNA。SIRV混合物也可作随时用于测试的参照RNA样品RC-0、RC-1和RC-2。第一个样品,通用人参照RNA(UHRR,来自10个合并的癌细胞系,Agilent Technologies,Inc.)掺有ERCC ExFold混合物1;第二个样品,人脑参照RNA(HBRR,来自23个供体的多个脑区域,Life Technologies,Inc.)掺入ERCC ExFold混合物2,并且对于第三个样品,两者以2:1的比例组合。然后将3个样品掺有SIRV混合物E0、E1和E2,以获得如估算的图所示的质量比,作为与总RNA中的2%mRNA含量相比的相对测量值。

[0276] 图16:作为将SIRV NGS读长分配给正确的注释SIRV_C的结果的SIRV的输入-输出相关性,A)在含有E1的样品RC-1和含有E2的RC-2中,以及B)E2和E1之间的差异表达比率。单个数据点由小的灰色符号显示,平均值由大的黑色符号突出显示。各行标记标准偏差。灰色直线突出对角线。

实施例

[0277] 实施例1:SIRV特征

[0278] 表5:SIRV(本发明的人工NA分子,模拟转录物变体)的特征。SEQ ID NO:75-148分别与SEQ ID NO:1-74相同,但没有30个腺苷的多聚(A)尾。“无模板”是指SIRV不具有直接的人转录模型模板,而是可通过具有步骤E)-G)的本发明产物方法获得。SIRV家族提供相同人工基因的转录物变体,并模拟人模型基因的条件。

[0279]

名称	人转录物模板	方向	外显子	长度	GC 含量	SEQ ID NO
SIRV1 家族						
SIRV101	KLK5-001	有义	6	1591	46%	1
SIRV102	KLK5-002	有义	4	1330	45%	2
SIRV103	KLK5-004	有义	6	1393	45%	3
SIRV104	KLK5-005	有义	7	1429	45%	4
SIRV105	KLK5-006	有义	5	700	44%	5
SIRV106	无模板	有义	3	1003	45%	6
SIRV107	无模板	有义，重叠	3	774	45%	7
SIRV108	无模板	反义，重叠	3	732	46%	8
SIRV109	无模板	反义，重叠	3	494	45%	9
SIRV2 家族						
SIRV201	LDHD-001	有义	11	2081	42%	10
SIRV202	LDHD-002	有义	11	2001	42%	11
SIRV203	LDHD-003	有义	5	716	41%	12
SIRV204	LDHD-004	有义	3	770	42%	13
SIRV205	无模板	反义	1	553	42%	14
SIRV206	无模板	反义	1	454	40%	15
SIRV3 家族						
SIRV301	LGALS17A-001	有义	5	2497	35%	16
SIRV302	LGALS17A-002	有义	2	1837	35%	17
SIRV303	LGALS17A-004	有义	3	2048	35%	18
SIRV304	LGALS17A-005	有义	8	1113	34%	19
SIRV305	LGALS17A-006	有义	3	466	32%	20
SIRV306	LGALS17A-201	有义	3	2403	36%	21
SIRV307	无模板	有义	5	809	34%	22
SIRV308	无模板	反义，重叠	3	509	41%	23
SIRV309	无模板	反义，重叠	3	826	43%	24
SIRV310	无模板	反义，重叠	3	619	39%	25
SIRV311	无模板	反义	1	191	30%	26
SIRV4 家族						
SIRV401	DAPK3-001	有义	9	2283	39%	27

[0280]

名称	人转录物模板	方向	外显子	长度	GC 含量	SEQ ID NO
SIRV402	DAPK3-004	有义	3	2089	37%	28
SIRV403	DAPK3-005	有义	4	700	38%	29
SIRV404	DAPK3-006	有义	4	622	38%	30
SIRV405	DAPK3-007	有义	2	656	40%	31
SIRV406	DAPK3-008	有义	2	647	42%	32
SIRV407	DAPK3-201	有义	8	2135	39%	33
SIRV408	无模板	有义	5	600	36%	34
SIRV409	无模板	反义，重叠	3	1597	44%	35
SIRV410	无模板	反义，重叠	2	980	44%	36
SIRV5 家族						
SIRV501	HAUS5-002	有义	17	1920	45%	37
SIRV502	HAUS5-003	有义	18	2014	46%	38
SIRV503	HAUS5-004	有义	3	556	43%	39
SIRV504	HAUS5-005	有义	1	2503	50%	40
SIRV505	HAUS5-006	有义	16	2059	47%	41
SIRV506	HAUS5-007	有义	2	582	51%	42
SIRV507	HAUS5-008	有义	6	563	50%	43
SIRV508	HAUS5-009	有义	17	2115	46%	44
SIRV509	HAUS5-010	有义	4	915	47%	45
SIRV510	HAUS5-201	有义	18	2504	48%	46
SIRV511	无模板	有义	2	576	51%	47
SIRV512	无模板	反义	1	259	47%	48
SIRV6 家族						
SIRV601	USF2-001	有义	9	1465	42%	49
SIRV602	USF2-002	有义	8	604	41%	50
SIRV603	USF2-003	有义	1	1999	35%	51
SIRV604	USF2-004	有义	10	1567	43%	52
SIRV605	USF2-005	有义	9	1118	43%	53
SIRV606	USF2-006	有义	4	575	45%	54
SIRV607	USF2-007	有义	4	604	47%	55
SIRV608	USF2-008	有义	4	407	35%	56
SIRV609	USF2-009	有义	4	515	48%	57
SIRV610	USF2-010	有义	5	1193	39%	58
SIRV611	USF2-012	有义	3	484	46%	59
SIRV612	USF2-013	有义	10	1558	43%	60
SIRV613	USF2-014	有义	6	1341	38%	61
SIRV614	USF2-015	有义	5	489	40%	62
SIRV615	USF2-016	有义	3	813	34%	63
SIRV616	无模板	有义	4	561	45%	64
SIRV617	无模板	反义	1	306	43%	65
SIRV618	无模板	反义	1	219	41%	66
SIRV7 家族						
SIRV701	TESK2-001	有义	5	2492	36%	67
SIRV702	TESK2-002	有义	6	2277	37%	68
SIRV703	TESK2-003	有义	5	2528	36%	69
SIRV704	TESK2-004	有义	3	458	29%	70
SIRV705	TESK2-201	有义	5	2492	36%	71
SIRV706	TESK2-202	有义	5	979	33%	72
SIRV707	TESK2-203	有义	10	2356	36%	73
SIRV708	无模板	有义	5	919	33%	74

[0281] 表6:SIRV的所选特征(x表示特征存在的次数)

[0282]

名称	AFE	TSS	A5SS	A3SS	CE	IR	TES	ALE
SIRV101		x				x		
SIRV102	x					x	x	
SIRV103				x				
SIRV104		x						
SIRV105		x		x				x
SIRV106		x	x	x	xx			
SIRV107								
SIRV108								
SIRV109								
SIRV201		x		xx				
SIRV202			x	xx			x	
SIRV203		x			x			x
SIRV204	x				xxxxx	x		x
SIRV205								
SIRV206								
SIRV301					x	x x	x	
SIRV302		x			xx	xx		x
SIRV303		x			x	xx		x
SIRV304		x					x	
SIRV305	x							x
SIRV306					x	x		x
SIRV307			x	xx			x	
SIRV308								
SIRV309								
SIRV310								
SIRV311								
SIRV401		x	xx		x	x		x
SIRV402	x				xx			x
SIRV403			x	x	x	x		x
SIRV404	x		x		x	x		x
SIRV405	x				x	x		x
SIRV406	x				xx	x	x	
SIRV407	x		x		x	x		x
SIRV408			xx		x			x
SIRV409								
SIRV410								
SIRV501		x				x		x
SIRV502		x						x
SIRV503	x				x	x	x	
SIRV504	x				x			
SIRV505					x	x		x
SIRV506		x			xx	xx		x
SIRV507		x			xx	x		x
SIRV508		x				x		x
SIRV509	x		x		x		x	
SIRV510		x			x	xx	x	
SIRV511				x	xx	xx		x
SIRV512								
SIRV601			x		x			x
SIRV602		x	x		xx			x
SIRV603	x				x		x	
SIRV604		x	x		x			x
SIRV605		x	x		x	x		x
SIRV606	x		x		xx		x	
SIRV607		x			x	x		x
SIRV608	x				xx			x
SIRV609		x			xx			x
SIRV610	x		x		xx	x		x
SIRV611	x				x	x		x

[0283]

SIRV612		x		x		x		x
SIRV613	x			x		xx		x
SIRV614	x			x		x	x	
SIRV615	x					x		x
SIRV616			x	x		xx	x	
SIRV617							x	
SIRV618								
SIRV701		x				xx	x	
SIRV702	x					xx		
SIRV703		x				xx		
SIRV704	x					xx		x
SIRV705		x				xx	x	
SIRV706						x		x
SIRV707		x				x	x	
SIRV708			x	x		x		x

[0284] 还参见图1和4-10。

[0285] 为了说明的目的,产生SIRV转录物家族1-7的七种人工SIRV基因(SIRV1-SIRV7)列于SEQ ID NO:149-156。SIRV基因仅由其外显子序列(即,在至少一个转录物中是外显子的序列,它们可以是内含子,即对于其他转录物不存在)的序列来定义,因为它们由它们产生的转录物所定义。如本文所提及的,如果它们仅仅作为概念存在就足够了。

[0286] SIRV的外显子列在SEQ ID NO:156-334中。

[0287] SIRVs缺乏与NCBI数据库中通过blast搜索核苷酸和蛋白质水平所显示的条目的同一性。在从人工SIRV转录组产生50nt的NGS读长的计算机模拟实验中,SIRV组(SIRVome)也不与来自模式生物体人、小鼠、拟南芥(Arabidopsis thaliana)、秀丽隐杆线虫(C.elegans)、黑腹果蝇(D.Melanogaster)、大肠杆菌(CGA1.20),酿酒酵母(S.Cerevisiae)和热带假丝酵母(X.tropicalis)的注释转录组显著对齐,但非常好地作图到SIRV组。此外,任何脱靶比对可以容易地鉴定为读长掺入。因此得出结论,SIRV转录物将与所测试的模型生物体转录物高度不同,并且当用作这些基因组中的掺入对照时不可能干扰转录物发现和定量。通过外推,并且因为除了nt blast之外还测试来自许多不同的系统类别的基因组,可以合理地假设人工SIRV序列不会干扰任何已知的基因组系统。

[0288] SIRV也可以与ERCC联合使用,因为脱靶到ERCC掺入转录物的作图几乎不存在。

[0289] 74个SIRV转录物

[0290] • 可用作NGS RNA-Seq实验和其他NA分析方法(诸如微阵列分析或qPCR)中的掺入转录物,

[0291] • 是人工序列,允许唯一作图到SIRV组,具有非常低的脱靶比对,

[0292] • 模拟关于长度、GC含量、内含子剪接位点二核苷酸和外显子-内含子结构的天然mRNA,

[0293] • 可与ERCC一起使用,

[0294] • 可以成本有效地产生为T7RNA聚合酶转录物。

[0295] SIRV允许

[0296] • 基于多聚(A)的选择和扩增,

[0297] • 同种型检测,

[0298] • 基于注释的同种型作图和假设建设,

[0299] • 同种型丰度估计,

[0300] • 对数倍数变化验证(通过使用具有不同SIRV浓度的2种混合物),

[0301] • 同种型丰度估计算法的训练和验证，

[0302] • 同种型从头组装，

[0303] • 在SQUARE系统中同种型分离(segregation)(在WO2011/095501A1中描述的复杂度降低方法)。

[0304] 实施例2:SIRV产生

[0305] 为了产生SIRV,通过外部DNA合成提供者合成体外转录模板。这些构建体包含5'至3'(a)独特的限制性位点(XhoI),紧接在(b)T7RNA聚合酶启动子的上游,其3'G是(c)SIRV序列的第一个核苷酸,无缝地接着(d)与(e)独特的NsiI限制性位点融合的A(30)尾(图11)。

[0306] T7启动子的融合以及NsiI位点整合入A(30)尾部允许产生以5'G(SIRV序列的一部分以及T7启动子的一部分)开始并以多聚(A)尾而没有额外的3'核苷酸结束产生序列-真实RNA的转录。

[0307] DNA合成提供者递送克隆到载体中的基因盒,质粒pUC57没有固有的T7启动子。

[0308] 长度为2710bp的质粒pUC57是pUC19的衍生物,通常用作大肠杆菌中的克隆载体。载体含有用于氨苄青霉素抗性的bla基因和用于白/蓝选择的lacZ基因。GenBank登录号Y14837.1,图由Bio Basic,Inc.提供。

[0309] 接收8-10μg的每种载体,其足以进行限制酶切和转录测定。用XhoI和NsiI双重消化显示正确的插入物大小和限制酶切的完成。

[0310] 然而,对于大规模制备转录,以50μg批量规模产生SIRV质粒。

[0311] 质粒线性化:产生大量RNA的初始默认方法是含有SIRV表达盒的NsiI限制性载体的run-off转录。为此,将几μg质粒消化以获得精确的3'末端。尽管完全的PstI/NsiI限制酶切已经由Bio Basic显示用于所有构建体,我们检查了单独的NsiI的有效切割(参见图2),因为转录起始是体外转录反应的限制性步骤之一,并且在模板制备中即使少量的环状质粒将产生大比例的转录物。

[0312] NsiI限制酶切产生3'突出端。这可能启动第二链转录,在这种情况下,我们诉诸钝化粘性。为此,使用T4DNA聚合酶的3'-5'外切核酸酶活性。

[0313] T7转录使用Epicentre AmpliScribe试剂盒High Yield和Flash:将线性化转录物用作商业T7转录试剂盒,Epicenter的AmpliScribe T7 High Yield转录试剂盒(Art.No 150408)和AmpliScribe T7 Flash转录试剂盒(Art.No 150405)中的模板。

[0314] 控制T7转录的主要因素是使用具有耐受高dNTP浓度的转录条件的试剂盒。这允许高产量,即1μg质粒可产生至多160-180μg RNA(例如Epicentre的High Yield试剂盒)。

[0315] 此外,直到绝对限制,更多的模板将产生更多的RNA。对于不同长度的模板,必须考虑摩尔比,短模板不会产生与较长模板相同的RNA质量,因为转录起始是限制性步骤,T7聚合酶延伸的一个阶段覆盖高达600nt(来自Epicentre的网站的信息)。

[0316] 更长的孵育时间增加了起始可能性,对较短模板的产量具有更大的影响。因此,有时建议孵化不是标准的2小时,而是4-6小时甚至过夜。然而,更长的孵育可导致RNA降解,因为T7转录缓冲液含有Mg^{2+}阳离子。

[0317] 将T7转录酶反应温度从37℃增加到42℃可以导致产量的强烈增加。这对于更复杂(富含GC,结构化)的模板可能更加明显(参见图3)。

[0318] 痕量的GuSCN、苯酚、SDS、RNA或金属离子可抑制T7转录酶活性。严格纯化线性化的

质粒,例如推荐Whatman纯化。或者,可以增加反应体积或降低质粒输入体积。

[0319] 模板DNA应通过DNA酶去除。根据Epicentre(AmpliScribe手册),可将1单位的所包含的DNA酶直接添加至转录中,进一步在37℃温育15分钟。将测试DNA酶处理是否影响RNA完整性,即,如果其由于残留的核糖核酸酶而降解RNA。或者,也可以通过酸性酚提取,也在SPLIT操作方案变体中除去DNA。然而,GuSCN可能不需要随后的氧化硅柱结合。

[0320] 剩余的质粒DNA可以在Bioanalyzer运行中检测或在使用引物GCTAATACGACTCACTATA*G(SEQ ID NO:337)和TTTTTTTTTTTTTTTTTTTTTTTTT*V(SEQ ID NO:338)的qPCR测定中(甚至使用RNA-特异性染料)定量地检测,其中(*)是具有硫代磷酸酯键的核苷酸。

[0321] 推荐的SIRV纯化方法如下所述。PAGE:用于以NGS掺入转录物所需的高质量纯化体外转录的RNA的标准方案是PAGE洗脱,但是麻烦的,不是非常精确的,可能诱导UV交联,并且其不适合于>1kb的转录物。

[0322] 基于氧化硅的纯化:纯化最初仅通过本领域技术人员已知的Whatman操作方案进行,从核酸中除去dNTP、添加剂和蛋白质。然而,这个过程是易损的;高达60%的测试标记物在标准程序中没有洗脱。此外,DNA模板将共洗脱。应该测试洗脱缓冲液EB或储存缓冲液SB是否可用于有效的洗脱。

[0323] 磁性寡聚(dT)珠纯化转录物:当转录反应不能产生全长RNA(直至NsiI限制性位点)时,则该RNA不含有A(30)尾。因此,寡聚(dT)珠纯化可用于选择性纯化全长转录物。然而,这种方法不会区分由运行转录或第二链转录产生的异常RNA,因为这些RNA也含有最小一个拷贝的A(30)-一段序列。注意,DNA模板的一条链也将含有多聚(A)的一段序列。需要确定DNA是否以其dsDNA形式存在(因为转录物从其模板释放)并且不能参与寡聚(dT)杂交。在该方法的一个变体中,寡核苷酸将是RNA,并且结合步骤之后可以进行RNA酶H消化,去除通过其编码的A(30)一段序列与珠结合的任何质粒DNA。或者,通过DNA酶处理除去DNA。

[0324] Pippin制备:Sage Scientific Pippin制备是自动凝胶洗脱系统,其被设计用于从1.5%或2%天然琼脂糖盒洗脱dsDNA(例如NGS文库)。由于RNA不会根据Pippin制备的外部或内部DNA标准运行,因此不可能进行长度估计。然而,足够纯度的SIRV运行在单个主峰中,其可以用大小选择操作方案“峰”进行检测,在设定的阈值碱基对值之后自动收集下一个峰。

[0325] 质量控制和定量对于预测SIRV混合物是重要的。Nanodrop定量:光度测量给出A260/A230和A260/A280比例形式的浓度(并因此,产率)和纯度。重要的是,纯化不充分是有问题的,因为如在Nanodrop仪器(Nanodrop Instruments)中进行的吸光度测量也测量微量的在260nm处具有超比例吸光度的dNTP。Qubit测量(LifeTechnologies)可以作为第三个参照。

[0326] Agilent Bioanalyzer RNA纳米芯片:可以在Agilent Bioanalyzer RNA芯片上评估SIRV转录物的正确长度、数量、RNA完整性(即折断或降解产物)和异常(更长)产物。

[0327] 变性凝胶电泳:与Bioanalyzer互补,RNA也可以在变性PAA或琼脂糖凝胶上分析,这取决于它们的大小。这可以使得能够更准确地评估转录物长度,但是没有定量和Bioanalyzer提供的范围。

[0328] qPCR:为了评估掺入转录物的完整性并导出互补定量,全长cDNA合成之后可以是

位于转录物的5'、中间和3'区域中的多个扩增子的qPCR。作为外标，PCR转录模板可以在相同的设置中扩增。这些设置也适用于确定SIRV混合物中的相对浓度。

[0329] 这些SIRV特异性引物需要仔细设计以各自仅靶向一种特异性SIRV，而不是靶向例如给定基因的所有SIRV共有的外显子。

[0330] 实施例3:SIRV作为外部对照在RNA-seq中的用途

[0331] 广泛假设由以下步骤组成的实验程序i)样品收集，ii)RNA纯化，iii)NGS文库生成，iv)NGS测序，v)读长与参照注释的比对，以及vi)后续生物信息处理准确计算相对转录物丰度。然而，不同的方法，例如不同的样品制备以及与下面实施例中所示相同的实验数据集的生物信息学处理程序也是可能的。

[0332] 只有非常少的含有部分验证的转录物丰度的数据集。其中之一是来自微阵列质量控制(MAQC)样品(MAQC Consortium,2006)，并且含有通用人参照RNA(UHRR)和人大脑参照RNA(HBRR)。对于两种RNA样品，用1044个Taqman探针衍生qPCR测量。这些测量可从Gene Expression Omnibus以登录号GSE5350获得。此外，UHR和脑RNA样品在Illumina GenomeAnalyzer的七个泳道上测序，产生35bp单端读长(James等人,2010)。这些读长可从NCBI读长档案库以登录号SRA010153获得，使用TopHat2作图到Ensembl注释GRCh37版本75。从1044个Taqman探针中仅保留906个探针，根据GSE5350，它们作图到单个Refseq注释。由于在实验中使用Ensembl注释，通过要求Taqman探针的Refseq注释在Ensembl中具有独特的等同物，进一步减少了该组Taqman探针。最后，从这些894个Taqman探针，只使用那些Ensembl转录标记被保留在具有多个转录物的基因内的那些。这导致最终的一组798个Taqman探针。使用Pennseq(Hu等人，2014)、方法1和具有和没有偏差校正的cufflinks、方法2和3(Roberts等人,2011;Trapnell等人,2010)来对798转录物导出以FPKM值形式估计的浓度。

[0333] 通过不同方法获得的FPKM值与qPCR值之间的相关性显示在表7中。相关性用对数空间中的R^2值和斯皮尔曼相关性ρ测量。由于接近零的值可以显著扭曲对数空间中的统计量，对于所有方法，低于1e-3的FPKM值设置为1e-3。或者，可以认为FPKM低于1e-3的转录物未被检测到。

[0334] 表7.在UHR RNA泳道SRR037445上FPKM和qPCR之间的相关性和未检测(ND)转录物(即具有FPKM<1e-3的转录物)的性质。

[0335]

	R^2	ρ	ND %	ND 平均 $\log_{10}$ (qPCR)
Pennseq	0.418	0.7129	2.79	-1.6506
Cufflinks	0.3317	0.6541	15.48	-1.6801
具有偏差校正的 Cufflinks	0.3943	0.7312	14.61	-1.7606

[0336] 如表7所示，一方面，对于Pennseq，R^2值为0.418，对于没有偏差校正的Cufflinks，R^2值为0.3317，对于具有偏差校正的Cufflink，R^2值为0.3943。另一方面，对于Pennseq，斯皮尔曼相关性为0.7129，对于没有偏差校正的Cufflinks，斯皮尔曼相关性为0.6541，对于具

有偏差校正的Cufflinks,斯皮尔曼相关性为0.7312。引人注目的分别是,有和没有偏差校正的Cufflinks没有检测到通过qPCR显示存在的转录物的14.61%和15.48%,而Pennseq没有检测到2.79%。重要的是,在qPCR验证实验中,通过3种计算方法未确定的转录物具有-1.65至-1.76的高平均$\log_{10}$丰度。

[0337] 该实施例通过选择798个Taqman qPCR验证的基因座,其含有超过一个的Ensembl转录物注释(两个不同的生物信息算法)和一个具有两个不同的偏差校正(Cufflinks),产生三个显著不同的结果。比对将大量基因内的阅读分布到错误的转录物。绝对相关是不可能的,因为接地槽(ground trough)我们是未知的。仅存在于与天然存在的基因中的转录物相似的复杂设置中的已知丰度的人工转录物变体使得能够定量评估测量方法的精确性,无论是单独的步骤和整个工作流程。

[0338] 实施例4:用于测试随机分布的卡方检验

[0339] 举例来说,将解释如何将卡方检验应用于“人工转录物序列集具有基本上随机分布出现的5’起始三核苷酸,所述5’起始三核苷酸选自GAA、GAC、GAG、GAT、GCA、GCC、GCG、GCT、GGA、GGC、GGG、GGT、GTA、GTC、GTG、GTT”。

[0340] 不同案例或细胞数(n):16(GAA、GAC、GAG、GAT、GCA、GCC、GCG、GCT、GGA、GGC、GGG、GGT、GTA、GTC、GTG、GTT)

[0341] 人工转录物序列数(N):74

[0342] 5’起始核苷酸的出现次数(计数)(O_1,O_2,O_3,…,O_n):

[0343]

GAA 5	GAC 5	GAG 4	GAG 6	GAT 3	GCA 2
GCC 4	GCG 5	GCT 6	GGA 7	GGC 4	GGG 3
GTA 4	GTC 5	GTG 6	GTT 5		

[0344] 自由度(df):n-p=15(对于离散的均匀分布p=1)

[0345] 任何细胞的预期出现是(在离散均匀分布的零假设下):E_i=N/n=4.625。这意味着具有三核苷酸的(完美)均匀分布的组将假想地具有每个所提及的三核苷酸的4.625作为5’起始三核苷酸。

[0346] 卡方(皮尔森的累积检验统计量)定义为:

[0347] $$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

[0348] 上述O_i、E_i和n的值直接应用于上述公式得到:卡方=5.57。

[0349] 在众所周知的表(所谓的卡方表)中列出了某个卡方值(在该实施例中为5.57)和某些自由度(在该实施例中为15)的概率值(“p值”)。p值还可以通过广泛使用的办公软件(诸如Microsoft Excel、LibreOffice或OpenOffice(其中它们中的后两个是可免费获得的))或者利用可自由使用的R软件包来计算。在Microsoft Excel 2003的英语版本中,此函数称为CHIDIST。

[0350] 与卡方=5.57和df=15相关联的p值为0.9861。因此,本实施例中起始核苷酸的出现满足如本文所定义的“基本上随机分布”的条件。

[0351] 实施例5:SIRV评估

[0352] 来自上述SEQ ID NO 1-74给出的集的74个SIRV中的60个被合成、克隆、表达、纯

化、质量控制和通过电泳测量(RNA nano和pico芯片和Bioanalyzer中的测定,Agilent)测定其浓度,然后合并成两个主混合物并浓缩至高于10ng/μl的浓度用于进一步的样品制备。SIRV混合物1含有相等质量的所有60个SIRV。根据混合方案制备SIRV混合物2,其以1:10:100的随机比率改变SIRV基因中的个体SIRV的量高达2个数量级。在该SIRV混合物2中,每个SIRV基因作为所有附属的SIRV的总和以相等的质量提供。

[0353] 制备三种RNA样品。样品1仅含有通用SIRV转录物混合物SIRV混合物1(100ng)。样品2组合500ng通用人参照RNA(Agilent)和0.3ng ERCC(Ambion)和3ng SIRV混合物1。样品3由具有0.3ng ERCC(Ambion)和3ng SIRV混合物2的500ng通用人参照RNA(Agilent)组成。

[0354] 将三个mRNA样品运送到服务提供商(Fasteris,Suisse),他们进行样品制备并进行测序。通过没有多聚A选择的定制文库制备从样品1制备NGS文库,而样品2和3进行具有多聚A选择的Illumina链式mRNA文库制备。所有三个文库都是加条形码的,以尝试相等的比例混合。在具有v3化学品的Illumina MiSeq上进行测序,得到150bp的经索引的读长。

[0355] 总共生成了26.7Mio读长并可分配给给定的条形码。用FastQC(v0.11.1)评估读长的质量。检测到一些适配器污染,并且可以通过使用具有以下参数的bbmap套件(版本32.32)中的bbduk进行修整:./bbduk.sh...ktrim=r k=28mink=12hdist=1minlength=20。将所得读长用tophat(v.2.0.8)针对Ensembl的GRCh 37.75、Ambion的ERCC92和SIRVome的组合的转录组和基因组参照注释作图。组图统计信息如表8所示。

[0356] 表8.作图统计信息。

[0357]

	总读长	作图读长	[%]	独特作图读长	[%]
样品1	10,246,442	8,585,641	83.79	8,505,344	83.01
样品2	10,119,416	8,642,852	85.41	8,399,336	83.00
样品3	6,308,855	5,404,486	85.67	5,268,757	83.51

[0358] 在表9中给出了在不同注释上的独特作图读长的分布。在样品2和样品3中,根据加权输入预期以下读长比率UHRR:ERCC:SIRV为70.3:2.7:27并假设在总RNA中2%mRNA含量。

[0359] 表9.独特作图读长的分布。

[0360]

	GRCh37.75		ERCC92		SIRV	
样品 1	4,330	0.05%	11	0.00%	8,505,555	99.949%
样品 2	7,521,308	89.55%	38,031	0.45%	839,997	10.00%
样品 3	4,156,399	78.89%	22,207	0.42%	1,090,151	20.69%

[0361] 在样品1中,特别高的数量的99.94%的所有读长作图到SIRV组,而仅有0.06%组图到整个人类基因组和ERCC。该结果证明了SIRV组与其它已知序列的高度不相容性和SIRV序列的独特性。

[0362] 在样品2和3中,92个ERCC的58个和52个被检测到对应于所有读长的0.45和0.42%。在加权添加的3%以下的ERCC读长的重复表示不足是由于仅24个腺苷的相对短的多聚(A)尾和潜在水解或以其它方式片段化和多聚(A)选择和耗尽的ERCC。将SIRV混合到样品中,在ERCC上存在10倍进入,并且出现10和20.7%,并且因此20-至40倍的进入,其由30个腺苷的更长的多聚A尾和可能更高的完整性的SRIV引起。

[0363] 使用IGV genome browser目测检查作图的读长。使用具有偏差校正的Cufflinks(v.1.3.0)来评估转录物丰度。所有SIRV转录物用FPKM值>0检测。R^2值低于0.8的输入-输出

相关性证明，除了使用插入荧光染料的初步储备浓度测量外，通过几种独立方式验证接地槽输入浓度需要广泛的质量测量。正在制备用于浓度的相应验证的qPCR和Taqman测定。

[0364] 图12显示了通过Cufflinks计算的样品2vs样品1的相对浓度值的相关性。当然由于UHRR和ERCC背景，样品2的SIRV浓度低约10倍。然而，预期高于0.95的高R^2值，因为在两个样品中测量相同的SIRV混合物1。部分假读长分配是由生物信息处理引起的，如图13所示。

[0365] SIRV基因1的总体覆盖度以及除了105以外的鉴定的注释转录物SIRV 101至109(全部用SIRV1编码)一起显示在图13顶行中，其中105不是SIRV混合物1中74个SIRV中的60个的一部分并因此没有包括在注释中。因为Cufflinks添加额外的转录物假说，并且按照内部确定的长度依赖性概率分布和其他许多分配规则将读长分配到转录物变体集，所以所呈现的值根本不正确，因为样品1和2之间具有R^2值为0.83的SIRV相关性，该相关性对于相同的样品是低的。

[0366] 为了评估所产生的分配误差，必须知道输入浓度的接地槽，这只有在所呈现的SIRV参照集的情况下才是可能的。仅给定模型复杂度中的输入-输出相关性的分析允许将关于测量的准确度的假设外推到未知的整个转录物变体集，通过本发明第一次使之成为可能。

[0367] 实施例6：制备具有确定浓度和浓度比的SIRV混合物E0、E1和E2，以及将SIRV混合物用于掺入RNA样品RC-0、RC-1和RC-2

[0368] 在这里，选择来自74个SIRV的69个SIRV，其已经通过在毛细管电泳Bioanalyzer迹线中在正确计算大小的主峰中显示≥85w/w％而定义的纯度获得。

[0369] 通过吸收光谱法(Nanodrop，Thermo Scientific)测量SIRV溶液，并将储备溶液浓度调节至≥50ng/μl。在260nm至280nm和260nm至230nm处的吸光度的比率表明RNA的最高纯度，并记录如下：

[0370] $A_{260nm/280nm}$ 2.14±0.12，

[0371] $A_{260nm/280nm}$ 2.17±0.20

[0372] Nanodrop允许精确的RNA定量，根据制造商的规格，对于≤100ng/μl的核酸样品，误差为±2ng/μl。在50ng/μl附近的最终SIRV储液浓度测量的定量的相对误差为±4％。

[0373] 基于SIRV序列的碱基分布，根据下式计算每种溶液的摩尔浓度：

[0374] MW[g/mol]＝A*329.2+U*306.2+C*305.2+G*345.2+159

[0375] 设计了含有等摩尔比的6-11个SIRV转录物的8个预混合物。它们的长度分布允许在如图14A所示的Bioanalyzer迹线中进行独特的鉴定，以监测预混合物和随后的混合物(图14B和C)中SIRV的出现和完整性。尽管Bioanalyzer迹线不允许绝对定量，但它们用于遵循混合程序的相对化合物分布和一致性。

[0376] 通过Nanodrop浓度测量来控制8个预混合物的准确体积制备，偏离计算的目标浓度的偏差为0.002％±3.4％(最大7.6％)。通过在分析天平上称重进一步监测体积的混合，其显示1.8％±0.65％(最大2.5％)的偏差。

[0377] 将8个预混合物成对混合，得到4个子混合物。通过电泳监测混合过程的质量，如图14B所示。通过Nanodrop浓度测量(偏差0.8％±2.5％，最大4.5％)控制4个子混合物的体积制备。

[0378] 将4个子混合物以确定体积比混合到最终混合物中，通过电泳监测混合过程如图

14C所示。4个子混合物与最终混合物E0组合的比例为1:1:1:1,对于最终混合物E1为1/4:1/2:1:1,对于最终混合物E2为4:1/4:1/32:1。Nanodrop浓度测量显示5.1％±3.3％的偏差(最大8.6％)。

[0379] 在非常狭窄的范围内,所有混合物的Bioanalyzer迹线类似于它们各自的预混合物和子混合物成分的总和(图14)。相对峰形状和位置是SIRV混合物的可靠定量监测工具。

[0380] 通过这些手段,在不同的混合物中可以确保可靠的SIRV浓度和浓度比。

[0381] 使用SIRV混合物E0、E1和E2来掺入通用人参照RNA(UHRR)和人脑参照RNA(HBRR),其另外包含ERCC对照混合物1和2以产生具有对照RC-0、RC-1和RC-2。各RNA部分的相对量显示在图15中,并且基于UHRR和HBRR中总RNA的2％的恒定mRNA含量计算。掺入,SIRV和ERCC混合物的最终相对浓度取决于参照RNA的真mRNA含量以及消耗和/或富集方法,同时减少核糖体和其他高丰度RNA的量。这些样品被设计用于测试不同的RNA-Seq工作流程。

[0382] 实施例7:NGS测序,具有SIRV混合物的RNA样品RC-1和RC-2的数据评估,以及通过使用不同的注释确定RNA测序流水线的准确性

[0383] 不具有多聚(A)尾的SIRV分子的序列SEQ ID NO:1-74和所有外显子的SEQ ID NO:156-334是纯的SIRV序列,其可以转换为任何常见的注释文件格式。一个这样的实例是列出所有外显子、内含子的纯核苷酸序列的FASTA文件和侧接第一个和最后一个外显子并被称为非翻译区的序列的组合,以及相应的GTF文件(其保存关于各个外显子的起始和终止坐标的信息)。序列SEQ ID NO:156-334已转换为对应于人模型基因的方向的链取向,并且所有内含子序列已经用各自长度的GC加权随机序列填充,所有内含子供体-受体位点在其相对出现中对应于如表2所示的规范和非规范供体受体对。SEQ ID NO:339-345(表示具有7个序列的FASTA文件)含有所述完整外显子和内含子序列以及1kb长上游和1kb长下游序列。GTF文件含有关于变体结构的信息,并且提供以下变体作为示例,GTF文件“SIRV C”(在附录B中列出)含有在混合物E1和E2中的所有SIRV的正确注释。GTF文件“SIRV I”(在附录A中列出)是注释不足的几种可能性之一。在这里,实际上存在于混合物中的一些SIRV没有被注释。GTF文件“SIRV O”(在附录C中列出)是无数的可能的过度注释之一。附加的SIRV是被注释过的,其并不存在于混合物中。在该文本中,注释的这些变化被称为SIRV_C、SIRV_I和SIRV_O。

[0384] 使用SIRV的数据评估的可能性是多方面的。以下建议概述了评估RNA-Seq流水线性能所必须执行的基本程序。在解复用后,条形码和质量修剪后,读长必须被作图到各自的基因组、SIRV组(所有SIRV序列的全部)和当适用时ERCC序列。作图到SIRV组的所有读长可以分开过滤和处理。

[0385] 读长分配给基因分类提供了关于掺入程序的可变性的第一概述。SIRV含量必须与其预期质量或摩尔比例相关。对于旨在覆盖RNA分子的长度并导致测量诸如FPKM的文库制备,SIRV读长的比例必须服从质量比,而对于标记独立计数RNA分子的文库制备,SIRV读长必须遵守摩尔比。样品特异性偏差的校正对于差异表达(DE)分析是重要的。变化的RNA样品背景、mRNA含量和完整性,以及消耗和/或mRNA富集程序的变化导致测序文库中的不同SIRV混合物含量。总RNA样品的mRNA含量可以变化高达2.5或更高的因子。这种偏差的校正对于差异表达的正确测试以及随后在RNA样品本身中相对化和校正DE测量是重要的。偏移因子是RNA分类分布的量度,并且可以用于基于SIRV控制的标准化。SIRV混合物的仔细的定量掺入程序是必需的前提条件,并且需要在样品定量下游进行精确的体积样品处理。所有测量

和随后的标准化都需要设置为具有明显的实验变量的环境，例如在微小体积秤中操作时可实现的移液准确度。

[0386] 在一个实施例中，使用TruSeq链式mRNA文库制备试剂盒(Illumina，Inc.)，用RC-1和RC-2的500ng输入RNA产生三份重复的NGS文库，然后在HiSeq 2500上在标称125bp长的双末端测序运行中对六个加条形码的文库进行测序，以分别获得对于RC-1三份重复的16.27±0.16Mio和获得对于RC-2三次重复的16.97±1.45Mio的修剪的保留的双末端读长。将读长与TopHat2作图到人参照基因组、ERCC序列和SIRV序列。属于SIRV的读长的相对量在样品RC-1中测量为2.32±0.05％，在样品RC-2中测量为1.87±0.12％。

[0387] 在图15中，提出了掺入的SIRV的比率，用于相对于总RNA中假定的2％平均mRNA含量更好的比较。然而，真正的mRNA含量已知是可变的。在UHRR中测得接近3％，在HBRR中接近2％(Shippy等人，2006)。预期mRNA比率UHRR/HBRR为1.5。

[0388] 因为样品RC-2的参照RNA背景含有RC-0参照RNA背景的2/3和RC-1参照RNA背景的1/3，所以RC样品RC-1和RC-2中的两个SIRV测量允许计算UHRR参照RNA中的mRNA含量(在样品RC-0中；参见上文)。SIRV已经被掺入样品RC-1中，相对于2％mRNA为2.53％，并且用2.32％测量，其导致HBRR mRNA含量的值为2.18％，样品RC-2中的mRNA含量为2.89％，其导致UHRR mRNA的计算值为3.44％。它允许确定mRNA比率UHRR/HBRR为1.58，这证实了以前发表的1.5的比率。基于掺入比例，SIRV表示为接近100％，这表明多聚(A30)尾足以用作在使用的mRNA NGS文库制备的一部分的多聚(A)富集方法中的定量表达。

[0389] 使用SIRV_C注释进行使用Cufflinks2算法的SIRV读长的分配。基于读长的分配计算丰度，并且可以与已知的输入量相关。在对数空间中计算输入-输出相关性，但是也可以在线性空间中进行，因为设定的浓度范围在RC-1中仅为1个数量级，在RC-2中为2个数量级。对于正确的测量，皮尔森积矩相关系数(皮尔森的r)应该接近1。相关图示于图16A中。对于样品RC-1中的SIRV，r值为0.446，而对于样品RC-2中的SIRV，r值为0.932，参见表10。

[0390] 源自相同子混合物的12至21个转录物的等摩尔浓度允许计算平均值和方差作为显著的质量测量。对于每个SIRV混合物，测序流水线的质量可以被证明为一组4个相对平均值连同相应的方差。所测试的流水线的结果分别为对于RC-1为1.21±56.05％、0.93±46.56％、0.97±49.46％和1.02±71.62％，对于RC-2为1.56±75.75％、0.93±54.83％、0.94±44.46％和1.02±54.48％。尽管在整个浓度范围内相对平均值接近1，高方差表明个体SIRV以大的变异确定。

[0391] 表10.在作图到不同的注释SIRV_C、_I和_O之后，RC-1和RC-2中的SIRV之间和之中的掺入和测量的相对浓度和浓度比的比较。在对数空间中计算r值。对于实际存在于混合物(行4)、未足够注释的SIRV(行15-16)和过度注释的SIRV(行27-28)的SIRV，显示预期的和测量的总SIRV浓度。

[0392]

1	2	3	4	5	6	7	8	9	10
2	相对浓度			RC-1		RC-2		RC-2/1	
3	和浓度比			均值	stdev	均值	stdev	均值	stdev
4		*69/69*		1		1			
5		1/64	0.02					0.04	0.07
6		1/32	0.03			0.05	0.04		
7		1/4	0.25	0.30	0.17	0.23	0.13		
8		1/2	0.50	0.46	0.22			0.54	0.22
9	SIRV_C	1	1	0.97	0.48	0.94	0.42	1.00	0.16
10		2	2	2.03	1.45				
11		4	4			4.09	2.23		
12		8	8						
13		16	16					12.44	2.92
14		r-值		0.466		0.932		0.851	
15		*44/69*		0.62		0.67			
16		meas		0.77		0.81			
17		1/64	0.02					0.09	1.75
18		1/32	0.03			0.10	0.12		
19		1/4	0.25	0.22	0.12	0.40	0.61		
20		1/2	0.50	0.34	0.22			1.09	1.42
21	SIRV_I	1	1	0.98	0.42	0.70	0.51	0.81	0.75
22		2	2	1.45	1.17				
23		4	4			2.93	1.43		
24		8	8						
25		16	16					13.09	0.40
26		r-值		0.407		0.813		0.889	

[0393]

27		100/69		1.00		1.00			
28		meas		1.05		1.03			
29		1/64	0.02					0.03	0.89
30		1/32	0.03			0.05	0.04		
31		1/4	0.25	0.30	0.16	0.23	0.12		
32		1/2	0.50	0.45	0.20			0.56	0.55
33	SIRV_O	1	1	1.00	0.57	0.97	0.49	1.02	0.28
34		2	2	2.16	1.65				
35		4	4			4.18	2.07		
36		8	8						
37		16	16					13.07	0.32
38		r-值		0.507		0.699		0.871	

[0394] 最准确和可重复的评估可以通过确定差异表达值或倍数变化来实现。由于通过4个子混合物的精确体积组合制备混合物，所以差异不受其它质量测量(例如SIRV的全长完整性)的影响。预期和测量的倍数变化之间的比较显示在图16B中，并且平均值在表10的第9列、第5至13行中类似地示出。相对平均值连同对应的方差显示出从比率1/64开始的值，偏

移为2.82,方差为±169.9%,继续为1.07±41.0%、1.00±16.2和0.78±23.5%。r值达到0.851。相对大的方差表示个体SIRV的假测量,并且NGS流水线的最重要的不一致的定量导致显著的变化,因此正确定量中存在不确定性。大的方差已经表明,一些SIRV与它们所属的子混合物的主要部分(fraction)不成比例。在SIRV家族1和2中可以看到四个这样的明显的实例,参见表11,并且在其它SIRV家族中更多。虽然一方面,SIRV 101、102、103、106、107、109、203、204和205的差异基因表达相差小于10%,而SIRV 206与所设置的比相差小于15%,但是另一方面,SIRV 105、108和202的比例差异超过40%,并且SIRV 201的比例超过250%。大多数物种的比例是正确的,并且在所有四个不同的子混合物中是明显的。因此,明显的偏差是由文库生成、测序和/或数据分析中产生的误差引起的。

[0395] 表11.来自SIRV家族1和2的SIRV的掺入和测量(meas)相对浓度比的比较。

[0396]

	RC-2/1		
	设定	meas	[%]
SIRV101	1.00	0.98	98
SIRV102	0.50	0.56	111
SIRV103	1.00	0.99	99
SIRV105	16.00	11.10	69
SIRV106	1.00	0.98	98
SIRV107	16.00	14.62	91
SIRV108	0.50	0.29	57
SIRV109	0.02	0.02	98
SIRV201	0.50	1.32	265
SIRV202	16.00	7.86	49
SIRV203	0.50	0.46	91
SIRV204	1.00	0.96	96
SIRV205	0.02	0.02	108
SIRV206	0.50	0.43	87

[0397] 使用不同的注释SIRV_I和SIRV_0重复作图。版本SIRV_I(注释不足)允许判断流水线检测新转录物变体的能力。该实验显示非注释的SIRV的读长如何伪造地分布到注释的子集,偏移定量。衍生的浓度的变化程度提供了RNA-Seq流水线的稳健性的另外的量度。对于本实验,相关性图劣化。样品RC-1中的SIRV的r值下降到0.406,而样品RC-2中的SIRV的r值下降到0.813。额外的误差似乎均匀地传播,并且预期和测量的倍数变化之间的比较显示甚至略微更高的0.889的r值。

[0398] 过度注释版本SIRV_0反映了第三种情况。在这里,经注释的SIRV比实际包含在样品中的SIRV更多。注释包括可能已经发现的转录物变体:例如在其他组织中,相同的组织但是在不同的发育阶段,已经被错误地注释,或者是早期实验的替代物,其中具有典型长度的克隆的EST的大量变体是典型的实例。现在,可以将读长分配给实际不是真实样品的一部分的SIRV变体。对于本实验,相关性图显示RC-1的0.506和RC-2的0.699的r值。预期和测量的倍数变化之间的比较显示0.871的类似r值。

[0399] 正确的SIRV检测的程度和稳健性是流水线性能的量度。

[0400] 在RNA-Seq实验中的准确性水平的测量可以使用SIRV掺入对照以不同的方式进行。与任何其它天然存在的基因一样,SIRV基因的变体以独特的告诉(telling)序列的程度变化为不同的程度。序列的独特性是基因复杂度的量度,其包括当将NGS读长分配到转录物变体时要解决的“简单”和“更困难”任务的组合。在注释的上下文内的一个转录物特异性图是相对变体特异性序列RSS,其在核苷酸水平上计数并标准化为其长度。每个转录物的共有核苷酸计数与竞争性转录物变体的数量成反比。序列复杂度的量度C是所有反向RSS值除以转录物长度L的总和。测量vs掺入浓度的相对倍数偏差D现在可以通过序列复杂度加权。对转录物变体的正确读长分配的挑战是与注释的内在复杂度成比例。对数倍数偏差D的反模数乘以序列复杂度C是根据下式的浓度测量A的加权准确度的量度:

[0401] $A_{SIRV}=f_1\{(\Sigma(1/RSS))/L\}/f_2\{|\log_2 D|\}=f_1\{C\}/f_2\{|\log_2 D|\}$

[0402] 两个函数f_1和f_2允许不同分量的加权和边界条件的定义,这将允许例如测量和掺入浓度的完美一致性,其中相对偏差接近1,因此log接近0,并且商不定义。因此,在SIRV_0注释内的所有69个SIRV的正确测量可以达到在SIRV_C注释内的更高值,因为它本质上更难以获得正确的浓度度量。倍数变化必须分配给定阈值,否则值接近零会使有意义的数据评估失真。

[0403] 相对变体特异性序列RSS和复杂度C可以在实施例中通过观察SIRV1开始时的重叠序列来解释。SIRV107是重叠有义转录物,而SIRV108和109是重叠反义转录物。在注释SIRV_I中,SIRV109的序列是独特的,因为缺少SIRV108,并且每个核苷酸的所有1/RSS值为1,乘以并除以SIRV109的长度,该值保持为1。在注释SIRV_C中,SIRV109的序列不再独特,因为它与SIRV108共有其部分序列。相应的1/RSS值为2,复杂度>1。在注释SIRV_0中,SIRV109的序列仅与SIRV108共有其序列的部分,仅与SIRV110共有其序列的部分,其中相应的1/RSS值再次为2,并且与两者均共有其序列的部分,以及相应的1/RSS值计数3,而其没有序列是独特的。在这里,SIRV109的C值再次较大。SIRV109的加权准确度A与那些C值成比例,并与混合物E1和E2中已知的SIRV109输入的确定的log2倍数偏差的模量成反比。

[0404] 倍数变化允许进一步计算多个参数,如调用差异表达中的真和假阳性率TP和FP。在TP vs FP曲线下的面积AUC可以作为差异表达分析中诊断性能的量度。

[0405] 实施例8:稀释、稳定和制备等分试样的SIRV和其他对照,以用于可靠的应用

[0406] RNA易于被二价阳离子和温度加速的RNA酶或水解降解。此外,RNA倾向于被许多表面吸附。因此,在含有抗氧化剂和添加剂如EDTA、DDT、RNasin或其它RNA酶抑制剂的缓冲液中,以25ng/μl以上的浓度提供用于电泳凝胶或ERCC混合物的如RNA梯状条带的RNA对照。这样的RNA溶液储存在通常-20℃的低温下。当在低百分比范围内使用RNA对照以与mRNA比较时,需要数十皮克(pictogram)的等分试样,并且高浓度对照必须在适合于掺入之前稀释成多个。当仅需要一次处理几个样品时,则必须扔掉大部分稀释的对照。等分试样的稀释和制备具有引入不希望的变化的风险。

[0407] 在本实施例中,将SIRV制备为易于使用且稳定的给定实验所需总量的等分试样。如上述E0、E1、E2的SIRV混合物或单独的SIRV或与另外的RNA对照的任何其它组合一起使用无RNA酶的缓冲液从储备溶液稀释至1pg/μl、10pg/μl或100pg/μl,所述缓冲液含有稳定剂如GenTegra-RNA(GenTegra)、RNAstable(Biomatrica)或在干燥溶液的同时减少RNA降解的

其它添加剂。然后，将具有稀释的RNA对照的溶液在小瓶中分成所需量的等分试样，然后将溶液在环境温度下快速干燥或冻干。当独立于后面的应用制备等分试样时间时，体积以及等分试样的数目可以相对较大，这增加了对照的制备的可重复性。对照RNA的干燥等分试样可以在室温下储存。

[0408] 当需要对照RNA等分试样时，只需在处理的任何阶段将靶RNA样品加入到干燥的对照RNA中。需要几分钟的短的孵育时间以溶解干燥的RNA对照。通过这些手段，样品可靠地掺入RNA对照中。

[0409] 在一个优选实例中，RNA对照含有具有独特标识符(如条形码序列)的RNA。条形码序列的侧翼是标记条形码序列的存在的独特的人工序列。对照中的条形码确保从RNA样品添加到对照的那一刻，该样品用内部条形码唯一鉴定。外部样品标记与内部条形码的匹配确保在高通量设置中不会出现错误的身份。

[0410] 在任何测序实验中，对照RNA和条形码的存在确保了样品的可追溯性和样品处理的可比性。

[0411] 实施例9:SIRV与另外的掺入对照如导致序列特异性连接偏差的微RNA的组合

[0412] SIRV可以与其他RNA对照如ERCC、上述条形码RNA或人工微RNA组合。微RNA是通常为21至23nt的短RNA。由于它们有限的大小，微RNA文库制备的工作流程是不同的，因为引发和cDNA合成受到阻碍/影响。微RNA必须直接连接。末端序列，特别是几个起始位点和终止位点负责引入可以高达5个数量级的强偏差。因此，需要特殊的微RNA对照，其允许测量连接反应中的序列偏差。

[0413] 在这里，我们使用具有4、5和至多8个随机核苷酸N(8)的随机序列的人工微RNA，在序列起始以及终止处，优选21至23nt长，但可以短至16nt并长达36nt。合成人工微RNA。本文的主要障碍在于，也使用A、U、G和C的混合物来补偿任何合成偏差，miRNA合成运行中的小变化可导致核苷酸分布的显著变化，其进而应当严格控制，因为它用于评估偏差。因此，人工微RNA也在中间部分还包含几个随机核苷酸N，至少一个，至多起始位点的N和终点的N之间的N的最大数目。

[0414] 虽然中间的N提供了对核苷酸分布中的随机性的独立量度，在N的一段序列中，在起始位点和终止位点的N允许确定微RNA文库制备的序列偏差。

[0415]

附录 A-GTF 文件 SIRV I

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[0416]

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[0417]

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SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_13";
SIRV5  LexogenSIRVData  exon  7871  8016  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_14";
SIRV5  LexogenSIRVData  exon  8278  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_15";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_16";
SIRV5  LexogenSIRVData  exon  10859 10989 .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_17";
SIRV5  LexogenSIRVData  exon  11134 13606 .  +  0  gene_id "SIRV5"; transcript_id "SIRV504"; exon_assignment "SIRV504_0";
SIRV5  LexogenSIRVData  exon  1001  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_2";
SIRV5  LexogenSIRVData  exon  2271  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_6";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_9";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_10";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_11";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_12";
SIRV5  LexogenSIRVData  exon  7871  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_13";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_14";
SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_15";
SIRV5  LexogenSIRVData  exon  1009  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV506"; exon_assignment "SIRV506_0";
SIRV5  LexogenSIRVData  exon  1988  2398  .  +  0  gene_id "SIRV5"; transcript_id "SIRV506"; exon_assignment "SIRV506_1";
SIRV5  LexogenSIRVData  exon  1009  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_2";
SIRV5  LexogenSIRVData  exon  2271  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_6";
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[0418]

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SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_9";
SIRV5  LexogenSIRVData  exon  6659  6722  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_10";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_11";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_12";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_13";
SIRV5  LexogenSIRVData  exon  7871  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_14";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_15";
SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_16";
SIRV5  LexogenSIRVData  exon  2178  2406  .  -  0  gene_id "SIRV5"; transcript_id "SIRV512"; exon_assignment "SIRV512_0";
SIRV6  LexogenSIRVData  exon  1001  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_2";
SIRV6  LexogenSIRVData  exon  2471  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_3";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_4";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_5";
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SIRV6  LexogenSIRVData  exon  11032 11108 .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_7";
SIRV6  LexogenSIRVData  exon  11206 11826 .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_8";
SIRV6  LexogenSIRVData  exon  9000  10968 .  +  0  gene_id "SIRV6"; transcript_id "SIRV603"; exon_assignment "SIRV603_0";
SIRV6  LexogenSIRVData  exon  1088  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_2";
SIRV6  LexogenSIRVData  exon  1846  2026  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_3";
SIRV6  LexogenSIRVData  exon  2471  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_4";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_5";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_6";
SIRV6  LexogenSIRVData  exon  10725 10818 .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_7";
SIRV6  LexogenSIRVData  exon  11035 11108 .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_8";
SIRV6  LexogenSIRVData  exon  11206 11837 .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_9";
SIRV6  LexogenSIRVData  exon  2286  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_0";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_1";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_2";
SIRV6  LexogenSIRVData  exon  10725 10788 .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_3";
SIRV6  LexogenSIRVData  exon  1131  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_0";
SIRV6  LexogenSIRVData  exon  1469  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_1";
SIRV6  LexogenSIRVData  exon  1846  2026  .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_2";
SIRV6  LexogenSIRVData  exon  2471  2540  .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_3";
SIRV6  LexogenSIRVData  exon  1138  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_2";
SIRV6  LexogenSIRVData  exon  1846  2120  .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_3";
SIRV6  LexogenSIRVData  exon  2473  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_0";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_1";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_2";
SIRV6  LexogenSIRVData  exon  10725 11108 .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_3";
SIRV6  LexogenSIRVData  exon  11206 11690 .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_4";
SIRV6  LexogenSIRVData  exon  1088  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_1";
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SIRV6  LexogenSIRVData  exon  2471  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_4";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_5";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_6";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_7";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_8";
SIRV6  LexogenSIRVData  exon  11206  11825  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_9";
SIRV6  LexogenSIRVData  exon  3106  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_0";
SIRV6  LexogenSIRVData  exon  7105  7448  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_1";
SIRV6  LexogenSIRVData  exon  7806  7923  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_2";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_3";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_4";
SIRV6  LexogenSIRVData  exon  11206  11824  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_5";
SIRV6  LexogenSIRVData  exon  2517  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_0";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_1";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_2";
SIRV6  LexogenSIRVData  exon  7806  7923  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_3";
SIRV6  LexogenSIRVData  exon  10725  10815  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_4";
SIRV6  LexogenSIRVData  exon  1545  1820  .  -  0  gene_id "SIRV6"; transcript_id "SIRV617"; exon_assignment "SIRV617_0";
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SIRV7  LexogenSIRVData  exon  3810  3896  .  -  0  gene_id "SIRV7"; transcript_id "SIRV703"; exon_assignment "SIRV703_2";
SIRV7  LexogenSIRVData  exon  114681  114988  .  -  0  gene_id "SIRV7"; transcript_id "SIRV703"; exon_assignment "SIRV703_3";
SIRV7  LexogenSIRVData  exon  147609  147918  .  -  0  gene_id "SIRV7"; transcript_id "SIRV703"; exon_assignment "SIRV703_4";
SIRV7  LexogenSIRVData  exon  55850  56097  .  -  0  gene_id "SIRV7"; transcript_id "SIRV704"; exon_assignment "SIRV704_0";
SIRV7  LexogenSIRVData  exon  78842  78963  .  -  0  gene_id "SIRV7"; transcript_id "SIRV704"; exon_assignment "SIRV704_1";
SIRV7  LexogenSIRVData  exon  114681  114738  .  -  0  gene_id "SIRV7"; transcript_id "SIRV704"; exon_assignment "SIRV704_2";
SIRV7  LexogenSIRVData  exon  1006  2675  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_0";
SIRV7  LexogenSIRVData  exon  2994  3111  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_1";
SIRV7  LexogenSIRVData  exon  43029  43077  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_2";
SIRV7  LexogenSIRVData  exon  114681  114988  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_3";
SIRV7  LexogenSIRVData  exon  147609  147925  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_4";
SIRV7  LexogenSIRVData  exon  56032  56097  .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_0";
SIRV7  LexogenSIRVData  exon  70884  70987  .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_1";
SIRV7  LexogenSIRVData  exon  78842  78963  .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_2";
SIRV7  LexogenSIRVData  exon  114681  114988  .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_3";
SIRV7  LexogenSIRVData  exon  147609  147957  .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_4";
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[0420]

附录 B-GTF 文件 SIRV C

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SIRV1  LexogenSIRVData  exon  1001  1484  .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_0";
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SIRV1  LexogenSIRVData  exon  6561  6813  .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_2";
SIRV1  LexogenSIRVData  exon  7553  7814  .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_3";
SIRV1  LexogenSIRVData  exon  10283 10366 .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_4";
SIRV1  LexogenSIRVData  exon  10445 10786 .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_5";
SIRV1  LexogenSIRVData  exon  1007  1484  .  -  0  gene_id "SIRV1"; transcript_id "SIRV102"; exon_assignment "SIRV102_0";
SIRV1  LexogenSIRVData  exon  6338  6813  .  -  0  gene_id "SIRV1"; transcript_id "SIRV102"; exon_assignment "SIRV102_1";
SIRV1  LexogenSIRVData  exon  7553  7814  .  -  0  gene_id "SIRV1"; transcript_id "SIRV102"; exon_assignment "SIRV102_2";
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SIRV1  LexogenSIRVData  exon  6338  6473  .  -  0  gene_id "SIRV1"; transcript_id "SIRV103"; exon_assignment "SIRV103_1";
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SIRV1  LexogenSIRVData  exon  10283 10366 .  -  0  gene_id "SIRV1"; transcript_id "SIRV103"; exon_assignment "SIRV103_4";
SIRV1  LexogenSIRVData  exon  10648 10791 .  -  0  gene_id "SIRV1"; transcript_id "SIRV103"; exon_assignment "SIRV103_5";
SIRV1  LexogenSIRVData  exon  6450  6473  .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_0";
SIRV1  LexogenSIRVData  exon  6561  6813  .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_1";
SIRV1  LexogenSIRVData  exon  7553  7814  .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_2";
SIRV1  LexogenSIRVData  exon  10283 10366 .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_3";
SIRV1  LexogenSIRVData  exon  10594 10640 .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_4";
SIRV1  LexogenSIRVData  exon  1001  1484  .  -  0  gene_id "SIRV1"; transcript_id "SIRV106"; exon_assignment "SIRV106_0";
SIRV1  LexogenSIRVData  exon  7553  7808  .  -  0  gene_id "SIRV1"; transcript_id "SIRV106"; exon_assignment "SIRV106_1";
SIRV1  LexogenSIRVData  exon  10554 10786 .  -  0  gene_id "SIRV1"; transcript_id "SIRV106"; exon_assignment "SIRV106_2";
SIRV1  LexogenSIRVData  exon  10648 10791 .  -  0  gene_id "SIRV1"; transcript_id "SIRV107"; exon_assignment "SIRV107_0";
SIRV1  LexogenSIRVData  exon  10883 11242 .  -  0  gene_id "SIRV1"; transcript_id "SIRV107"; exon_assignment "SIRV107_1";
SIRV1  LexogenSIRVData  exon  11404 11643 .  -  0  gene_id "SIRV1"; transcript_id "SIRV107"; exon_assignment "SIRV107_2";
SIRV1  LexogenSIRVData  exon  10583 10791 .  +  0  gene_id "SIRV1"; transcript_id "SIRV108"; exon_assignment "SIRV108_0";
SIRV1  LexogenSIRVData  exon  10898 11187 .  +  0  gene_id "SIRV1"; transcript_id "SIRV108"; exon_assignment "SIRV108_1";
SIRV1  LexogenSIRVData  exon  11404 11606 .  +  0  gene_id "SIRV1"; transcript_id "SIRV108"; exon_assignment "SIRV108_2";
SIRV1  LexogenSIRVData  exon  10712 10791 .  +  0  gene_id "SIRV1"; transcript_id "SIRV109"; exon_assignment "SIRV109_0";
SIRV1  LexogenSIRVData  exon  10883 11057 .  +  0  gene_id "SIRV1"; transcript_id "SIRV109"; exon_assignment "SIRV109_1";
SIRV1  LexogenSIRVData  exon  11435 11643 .  +  0  gene_id "SIRV1"; transcript_id "SIRV109"; exon_assignment "SIRV109_2";
SIRV2  LexogenSIRVData  exon  1001  1661  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_0";
SIRV2  LexogenSIRVData  exon  1742  1853  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_1";
SIRV2  LexogenSIRVData  exon  1974  2064  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_2";
SIRV2  LexogenSIRVData  exon  2675  2802  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_3";
SIRV2  LexogenSIRVData  exon  2882  3010  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_4";
SIRV2  LexogenSIRVData  exon  3106  3374  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_5";
SIRV2  LexogenSIRVData  exon  3666  3825  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_6";
SIRV2  LexogenSIRVData  exon  3967  4094  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_7";
SIRV2  LexogenSIRVData  exon  4339  4479  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_8";
SIRV2  LexogenSIRVData  exon  4688  4800  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_9";
SIRV2  LexogenSIRVData  exon  5789  5907  .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_10";
SIRV2  LexogenSIRVData  exon  1036  1661  .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_0";
SIRV2  LexogenSIRVData  exon  1742  1853  .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_1";
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SIRV2  LexogenSIRVData  exon  3106  3325  .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_5";
SIRV2  LexogenSIRVData  exon  3666  3825  .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_6";
SIRV2  LexogenSIRVData  exon  3967  4094  .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_7";
SIRV2  LexogenSIRVData  exon  4339  4479  .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_8";
SIRV2  LexogenSIRVData  exon  4688  4800  .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_9";
SIRV2  LexogenSIRVData  exon  5789  5911  .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_10";
SIRV2  LexogenSIRVData  exon  3666  3825  .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_0";
SIRV2  LexogenSIRVData  exon  3967  4094  .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_1";
SIRV2  LexogenSIRVData  exon  4339  4479  .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_2";
SIRV2  LexogenSIRVData  exon  4688  4800  .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_3";
SIRV2  LexogenSIRVData  exon  5752  5895  .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_4";
SIRV2  LexogenSIRVData  exon  3644  3825  .  -  0  gene_id "SIRV2"; transcript_id "SIRV204"; exon_assignment "SIRV204_0";
SIRV2  LexogenSIRVData  exon  3967  4479  .  -  0  gene_id "SIRV2"; transcript_id "SIRV204"; exon_assignment "SIRV204_1";
SIRV2  LexogenSIRVData  exon  4688  4732  .  -  0  gene_id "SIRV2"; transcript_id "SIRV204"; exon_assignment "SIRV204_2";
SIRV2  LexogenSIRVData  exon  1109  1631  .  +  0  gene_id "SIRV2"; transcript_id "SIRV205"; exon_assignment "SIRV205_0";
SIRV2  LexogenSIRVData  exon  4034  4457  .  +  0  gene_id "SIRV2"; transcript_id "SIRV206"; exon_assignment "SIRV206_0";
SIRV3  LexogenSIRVData  exon  1945  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_0";
SIRV3  LexogenSIRVData  exon  4569  4779  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_1";
SIRV3  LexogenSIRVData  exon  6058  7988  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_2";
SIRV3  LexogenSIRVData  exon  8128  8207  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_3";
SIRV3  LexogenSIRVData  exon  8756  8939  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_4";
SIRV3  LexogenSIRVData  exon  1964  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV302"; exon_assignment "SIRV302_0";
SIRV3  LexogenSIRVData  exon  6058  7822  .  +  0  gene_id "SIRV3"; transcript_id "SIRV302"; exon_assignment "SIRV302_1";
SIRV3  LexogenSIRVData  exon  1964  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV303"; exon_assignment "SIRV303_0";
SIRV3  LexogenSIRVData  exon  4569  4779  .  +  0  gene_id "SIRV3"; transcript_id "SIRV303"; exon_assignment "SIRV303_1";
SIRV3  LexogenSIRVData  exon  6058  7822  .  +  0  gene_id "SIRV3"; transcript_id "SIRV303"; exon_assignment "SIRV303_2";
SIRV3  LexogenSIRVData  exon  1964  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_0";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_1";
SIRV3  LexogenSIRVData  exon  4569  4779  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_2";
SIRV3  LexogenSIRVData  exon  6058  6333  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_3";
SIRV3  LexogenSIRVData  exon  7271  7366  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_4";
SIRV3  LexogenSIRVData  exon  7873  7988  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_5";
SIRV3  LexogenSIRVData  exon  8125  8207  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_6";
SIRV3  LexogenSIRVData  exon  8756  8937  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_7";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV305"; exon_assignment "SIRV305_0";
SIRV3  LexogenSIRVData  exon  4569  4779  .  +  0  gene_id "SIRV3"; transcript_id "SIRV305"; exon_assignment "SIRV305_1";
SIRV3  LexogenSIRVData  exon  6571  6718  .  +  0  gene_id "SIRV3"; transcript_id "SIRV305"; exon_assignment "SIRV305_2";
SIRV3  LexogenSIRVData  exon  1945  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV306"; exon_assignment "SIRV306_0";
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SIRV3  LexogenSIRVData  exon  6058  8292  .  +  0  gene_id "SIRV3"; transcript_id "SIRV306"; exon_assignment "SIRV306_2";
SIRV3  LexogenSIRVData  exon  1964  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_0";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_1";
SIRV3  LexogenSIRVData  exon  4575  4774  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_2";
SIRV3  LexogenSIRVData  exon  6058  6333  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_3";
SIRV3  LexogenSIRVData  exon  8756  8939  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_4";
SIRV3  LexogenSIRVData  exon  1001  1167  .  -  0  gene_id "SIRV3"; transcript_id "SIRV308"; exon_assignment "SIRV308_0";
SIRV3  LexogenSIRVData  exon  1533  1764  .  -  0  gene_id "SIRV3"; transcript_id "SIRV308"; exon_assignment "SIRV308_1";
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SIRV3  LexogenSIRVData  exon  8798  8975  .  -  0  gene_id "SIRV3"; transcript_id "SIRV309"; exon_assignment "SIRV309_0";
SIRV3  LexogenSIRVData  exon  9190  9298  .  -  0  gene_id "SIRV3"; transcript_id "SIRV309"; exon_assignment "SIRV309_1";
SIRV3  LexogenSIRVData  exon  9435  9943  .  -  0  gene_id "SIRV3"; transcript_id "SIRV309"; exon_assignment "SIRV309_2";
SIRV3  LexogenSIRVData  exon  8760  8966  .  -  0  gene_id "SIRV3"; transcript_id "SIRV310"; exon_assignment "SIRV310_0";
SIRV3  LexogenSIRVData  exon  9190  9324  .  -  0  gene_id "SIRV3"; transcript_id "SIRV310"; exon_assignment "SIRV310_1";
SIRV3  LexogenSIRVData  exon  9668  9914  .  -  0  gene_id "SIRV3"; transcript_id "SIRV310"; exon_assignment "SIRV310_2";
SIRV3  LexogenSIRVData  exon  4602  4762  .  -  0  gene_id "SIRV3"; transcript_id "SIRV311"; exon_assignment "SIRV311_0";
SIRV4  LexogenSIRVData  exon  8323  8372  .  -  0  gene_id "SIRV4"; transcript_id "SIRV403"; exon_assignment "SIRV403_0";
SIRV4  LexogenSIRVData  exon  8630  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV403"; exon_assignment "SIRV403_1";
SIRV4  LexogenSIRVData  exon  13673  13828  .  -  0  gene_id "SIRV4"; transcript_id "SIRV403"; exon_assignment "SIRV403_2";
SIRV4  LexogenSIRVData  exon  15020  15122  .  -  0  gene_id "SIRV4"; transcript_id "SIRV403"; exon_assignment "SIRV403_3";
SIRV4  LexogenSIRVData  exon  8323  8372  .  -  0  gene_id "SIRV4"; transcript_id "SIRV404"; exon_assignment "SIRV404_0";
SIRV4  LexogenSIRVData  exon  8630  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV404"; exon_assignment "SIRV404_1";
SIRV4  LexogenSIRVData  exon  13673  13822  .  -  0  gene_id "SIRV4"; transcript_id "SIRV404"; exon_assignment "SIRV404_2";
SIRV4  LexogenSIRVData  exon  14593  14623  .  -  0  gene_id "SIRV4"; transcript_id "SIRV404"; exon_assignment "SIRV404_3";
SIRV4  LexogenSIRVData  exon  8630  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV405"; exon_assignment "SIRV405_0";
SIRV4  LexogenSIRVData  exon  13673  13937  .  -  0  gene_id "SIRV4"; transcript_id "SIRV405"; exon_assignment "SIRV405_1";
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SIRV4  LexogenSIRVData  exon  5008  5158  .  -  0  gene_id "SIRV4"; transcript_id "SIRV406"; exon_assignment "SIRV406_1";
SIRV4  LexogenSIRVData  exon  8324  8372  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_0";
SIRV4  LexogenSIRVData  exon  8630  8747  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_1";
SIRV4  LexogenSIRVData  exon  8847  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_2";
SIRV4  LexogenSIRVData  exon  13673  13828  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_3";
SIRV4  LexogenSIRVData  exon  15020  15122  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_4";
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SIRV4  LexogenSIRVData  exon  1679  1885  .  +  0  gene_id "SIRV4"; transcript_id "SIRV409"; exon_assignment "SIRV409_1";
SIRV4  LexogenSIRVData  exon  2390  3403  .  +  0  gene_id "SIRV4"; transcript_id "SIRV409"; exon_assignment "SIRV409_2";
SIRV4  LexogenSIRVData  exon  1456  1885  .  +  0  gene_id "SIRV4"; transcript_id "SIRV410"; exon_assignment "SIRV410_0";
SIRV4  LexogenSIRVData  exon  2252  2771  .  +  0  gene_id "SIRV4"; transcript_id "SIRV410"; exon_assignment "SIRV410_1";
SIRV5  LexogenSIRVData  exon  1057  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_1";
SIRV5  LexogenSIRVData  exon  2120  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_2";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_3";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_4";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_5";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_6";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_7";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_8";
SIRV5  LexogenSIRVData  exon  6659  6722  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_9";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_10";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_11";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_12";
SIRV5  LexogenSIRVData  exon  7871  8016  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_13";
SIRV5  LexogenSIRVData  exon  8278  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_14";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_15";
SIRV5  LexogenSIRVData  exon  10859  10991  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_16";
SIRV5  LexogenSIRVData  exon  1020  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_2";
SIRV5  LexogenSIRVData  exon  2271  2488  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_3";
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SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_4";
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SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_6";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_9";
SIRV5  LexogenSIRVData  exon  6659  6722  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_10";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_11";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_12";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_13";
SIRV5  LexogenSIRVData  exon  7871  8016  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_14";
SIRV5  LexogenSIRVData  exon  8278  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_15";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_16";
SIRV5  LexogenSIRVData  exon  10859 10989 .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_17";
SIRV5  LexogenSIRVData  exon  8202  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV503"; exon_assignment "SIRV503_0";
SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV503"; exon_assignment "SIRV503_1";
SIRV5  LexogenSIRVData  exon  11134 11142 .  +  0  gene_id "SIRV5"; transcript_id "SIRV503"; exon_assignment "SIRV503_2";
SIRV5  LexogenSIRVData  exon  11134 13606 .  +  0  gene_id "SIRV5"; transcript_id "SIRV504"; exon_assignment "SIRV504_0";
SIRV5  LexogenSIRVData  exon  1001  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_2";
SIRV5  LexogenSIRVData  exon  2271  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_6";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_9";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_10";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_11";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_12";
SIRV5  LexogenSIRVData  exon  7871  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_13";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_14";
SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_15";
SIRV5  LexogenSIRVData  exon  1009  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV506"; exon_assignment "SIRV506_0";
SIRV5  LexogenSIRVData  exon  1988  2398  .  +  0  gene_id "SIRV5"; transcript_id "SIRV506"; exon_assignment "SIRV506_1";
SIRV5  LexogenSIRVData  exon  1028  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_0";
SIRV5  LexogenSIRVData  exon  1926  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_2";
SIRV5  LexogenSIRVData  exon  2271  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_4";
SIRV5  LexogenSIRVData  exon  3484  3598  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_5";
SIRV5  LexogenSIRVData  exon  1009  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_2";
SIRV5  LexogenSIRVData  exon  2271  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_6";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_7";
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SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_9";
SIRV5  LexogenSIRVData  exon  6659  6722  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_10";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_11";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_12";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_13";
SIRV5  LexogenSIRVData  exon  7871  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_14";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_15";
SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_16";
SIRV5  LexogenSIRVData  exon  8316  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV509"; exon_assignment "SIRV509_0";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV509"; exon_assignment "SIRV509_1";
SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV509"; exon_assignment "SIRV509_2";
SIRV5  LexogenSIRVData  exon  11312 11866 .  +  0  gene_id "SIRV5"; transcript_id "SIRV509"; exon_assignment "SIRV509_3";
SIRV5  LexogenSIRVData  exon  1029  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_2";
SIRV5  LexogenSIRVData  exon  2271  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_6";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_9";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_10";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_11";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_12";
SIRV5  LexogenSIRVData  exon  7871  8016  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_13";
SIRV5  LexogenSIRVData  exon  8278  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_14";
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SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_16";
SIRV5  LexogenSIRVData  exon  11134 11867 .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_17";
SIRV5  LexogenSIRVData  exon  1009  1143  .  +  0  gene_id "SIRV5"; transcript_id "SIRV511"; exon_assignment "SIRV511_0";
SIRV5  LexogenSIRVData  exon  1988  2398  .  +  0  gene_id "SIRV5"; transcript_id "SIRV511"; exon_assignment "SIRV511_1";
SIRV5  LexogenSIRVData  exon  2178  2406  .  -  0  gene_id "SIRV5"; transcript_id "SIRV512"; exon_assignment "SIRV512_0";
SIRV6  LexogenSIRVData  exon  1001  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_2";
SIRV6  LexogenSIRVData  exon  2471  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_3";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_4";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_5";
SIRV6  LexogenSIRVData  exon  10725 10818 .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_6";
SIRV6  LexogenSIRVData  exon  11032 11108 .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_7";
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SIRV6  LexogenSIRVData  exon  1125  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_2";
SIRV6  LexogenSIRVData  exon  2781  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_3";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_4";
SIRV6  LexogenSIRVData  exon  10725 10818 .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_5";
SIRV6  LexogenSIRVData  exon  11032 11108 .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_6";
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SIRV6  LexogenSIRVData  exon  1088   1186   .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_0";
SIRV6  LexogenSIRVData  exon  1469   1534   .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_1";
SIRV6  LexogenSIRVData  exon  1641   1735   .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_2";
SIRV6  LexogenSIRVData  exon  1846   2026   .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_3";
SIRV6  LexogenSIRVData  exon  2471   2620   .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_4";
SIRV6  LexogenSIRVData  exon  2741   2828   .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_5";
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SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_7";
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SIRV6  LexogenSIRVData  exon  2741   2828   .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_1";
SIRV6  LexogenSIRVData  exon  3107   3164   .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_2";
SIRV6  LexogenSIRVData  exon  10725  10788  .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_3";
SIRV6  LexogenSIRVData  exon  1131   1186   .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_0";
SIRV6  LexogenSIRVData  exon  1469   1735   .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_1";
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SIRV6  LexogenSIRVData  exon  1641   1735   .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_2";
SIRV6  LexogenSIRVData  exon  1846   2120   .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_3";
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SIRV6  LexogenSIRVData  exon  2741   2828   .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_1";
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SIRV6  LexogenSIRVData  exon  11206  11690  .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_4";
SIRV6  LexogenSIRVData  exon  1304   1381   .  +  0  gene_id "SIRV6"; transcript_id "SIRV611"; exon_assignment "SIRV611_0";
SIRV6  LexogenSIRVData  exon  1469   1534   .  +  0  gene_id "SIRV6"; transcript_id "SIRV611"; exon_assignment "SIRV611_1";
SIRV6  LexogenSIRVData  exon  1641   1950   .  +  0  gene_id "SIRV6"; transcript_id "SIRV611"; exon_assignment "SIRV611_2";
SIRV6  LexogenSIRVData  exon  1088   1186   .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_0";
SIRV6  LexogenSIRVData  exon  1469   1534   .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_1";
SIRV6  LexogenSIRVData  exon  1641   1735   .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_2";
SIRV6  LexogenSIRVData  exon  1846   2026   .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_3";
SIRV6  LexogenSIRVData  exon  2471   2620   .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_4";
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[0426]

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SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_5";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_6";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_7";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_8";
SIRV6  LexogenSIRVData  exon  11206  11825  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_9";
SIRV6  LexogenSIRVData  exon  3106  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_0";
SIRV6  LexogenSIRVData  exon  7105  7448  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_1";
SIRV6  LexogenSIRVData  exon  7806  7923  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_2";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_3";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_4";
SIRV6  LexogenSIRVData  exon  11206  11824  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_5";
SIRV6  LexogenSIRVData  exon  2517  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_0";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_1";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_2";
SIRV6  LexogenSIRVData  exon  7806  7923  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_3";
SIRV6  LexogenSIRVData  exon  10725  10815  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_4";
SIRV6  LexogenSIRVData  exon  10238  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV615"; exon_assignment "SIRV615_0";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV615"; exon_assignment "SIRV615_1";
SIRV6  LexogenSIRVData  exon  11206  11330  .  +  0  gene_id "SIRV6"; transcript_id "SIRV615"; exon_assignment "SIRV615_2";
SIRV6  LexogenSIRVData  exon  2286  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV616"; exon_assignment "SIRV616_0";
SIRV6  LexogenSIRVData  exon  2741  2814  .  +  0  gene_id "SIRV6"; transcript_id "SIRV616"; exon_assignment "SIRV616_1";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV616"; exon_assignment "SIRV616_2";
SIRV6  LexogenSIRVData  exon  10725  10788  .  +  0  gene_id "SIRV6"; transcript_id "SIRV616"; exon_assignment "SIRV616_3";
SIRV6  LexogenSIRVData  exon  1545  1820  .  -  0  gene_id "SIRV6"; transcript_id "SIRV617"; exon_assignment "SIRV617_0";
SIRV6  LexogenSIRVData  exon  2359  2547  .  -  0  gene_id "SIRV6"; transcript_id "SIRV618"; exon_assignment "SIRV618_0";
SIRV7  LexogenSIRVData  exon  1004  2675  .  -  0  gene_id "SIRV7"; transcript_id "SIRV701"; exon_assignment "SIRV701_0";
SIRV7  LexogenSIRVData  exon  2994  3111  .  -  0  gene_id "SIRV7"; transcript_id "SIRV701"; exon_assignment "SIRV701_1";
SIRV7  LexogenSIRVData  exon  43029  43077  .  -  0  gene_id "SIRV7"; transcript_id "SIRV701"; exon_assignment "SIRV701_2";
SIRV7  LexogenSIRVData  exon  114681  114988  .  -  0  gene_id "SIRV7"; transcript_id "SIRV701"; exon_assignment "SIRV701_3";
SIRV7  LexogenSIRVData  exon  147609  147923  .  -  0  gene_id "SIRV7"; transcript_id "SIRV701"; exon_assignment "SIRV701_4";
SIRV7  LexogenSIRVData  exon  1001  2675  .  -  0  gene_id "SIRV7"; transcript_id "SIRV702"; exon_assignment "SIRV702_0";
SIRV7  LexogenSIRVData  exon  2994  3111  .  -  0  gene_id "SIRV7"; transcript_id "SIRV702"; exon_assignment "SIRV702_1";
SIRV7  LexogenSIRVData  exon  4096  4179  .  -  0  gene_id "SIRV7"; transcript_id "SIRV702"; exon_assignment "SIRV702_2";
SIRV7  LexogenSIRVData  exon  4726  4810  .  -  0  gene_id "SIRV7"; transcript_id "SIRV702"; exon_assignment "SIRV702_3";
SIRV7  LexogenSIRVData  exon  43029  43077  .  -  0  gene_id "SIRV7"; transcript_id "SIRV702"; exon_assignment "SIRV702_4";
SIRV7  LexogenSIRVData  exon  114681  114916  .  -  0  gene_id "SIRV7"; transcript_id "SIRV702"; exon_assignment "SIRV702_5";
SIRV7  LexogenSIRVData  exon  1001  2675  .  -  0  gene_id "SIRV7"; transcript_id "SIRV703"; exon_assignment "SIRV703_0";
SIRV7  LexogenSIRVData  exon  2994  3111  .  -  0  gene_id "SIRV7"; transcript_id "SIRV703"; exon_assignment "SIRV703_1";
SIRV7  LexogenSIRVData  exon  3810  3896  .  -  0  gene_id "SIRV7"; transcript_id "SIRV703"; exon_assignment "SIRV703_2";
SIRV7  LexogenSIRVData  exon  114681  114988  .  -  0  gene_id "SIRV7"; transcript_id "SIRV703"; exon_assignment "SIRV703_3";
SIRV7  LexogenSIRVData  exon  147609  147918  .  -  0  gene_id "SIRV7"; transcript_id "SIRV703"; exon_assignment "SIRV703_4";
SIRV7  LexogenSIRVData  exon  55850  56097  .  -  0  gene_id "SIRV7"; transcript_id "SIRV704"; exon_assignment "SIRV704_0";
SIRV7  LexogenSIRVData  exon  78842  78963  .  -  0  gene_id "SIRV7"; transcript_id "SIRV704"; exon_assignment "SIRV704_1";
SIRV7  LexogenSIRVData  exon  114681  114738  .  -  0  gene_id "SIRV7"; transcript_id "SIRV704"; exon_assignment "SIRV704_2";
SIRV7  LexogenSIRVData  exon  1006  2675  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_0";
SIRV7  LexogenSIRVData  exon  2994  3111  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_1";
SIRV7  LexogenSIRVData  exon  43029  43077  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_2";
SIRV7  LexogenSIRVData  exon  114681  114988  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_3";
SIRV7  LexogenSIRVData  exon  147609  147925  .  -  0  gene_id "SIRV7"; transcript_id "SIRV705"; exon_assignment "SIRV705_4";
SIRV7  LexogenSIRVData  exon  56032  56097  .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_0";
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SIRV7  LexogenSIRVData  exon  70884  70987  .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_1";
SIRV7  LexogenSIRVData  exon  78842  78963  .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_2";
SIRV7  LexogenSIRVData  exon  114681 114988 .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_3";
SIRV7  LexogenSIRVData  exon  147609 147957 .  -  0  gene_id "SIRV7"; transcript_id "SIRV706"; exon_assignment "SIRV706_4";
SIRV7  LexogenSIRVData  exon  56038  56097  .  -  0  gene_id "SIRV7"; transcript_id "SIRV708"; exon_assignment "SIRV708_0";
SIRV7  LexogenSIRVData  exon  70884  70987  .  -  0  gene_id "SIRV7"; transcript_id "SIRV708"; exon_assignment "SIRV708_1";
SIRV7  LexogenSIRVData  exon  78842  78908  .  -  0  gene_id "SIRV7"; transcript_id "SIRV708"; exon_assignment "SIRV708_2";
SIRV7  LexogenSIRVData  exon  78929  78963  .  -  0  gene_id "SIRV7"; transcript_id "SIRV708"; exon_assignment "SIRV708_3";
SIRV7  LexogenSIRVData  exon  114687 114960 .  -  0  gene_id "SIRV7"; transcript_id "SIRV708"; exon_assignment "SIRV708_4";
SIRV7  LexogenSIRVData  exon  147609 147957 .  -  0  gene_id "SIRV7"; transcript_id "SIRV708"; exon_assignment "SIRV708_5";
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[0428]

附录 C-GTF 文件 SIRV O

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SIRV1  LexogenSIRVData  exon  1001  1484  .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_0";
SIRV1  LexogenSIRVData  exon  6338  6473  .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_1";
SIRV1  LexogenSIRVData  exon  6561  6813  .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_2";
SIRV1  LexogenSIRVData  exon  7553  7814  .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_3";
SIRV1  LexogenSIRVData  exon  10283  10366  .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_4";
SIRV1  LexogenSIRVData  exon  10445  10786  .  -  0  gene_id "SIRV1"; transcript_id "SIRV101"; exon_assignment "SIRV101_5";
SIRV1  LexogenSIRVData  exon  1007  1484  .  -  0  gene_id "SIRV1"; transcript_id "SIRV102"; exon_assignment "SIRV102_0";
SIRV1  LexogenSIRVData  exon  6338  6813  .  -  0  gene_id "SIRV1"; transcript_id "SIRV102"; exon_assignment "SIRV102_1";
SIRV1  LexogenSIRVData  exon  7553  7814  .  -  0  gene_id "SIRV1"; transcript_id "SIRV102"; exon_assignment "SIRV102_2";
SIRV1  LexogenSIRVData  exon  10283  10366  .  -  0  gene_id "SIRV1"; transcript_id "SIRV102"; exon_assignment "SIRV102_3";
SIRV1  LexogenSIRVData  exon  1001  1484  .  -  0  gene_id "SIRV1"; transcript_id "SIRV103"; exon_assignment "SIRV103_0";
SIRV1  LexogenSIRVData  exon  6338  6473  .  -  0  gene_id "SIRV1"; transcript_id "SIRV103"; exon_assignment "SIRV103_1";
SIRV1  LexogenSIRVData  exon  6561  6813  .  -  0  gene_id "SIRV1"; transcript_id "SIRV103"; exon_assignment "SIRV103_2";
SIRV1  LexogenSIRVData  exon  7553  7814  .  -  0  gene_id "SIRV1"; transcript_id "SIRV103"; exon_assignment "SIRV103_3";
SIRV1  LexogenSIRVData  exon  10283  10366  .  -  0  gene_id "SIRV1"; transcript_id "SIRV103"; exon_assignment "SIRV103_4";
SIRV1  LexogenSIRVData  exon  10648  10791  .  -  0  gene_id "SIRV1"; transcript_id "SIRV103"; exon_assignment "SIRV103_5";
SIRV1  LexogenSIRVData  exon  6450  6473  .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_0";
SIRV1  LexogenSIRVData  exon  6561  6813  .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_1";
SIRV1  LexogenSIRVData  exon  7553  7814  .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_2";
SIRV1  LexogenSIRVData  exon  10283  10366  .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_3";
SIRV1  LexogenSIRVData  exon  10594  10640  .  -  0  gene_id "SIRV1"; transcript_id "SIRV105"; exon_assignment "SIRV105_4";
SIRV1  LexogenSIRVData  exon  1001  1484  .  -  0  gene_id "SIRV1"; transcript_id "SIRV106"; exon_assignment "SIRV106_0";
SIRV1  LexogenSIRVData  exon  7553  7808  .  -  0  gene_id "SIRV1"; transcript_id "SIRV106"; exon_assignment "SIRV106_1";
SIRV1  LexogenSIRVData  exon  10554  10786  .  -  0  gene_id "SIRV1"; transcript_id "SIRV106"; exon_assignment "SIRV106_2";
SIRV1  LexogenSIRVData  exon  10648  10791  .  -  0  gene_id "SIRV1"; transcript_id "SIRV107"; exon_assignment "SIRV107_0";
SIRV1  LexogenSIRVData  exon  10883  11242  .  -  0  gene_id "SIRV1"; transcript_id "SIRV107"; exon_assignment "SIRV107_1";
SIRV1  LexogenSIRVData  exon  11404  11643  .  -  0  gene_id "SIRV1"; transcript_id "SIRV107"; exon_assignment "SIRV107_2";
SIRV1  LexogenSIRVData  exon  10583  10791  .  +  0  gene_id "SIRV1"; transcript_id "SIRV108"; exon_assignment "SIRV108_0";
SIRV1  LexogenSIRVData  exon  10898  11187  .  +  0  gene_id "SIRV1"; transcript_id "SIRV108"; exon_assignment "SIRV108_1";
SIRV1  LexogenSIRVData  exon  11404  11606  .  +  0  gene_id "SIRV1"; transcript_id "SIRV108"; exon_assignment "SIRV108_2";
SIRV1  LexogenSIRVData  exon  10712  10791  .  +  0  gene_id "SIRV1"; transcript_id "SIRV109"; exon_assignment "SIRV109_0";
SIRV1  LexogenSIRVData  exon  10883  11057  .  +  0  gene_id "SIRV1"; transcript_id "SIRV109"; exon_assignment "SIRV109_1";
SIRV1  LexogenSIRVData  exon  11435  11643  .  +  0  gene_id "SIRV1"; transcript_id "SIRV109"; exon_assignment "SIRV109_2";
SIRV1  LexogenSIRVData  exon  1001  1484  .  -  0  gene_id "SIRV1"; transcript_id "SIRV104"; exon_assignment "SIRV104_0";
SIRV1  LexogenSIRVData  exon  6338  6473  .  -  0  gene_id "SIRV1"; transcript_id "SIRV104"; exon_assignment "SIRV104_1";
SIRV1  LexogenSIRVData  exon  6561  6813  .  -  0  gene_id "SIRV1"; transcript_id "SIRV104"; exon_assignment "SIRV104_2";
SIRV1  LexogenSIRVData  exon  7553  7814  .  -  0  gene_id "SIRV1"; transcript_id "SIRV104"; exon_assignment "SIRV104_3";
SIRV1  LexogenSIRVData  exon  10283  10366  .  -  0  gene_id "SIRV1"; transcript_id "SIRV104"; exon_assignment "SIRV104_4";
SIRV1  LexogenSIRVData  exon  10445  10508  .  -  0  gene_id "SIRV1"; transcript_id "SIRV104"; exon_assignment "SIRV104_5";
SIRV1  LexogenSIRVData  exon  10648  10763  .  -  0  gene_id "SIRV1"; transcript_id "SIRV104"; exon_assignment "SIRV104_6";
SIRV1  LexogenSIRVData  exon  10720  10791  .  +  0  gene_id "SIRV1"; transcript_id "SIRV110"; exon_assignment "SIRV110_0";
SIRV1  LexogenSIRVData  exon  10883  10995  .  +  0  gene_id "SIRV1"; transcript_id "SIRV110"; exon_assignment "SIRV110_1";
SIRV1  LexogenSIRVData  exon  11435  11643  .  +  0  gene_id "SIRV1"; transcript_id "SIRV110"; exon_assignment "SIRV110_2";
SIRV1  LexogenSIRVData  exon  6450  6473  .  -  0  gene_id "SIRV1"; transcript_id "SIRV111"; exon_assignment "SIRV111_0";
SIRV1  LexogenSIRVData  exon  6561  6813  .  -  0  gene_id "SIRV1"; transcript_id "SIRV111"; exon_assignment "SIRV111_1";
SIRV1  LexogenSIRVData  exon  7553  7808  .  -  0  gene_id "SIRV1"; transcript_id "SIRV111"; exon_assignment "SIRV111_2";
SIRV1  LexogenSIRVData  exon  10648  10791  .  -  0  gene_id "SIRV1"; transcript_id "SIRV111"; exon_assignment "SIRV111_3";
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[0429]

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SIRV1  LexogenSIRVData  exon  10883  11242  .  -  0  gene_id "SIRV1"; transcript_id "SIRV111"; exon_assignment "SIRV111_4";
SIRV1  LexogenSIRVData  exon  11404  11643  .  -  0  gene_id "SIRV1"; transcript_id "SIRV111"; exon_assignment "SIRV111_5";
SIRV1  LexogenSIRVData  exon  1007   1484   .  -  0  gene_id "SIRV1"; transcript_id "SIRV112"; exon_assignment "SIRV112_0";
SIRV1  LexogenSIRVData  exon  6561   6813   .  -  0  gene_id "SIRV1"; transcript_id "SIRV112"; exon_assignment "SIRV112_1";
SIRV1  LexogenSIRVData  exon  7553   7814   .  -  0  gene_id "SIRV1"; transcript_id "SIRV112"; exon_assignment "SIRV112_2";
SIRV1  LexogenSIRVData  exon  10283  10366  .  -  0  gene_id "SIRV1"; transcript_id "SIRV112"; exon_assignment "SIRV112_3";
SIRV1  LexogenSIRVData  exon  10445  10791  .  -  0  gene_id "SIRV1"; transcript_id "SIRV112"; exon_assignment "SIRV112_4";
SIRV2  LexogenSIRVData  exon  1001   1661   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_0";
SIRV2  LexogenSIRVData  exon  1742   1853   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_1";
SIRV2  LexogenSIRVData  exon  1974   2064   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_2";
SIRV2  LexogenSIRVData  exon  2675   2802   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_3";
SIRV2  LexogenSIRVData  exon  2882   3010   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_4";
SIRV2  LexogenSIRVData  exon  3106   3374   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_5";
SIRV2  LexogenSIRVData  exon  3666   3825   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_6";
SIRV2  LexogenSIRVData  exon  3967   4094   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_7";
SIRV2  LexogenSIRVData  exon  4339   4479   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_8";
SIRV2  LexogenSIRVData  exon  4688   4800   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_9";
SIRV2  LexogenSIRVData  exon  5789   5907   .  -  0  gene_id "SIRV2"; transcript_id "SIRV201"; exon_assignment "SIRV201_10";
SIRV2  LexogenSIRVData  exon  1036   1661   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_0";
SIRV2  LexogenSIRVData  exon  1742   1853   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_1";
SIRV2  LexogenSIRVData  exon  1974   2064   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_2";
SIRV2  LexogenSIRVData  exon  2675   2802   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_3";
SIRV2  LexogenSIRVData  exon  2882   3010   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_4";
SIRV2  LexogenSIRVData  exon  3106   3325   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_5";
SIRV2  LexogenSIRVData  exon  3666   3825   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_6";
SIRV2  LexogenSIRVData  exon  3967   4094   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_7";
SIRV2  LexogenSIRVData  exon  4339   4479   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_8";
SIRV2  LexogenSIRVData  exon  4688   4800   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_9";
SIRV2  LexogenSIRVData  exon  5789   5911   .  -  0  gene_id "SIRV2"; transcript_id "SIRV202"; exon_assignment "SIRV202_10";
SIRV2  LexogenSIRVData  exon  3666   3825   .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_0";
SIRV2  LexogenSIRVData  exon  3967   4094   .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_1";
SIRV2  LexogenSIRVData  exon  4339   4479   .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_2";
SIRV2  LexogenSIRVData  exon  4688   4800   .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_3";
SIRV2  LexogenSIRVData  exon  5752   5895   .  -  0  gene_id "SIRV2"; transcript_id "SIRV203"; exon_assignment "SIRV203_4";
SIRV2  LexogenSIRVData  exon  3644   3825   .  -  0  gene_id "SIRV2"; transcript_id "SIRV204"; exon_assignment "SIRV204_0";
SIRV2  LexogenSIRVData  exon  3967   4479   .  -  0  gene_id "SIRV2"; transcript_id "SIRV204"; exon_assignment "SIRV204_1";
SIRV2  LexogenSIRVData  exon  4688   4732   .  -  0  gene_id "SIRV2"; transcript_id "SIRV204"; exon_assignment "SIRV204_2";
SIRV2  LexogenSIRVData  exon  1109   1631   .  +  0  gene_id "SIRV2"; transcript_id "SIRV205"; exon_assignment "SIRV205_0";
SIRV2  LexogenSIRVData  exon  4034   4457   .  +  0  gene_id "SIRV2"; transcript_id "SIRV206"; exon_assignment "SIRV206_0";
SIRV2  LexogenSIRVData  exon  1001   1661   .  -  0  gene_id "SIRV2"; transcript_id "SIRV207"; exon_assignment "SIRV207_0";
SIRV2  LexogenSIRVData  exon  1742   1853   .  -  0  gene_id "SIRV2"; transcript_id "SIRV207"; exon_assignment "SIRV207_1";
SIRV2  LexogenSIRVData  exon  1974   2064   .  -  0  gene_id "SIRV2"; transcript_id "SIRV207"; exon_assignment "SIRV207_2";
SIRV2  LexogenSIRVData  exon  2675   2802   .  -  0  gene_id "SIRV2"; transcript_id "SIRV207"; exon_assignment "SIRV207_3";
SIRV2  LexogenSIRVData  exon  2882   3010   .  -  0  gene_id "SIRV2"; transcript_id "SIRV207"; exon_assignment "SIRV207_4";
SIRV2  LexogenSIRVData  exon  3106   3374   .  -  0  gene_id "SIRV2"; transcript_id "SIRV207"; exon_assignment "SIRV207_5";
SIRV2  LexogenSIRVData  exon  3666   3825   .  -  0  gene_id "SIRV2"; transcript_id "SIRV207"; exon_assignment "SIRV207_6";
SIRV2  LexogenSIRVData  exon  3967   4479   .  -  0  gene_id "SIRV2"; transcript_id "SIRV207"; exon_assignment "SIRV207_7";
SIRV2  LexogenSIRVData  exon  4688   4732   .  -  0  gene_id "SIRV2"; transcript_id "SIRV207"; exon_assignment "SIRV207_8";
SIRV2  LexogenSIRVData  exon  3666   3825   .  -  0  gene_id "SIRV2"; transcript_id "SIRV208"; exon_assignment "SIRV208_0";
SIRV2  LexogenSIRVData  exon  3967   4479   .  -  0  gene_id "SIRV2"; transcript_id "SIRV208"; exon_assignment "SIRV208_1";
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[0430]

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SIRV2  LexogenSIRVData  exon  4688  4800  .  -  0  gene_id "SIRV2"; transcript_id "SIRV208"; exon_assignment "SIRV208_2";
SIRV2  LexogenSIRVData  exon  5752  5907  .  -  0  gene_id "SIRV2"; transcript_id "SIRV208"; exon_assignment "SIRV208_3";
SIRV2  LexogenSIRVData  exon  1001  1661  .  -  0  gene_id "SIRV2"; transcript_id "SIRV209"; exon_assignment "SIRV209_0";
SIRV2  LexogenSIRVData  exon  1742  1853  .  -  0  gene_id "SIRV2"; transcript_id "SIRV209"; exon_assignment "SIRV209_1";
SIRV2  LexogenSIRVData  exon  1974  2064  .  -  0  gene_id "SIRV2"; transcript_id "SIRV209"; exon_assignment "SIRV209_2";
SIRV2  LexogenSIRVData  exon  2675  2802  .  -  0  gene_id "SIRV2"; transcript_id "SIRV209"; exon_assignment "SIRV209_3";
SIRV2  LexogenSIRVData  exon  2882  2911  .  -  0  gene_id "SIRV2"; transcript_id "SIRV209"; exon_assignment "SIRV209_4";
SIRV3  LexogenSIRVData  exon  1945  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_0";
SIRV3  LexogenSIRVData  exon  4569  4779  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_1";
SIRV3  LexogenSIRVData  exon  6058  7988  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_2";
SIRV3  LexogenSIRVData  exon  8128  8207  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_3";
SIRV3  LexogenSIRVData  exon  8756  8939  .  +  0  gene_id "SIRV3"; transcript_id "SIRV301"; exon_assignment "SIRV301_4";
SIRV3  LexogenSIRVData  exon  1964  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV302"; exon_assignment "SIRV302_0";
SIRV3  LexogenSIRVData  exon  6058  7822  .  +  0  gene_id "SIRV3"; transcript_id "SIRV302"; exon_assignment "SIRV302_1";
SIRV3  LexogenSIRVData  exon  1964  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV303"; exon_assignment "SIRV303_0";
SIRV3  LexogenSIRVData  exon  4569  4779  .  +  0  gene_id "SIRV3"; transcript_id "SIRV303"; exon_assignment "SIRV303_1";
SIRV3  LexogenSIRVData  exon  6058  7822  .  +  0  gene_id "SIRV3"; transcript_id "SIRV303"; exon_assignment "SIRV303_2";
SIRV3  LexogenSIRVData  exon  1964  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_0";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_1";
SIRV3  LexogenSIRVData  exon  4569  4779  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_2";
SIRV3  LexogenSIRVData  exon  6058  6333  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_3";
SIRV3  LexogenSIRVData  exon  7271  7366  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_4";
SIRV3  LexogenSIRVData  exon  7873  7988  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_5";
SIRV3  LexogenSIRVData  exon  8125  8207  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_6";
SIRV3  LexogenSIRVData  exon  8756  8937  .  +  0  gene_id "SIRV3"; transcript_id "SIRV304"; exon_assignment "SIRV304_7";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV305"; exon_assignment "SIRV305_0";
SIRV3  LexogenSIRVData  exon  4569  4779  .  +  0  gene_id "SIRV3"; transcript_id "SIRV305"; exon_assignment "SIRV305_1";
SIRV3  LexogenSIRVData  exon  6571  6718  .  +  0  gene_id "SIRV3"; transcript_id "SIRV305"; exon_assignment "SIRV305_2";
SIRV3  LexogenSIRVData  exon  1945  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV306"; exon_assignment "SIRV306_0";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV306"; exon_assignment "SIRV306_1";
SIRV3  LexogenSIRVData  exon  6058  8292  .  +  0  gene_id "SIRV3"; transcript_id "SIRV306"; exon_assignment "SIRV306_2";
SIRV3  LexogenSIRVData  exon  1964  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_0";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_1";
SIRV3  LexogenSIRVData  exon  4575  4774  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_2";
SIRV3  LexogenSIRVData  exon  6058  6333  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_3";
SIRV3  LexogenSIRVData  exon  8756  8939  .  +  0  gene_id "SIRV3"; transcript_id "SIRV307"; exon_assignment "SIRV307_4";
SIRV3  LexogenSIRVData  exon  1001  1167  .  -  0  gene_id "SIRV3"; transcript_id "SIRV308"; exon_assignment "SIRV308_0";
SIRV3  LexogenSIRVData  exon  1533  1764  .  -  0  gene_id "SIRV3"; transcript_id "SIRV308"; exon_assignment "SIRV308_1";
SIRV3  LexogenSIRVData  exon  1903  1982  .  -  0  gene_id "SIRV3"; transcript_id "SIRV308"; exon_assignment "SIRV308_2";
SIRV3  LexogenSIRVData  exon  8798  8975  .  -  0  gene_id "SIRV3"; transcript_id "SIRV309"; exon_assignment "SIRV309_0";
SIRV3  LexogenSIRVData  exon  9190  9298  .  -  0  gene_id "SIRV3"; transcript_id "SIRV309"; exon_assignment "SIRV309_1";
SIRV3  LexogenSIRVData  exon  9435  9943  .  -  0  gene_id "SIRV3"; transcript_id "SIRV309"; exon_assignment "SIRV309_2";
SIRV3  LexogenSIRVData  exon  8760  8966  .  -  0  gene_id "SIRV3"; transcript_id "SIRV310"; exon_assignment "SIRV310_0";
SIRV3  LexogenSIRVData  exon  9190  9324  .  -  0  gene_id "SIRV3"; transcript_id "SIRV310"; exon_assignment "SIRV310_1";
SIRV3  LexogenSIRVData  exon  9668  9914  .  -  0  gene_id "SIRV3"; transcript_id "SIRV310"; exon_assignment "SIRV310_2";
SIRV3  LexogenSIRVData  exon  4602  4762  .  -  0  gene_id "SIRV3"; transcript_id "SIRV311"; exon_assignment "SIRV311_0";
SIRV3  LexogenSIRVData  exon  8798  8975  .  -  0  gene_id "SIRV3"; transcript_id "SIRV312"; exon_assignment "SIRV312_0";
SIRV3  LexogenSIRVData  exon  9435  9943  .  -  0  gene_id "SIRV3"; transcript_id "SIRV312"; exon_assignment "SIRV312_1";
SIRV3  LexogenSIRVData  exon  1964  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV313"; exon_assignment "SIRV313_0";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV313"; exon_assignment "SIRV313_1";
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SIRV3  LexogenSIRVData  exon  4569  4779  .  +  0  gene_id "SIRV3"; transcript_id "SIRV313"; exon_assignment "SIRV313_2";
SIRV3  LexogenSIRVData  exon  6058  6718  .  +  0  gene_id "SIRV3"; transcript_id "SIRV313"; exon_assignment "SIRV313_3";
SIRV3  LexogenSIRVData  exon  1945  2005  .  +  0  gene_id "SIRV3"; transcript_id "SIRV314"; exon_assignment "SIRV314_0";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV314"; exon_assignment "SIRV314_1";
SIRV3  LexogenSIRVData  exon  4569  4774  .  +  0  gene_id "SIRV3"; transcript_id "SIRV314"; exon_assignment "SIRV314_2";
SIRV3  LexogenSIRVData  exon  6058  8292  .  +  0  gene_id "SIRV3"; transcript_id "SIRV314"; exon_assignment "SIRV314_3";
SIRV3  LexogenSIRVData  exon  4004  4080  .  +  0  gene_id "SIRV3"; transcript_id "SIRV315"; exon_assignment "SIRV315_0";
SIRV3  LexogenSIRVData  exon  6058  7988  .  +  0  gene_id "SIRV3"; transcript_id "SIRV315"; exon_assignment "SIRV315_1";
SIRV3  LexogenSIRVData  exon  8128  8207  .  +  0  gene_id "SIRV3"; transcript_id "SIRV315"; exon_assignment "SIRV315_2";
SIRV3  LexogenSIRVData  exon  8756  8939  .  +  0  gene_id "SIRV3"; transcript_id "SIRV315"; exon_assignment "SIRV315_3";
SIRV4  LexogenSIRVData  exon  8323  8372  .  -  0  gene_id "SIRV4"; transcript_id "SIRV403"; exon_assignment "SIRV403_0";
SIRV4  LexogenSIRVData  exon  8630  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV403"; exon_assignment "SIRV403_1";
SIRV4  LexogenSIRVData  exon  13673  13828  .  -  0  gene_id "SIRV4"; transcript_id "SIRV403"; exon_assignment "SIRV403_2";
SIRV4  LexogenSIRVData  exon  15020  15122  .  -  0  gene_id "SIRV4"; transcript_id "SIRV403"; exon_assignment "SIRV403_3";
SIRV4  LexogenSIRVData  exon  8323  8372  .  -  0  gene_id "SIRV4"; transcript_id "SIRV404"; exon_assignment "SIRV404_0";
SIRV4  LexogenSIRVData  exon  8630  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV404"; exon_assignment "SIRV404_1";
SIRV4  LexogenSIRVData  exon  13673  13822  .  -  0  gene_id "SIRV4"; transcript_id "SIRV404"; exon_assignment "SIRV404_2";
SIRV4  LexogenSIRVData  exon  14593  14623  .  -  0  gene_id "SIRV4"; transcript_id "SIRV404"; exon_assignment "SIRV404_3";
SIRV4  LexogenSIRVData  exon  8630  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV405"; exon_assignment "SIRV405_0";
SIRV4  LexogenSIRVData  exon  13673  13937  .  -  0  gene_id "SIRV4"; transcript_id "SIRV405"; exon_assignment "SIRV405_1";
SIRV4  LexogenSIRVData  exon  3638  4103  .  -  0  gene_id "SIRV4"; transcript_id "SIRV406"; exon_assignment "SIRV406_0";
SIRV4  LexogenSIRVData  exon  5008  5158  .  -  0  gene_id "SIRV4"; transcript_id "SIRV406"; exon_assignment "SIRV406_1";
SIRV4  LexogenSIRVData  exon  8324  8372  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_0";
SIRV4  LexogenSIRVData  exon  8630  8747  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_1";
SIRV4  LexogenSIRVData  exon  8847  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_2";
SIRV4  LexogenSIRVData  exon  13673  13828  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_3";
SIRV4  LexogenSIRVData  exon  15020  15122  .  -  0  gene_id "SIRV4"; transcript_id "SIRV408"; exon_assignment "SIRV408_4";
SIRV4  LexogenSIRVData  exon  1001  1346  .  +  0  gene_id "SIRV4"; transcript_id "SIRV409"; exon_assignment "SIRV409_0";
SIRV4  LexogenSIRVData  exon  1679  1885  .  +  0  gene_id "SIRV4"; transcript_id "SIRV409"; exon_assignment "SIRV409_1";
SIRV4  LexogenSIRVData  exon  2390  3403  .  +  0  gene_id "SIRV4"; transcript_id "SIRV409"; exon_assignment "SIRV409_2";
SIRV4  LexogenSIRVData  exon  1456  1885  .  +  0  gene_id "SIRV4"; transcript_id "SIRV410"; exon_assignment "SIRV410_0";
SIRV4  LexogenSIRVData  exon  2252  2771  .  +  0  gene_id "SIRV4"; transcript_id "SIRV410"; exon_assignment "SIRV410_1";
SIRV4  LexogenSIRVData  exon  2455  3637  .  -  0  gene_id "SIRV4"; transcript_id "SIRV401"; exon_assignment "SIRV401_0";
SIRV4  LexogenSIRVData  exon  4057  4103  .  -  0  gene_id "SIRV4"; transcript_id "SIRV401"; exon_assignment "SIRV401_1";
SIRV4  LexogenSIRVData  exon  5008  5163  .  -  0  gene_id "SIRV4"; transcript_id "SIRV401"; exon_assignment "SIRV401_2";
SIRV4  LexogenSIRVData  exon  7642  7668  .  -  0  gene_id "SIRV4"; transcript_id "SIRV401"; exon_assignment "SIRV401_3";
SIRV4  LexogenSIRVData  exon  7870  7918  .  -  0  gene_id "SIRV4"; transcript_id "SIRV401"; exon_assignment "SIRV401_4";
SIRV4  LexogenSIRVData  exon  8243  8372  .  -  0  gene_id "SIRV4"; transcript_id "SIRV401"; exon_assignment "SIRV401_5";
SIRV4  LexogenSIRVData  exon  8630  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV401"; exon_assignment "SIRV401_6";
SIRV4  LexogenSIRVData  exon  13673  13822  .  -  0  gene_id "SIRV4"; transcript_id "SIRV401"; exon_assignment "SIRV401_7";
SIRV4  LexogenSIRVData  exon  14920  15069  .  -  0  gene_id "SIRV4"; transcript_id "SIRV401"; exon_assignment "SIRV401_8";
SIRV4  LexogenSIRVData  exon  2458  3637  .  -  0  gene_id "SIRV4"; transcript_id "SIRV402"; exon_assignment "SIRV402_0";
SIRV4  LexogenSIRVData  exon  4057  4103  .  -  0  gene_id "SIRV4"; transcript_id "SIRV402"; exon_assignment "SIRV402_1";
SIRV4  LexogenSIRVData  exon  5008  5839  .  -  0  gene_id "SIRV4"; transcript_id "SIRV402"; exon_assignment "SIRV402_2";
SIRV4  LexogenSIRVData  exon  2457  3637  .  -  0  gene_id "SIRV4"; transcript_id "SIRV407"; exon_assignment "SIRV407_0";
SIRV4  LexogenSIRVData  exon  4057  4103  .  -  0  gene_id "SIRV4"; transcript_id "SIRV407"; exon_assignment "SIRV407_1";
SIRV4  LexogenSIRVData  exon  5008  5163  .  -  0  gene_id "SIRV4"; transcript_id "SIRV407"; exon_assignment "SIRV407_2";
SIRV4  LexogenSIRVData  exon  7642  7668  .  -  0  gene_id "SIRV4"; transcript_id "SIRV407"; exon_assignment "SIRV407_3";
SIRV4  LexogenSIRVData  exon  7870  7918  .  -  0  gene_id "SIRV4"; transcript_id "SIRV407"; exon_assignment "SIRV407_4";
SIRV4  LexogenSIRVData  exon  8243  8372  .  -  0  gene_id "SIRV4"; transcript_id "SIRV407"; exon_assignment "SIRV407_5";
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SIRV4  LexogenSIRVData  exon  8630  8990  .  -  0  gene_id "SIRV4"; transcript_id "SIRV407"; exon_assignment "SIRV407_6";
SIRV4  LexogenSIRVData  exon  13673  13826  .  -  0  gene_id "SIRV4"; transcript_id "SIRV407"; exon_assignment "SIRV407_7";
SIRV4  LexogenSIRVData  exon  1456  1885  .  +  0  gene_id "SIRV4"; transcript_id "SIRV411"; exon_assignment "SIRV411_0";
SIRV4  LexogenSIRVData  exon  2390  3403  .  +  0  gene_id "SIRV4"; transcript_id "SIRV411"; exon_assignment "SIRV411_1";
SIRV5  LexogenSIRVData  exon  1057  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_1";
SIRV5  LexogenSIRVData  exon  2120  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_2";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_3";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_4";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_5";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_6";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_7";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_8";
SIRV5  LexogenSIRVData  exon  6659  6722  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_9";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_10";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_11";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_12";
SIRV5  LexogenSIRVData  exon  7871  8016  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_13";
SIRV5  LexogenSIRVData  exon  8278  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_14";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_15";
SIRV5  LexogenSIRVData  exon  10859  10991  .  +  0  gene_id "SIRV5"; transcript_id "SIRV501"; exon_assignment "SIRV501_16";
SIRV5  LexogenSIRVData  exon  1020  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_2";
SIRV5  LexogenSIRVData  exon  2271  2488  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_6";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_9";
SIRV5  LexogenSIRVData  exon  6659  6722  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_10";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_11";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_12";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_13";
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SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV502"; exon_assignment "SIRV502_16";
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SIRV5  LexogenSIRVData  exon  8202  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV503"; exon_assignment "SIRV503_0";
SIRV5  LexogenSIRVData  exon  10859  10991  .  +  0  gene_id "SIRV5"; transcript_id "SIRV503"; exon_assignment "SIRV503_1";
SIRV5  LexogenSIRVData  exon  11134  11142  .  +  0  gene_id "SIRV5"; transcript_id "SIRV503"; exon_assignment "SIRV503_2";
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SIRV5  LexogenSIRVData  exon  1001  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_2";
SIRV5  LexogenSIRVData  exon  2271  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_6";
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[0433]

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SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_9";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_10";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_11";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_12";
SIRV5  LexogenSIRVData  exon  7871  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_13";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_14";
SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV505"; exon_assignment "SIRV505_15";
SIRV5  LexogenSIRVData  exon  1009  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV506"; exon_assignment "SIRV506_0";
SIRV5  LexogenSIRVData  exon  1988  2398  .  +  0  gene_id "SIRV5"; transcript_id "SIRV506"; exon_assignment "SIRV506_1";
SIRV5  LexogenSIRVData  exon  1028  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_0";
SIRV5  LexogenSIRVData  exon  1926  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_2";
SIRV5  LexogenSIRVData  exon  2271  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_4";
SIRV5  LexogenSIRVData  exon  3484  3598  .  +  0  gene_id "SIRV5"; transcript_id "SIRV507"; exon_assignment "SIRV507_5";
SIRV5  LexogenSIRVData  exon  1009  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_2";
SIRV5  LexogenSIRVData  exon  2271  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_6";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_9";
SIRV5  LexogenSIRVData  exon  6659  6722  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_10";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_11";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_12";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_13";
SIRV5  LexogenSIRVData  exon  7871  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_14";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_15";
SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV508"; exon_assignment "SIRV508_16";
SIRV5  LexogenSIRVData  exon  8316  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV509"; exon_assignment "SIRV509_0";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV509"; exon_assignment "SIRV509_1";
SIRV5  LexogenSIRVData  exon  10859 10991 .  +  0  gene_id "SIRV5"; transcript_id "SIRV509"; exon_assignment "SIRV509_2";
SIRV5  LexogenSIRVData  exon  11312 11866 .  +  0  gene_id "SIRV5"; transcript_id "SIRV509"; exon_assignment "SIRV509_3";
SIRV5  LexogenSIRVData  exon  1029  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_2";
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SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_6";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_9";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_10";
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[0434]

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SIRV5  LexogenSIRVData  exon  11134  11867  .  +  0  gene_id "SIRV5"; transcript_id "SIRV510"; exon_assignment "SIRV510_17";
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SIRV5  LexogenSIRVData  exon  1988  2398  .  +  0  gene_id "SIRV5"; transcript_id "SIRV511"; exon_assignment "SIRV511_1";
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SIRV5  LexogenSIRVData  exon  10859  10991  .  +  0  gene_id "SIRV5"; transcript_id "SIRV513"; exon_assignment "SIRV513_13";
SIRV5  LexogenSIRVData  exon  11312  11866  .  +  0  gene_id "SIRV5"; transcript_id "SIRV513"; exon_assignment "SIRV513_14";
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SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV514"; exon_assignment "SIRV514_11";
SIRV5  LexogenSIRVData  exon  7871  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV514"; exon_assignment "SIRV514_12";
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SIRV5  LexogenSIRVData  exon  11134  13606  .  +  0  gene_id "SIRV5"; transcript_id "SIRV514"; exon_assignment "SIRV514_14";
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SIRV5  LexogenSIRVData  exon  2120  2315  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_2";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_3";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_4";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_5";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_6";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_7";
SIRV5  LexogenSIRVData  exon  6659  6722  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_8";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_9";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_10";
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[0435]

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SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_11";
SIRV5  LexogenSIRVData  exon  7871  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_12";
SIRV5  LexogenSIRVData  exon  10859  10991  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_13";
SIRV5  LexogenSIRVData  exon  11134  11309  .  +  0  gene_id "SIRV5"; transcript_id "SIRV515"; exon_assignment "SIRV515_14";
SIRV5  LexogenSIRVData  exon  8202  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV516"; exon_assignment "SIRV516_0";
SIRV5  LexogenSIRVData  exon  10859  10991  .  +  0  gene_id "SIRV5"; transcript_id "SIRV516"; exon_assignment "SIRV516_1";
SIRV5  LexogenSIRVData  exon  11134  13606  .  +  0  gene_id "SIRV5"; transcript_id "SIRV516"; exon_assignment "SIRV516_2";
SIRV5  LexogenSIRVData  exon  1057  1149  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_0";
SIRV5  LexogenSIRVData  exon  1988  2033  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_1";
SIRV5  LexogenSIRVData  exon  2120  2156  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_2";
SIRV5  LexogenSIRVData  exon  2271  2488  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_3";
SIRV5  LexogenSIRVData  exon  3299  3404  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_4";
SIRV5  LexogenSIRVData  exon  3484  3643  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_5";
SIRV5  LexogenSIRVData  exon  5381  5450  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_6";
SIRV5  LexogenSIRVData  exon  5544  5626  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_7";
SIRV5  LexogenSIRVData  exon  6112  6169  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_8";
SIRV5  LexogenSIRVData  exon  6328  6452  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_9";
SIRV5  LexogenSIRVData  exon  6659  6722  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_10";
SIRV5  LexogenSIRVData  exon  6827  6957  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_11";
SIRV5  LexogenSIRVData  exon  7145  7307  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_12";
SIRV5  LexogenSIRVData  exon  7682  7762  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_13";
SIRV5  LexogenSIRVData  exon  7871  8381  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_14";
SIRV5  LexogenSIRVData  exon  8455  8585  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_15";
SIRV5  LexogenSIRVData  exon  10859  10989  .  +  0  gene_id "SIRV5"; transcript_id "SIRV517"; exon_assignment "SIRV517_16";
SIRV6  LexogenSIRVData  exon  1001  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_2";
SIRV6  LexogenSIRVData  exon  2471  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_3";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_4";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_5";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_6";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_7";
SIRV6  LexogenSIRVData  exon  11206  11826  .  +  0  gene_id "SIRV6"; transcript_id "SIRV601"; exon_assignment "SIRV601_8";
SIRV6  LexogenSIRVData  exon  1125  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_2";
SIRV6  LexogenSIRVData  exon  2781  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_3";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_4";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_5";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_6";
SIRV6  LexogenSIRVData  exon  11206  11279  .  +  0  gene_id "SIRV6"; transcript_id "SIRV602"; exon_assignment "SIRV602_7";
SIRV6  LexogenSIRVData  exon  9000  10968  .  +  0  gene_id "SIRV6"; transcript_id "SIRV603"; exon_assignment "SIRV603_0";
SIRV6  LexogenSIRVData  exon  1088  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_2";
SIRV6  LexogenSIRVData  exon  1846  2026  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_3";
SIRV6  LexogenSIRVData  exon  2471  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_4";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_5";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_6";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_7";
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SIRV6  LexogenSIRVData  exon  11035  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_8";
SIRV6  LexogenSIRVData  exon  11206  11837  .  +  0  gene_id "SIRV6"; transcript_id "SIRV604"; exon_assignment "SIRV604_9";
SIRV6  LexogenSIRVData  exon  1131  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_2";
SIRV6  LexogenSIRVData  exon  1846  2026  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_3";
SIRV6  LexogenSIRVData  exon  2471  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_4";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_5";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_6";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_7";
SIRV6  LexogenSIRVData  exon  11032  11331  .  +  0  gene_id "SIRV6"; transcript_id "SIRV605"; exon_assignment "SIRV605_8";
SIRV6  LexogenSIRVData  exon  2286  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_0";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_1";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_2";
SIRV6  LexogenSIRVData  exon  10725  10788  .  +  0  gene_id "SIRV6"; transcript_id "SIRV606"; exon_assignment "SIRV606_3";
SIRV6  LexogenSIRVData  exon  1131  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_0";
SIRV6  LexogenSIRVData  exon  1469  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_1";
SIRV6  LexogenSIRVData  exon  1846  2026  .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_2";
SIRV6  LexogenSIRVData  exon  2471  2540  .  +  0  gene_id "SIRV6"; transcript_id "SIRV607"; exon_assignment "SIRV607_3";
SIRV6  LexogenSIRVData  exon  3024  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV608"; exon_assignment "SIRV608_0";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV608"; exon_assignment "SIRV608_1";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV608"; exon_assignment "SIRV608_2";
SIRV6  LexogenSIRVData  exon  11206  11270  .  +  0  gene_id "SIRV6"; transcript_id "SIRV608"; exon_assignment "SIRV608_3";
SIRV6  LexogenSIRVData  exon  1138  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_2";
SIRV6  LexogenSIRVData  exon  1846  2120  .  +  0  gene_id "SIRV6"; transcript_id "SIRV609"; exon_assignment "SIRV609_3";
SIRV6  LexogenSIRVData  exon  2473  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_0";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_1";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_2";
SIRV6  LexogenSIRVData  exon  10725  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_3";
SIRV6  LexogenSIRVData  exon  11206  11690  .  +  0  gene_id "SIRV6"; transcript_id "SIRV610"; exon_assignment "SIRV610_4";
SIRV6  LexogenSIRVData  exon  1304  1381  .  +  0  gene_id "SIRV6"; transcript_id "SIRV611"; exon_assignment "SIRV611_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV611"; exon_assignment "SIRV611_1";
SIRV6  LexogenSIRVData  exon  1641  1950  .  +  0  gene_id "SIRV6"; transcript_id "SIRV611"; exon_assignment "SIRV611_2";
SIRV6  LexogenSIRVData  exon  1088  1186  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_0";
SIRV6  LexogenSIRVData  exon  1469  1534  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_1";
SIRV6  LexogenSIRVData  exon  1641  1735  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_2";
SIRV6  LexogenSIRVData  exon  1846  2026  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_3";
SIRV6  LexogenSIRVData  exon  2471  2620  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_4";
SIRV6  LexogenSIRVData  exon  2741  2828  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_5";
SIRV6  LexogenSIRVData  exon  3107  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_6";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_7";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_8";
SIRV6  LexogenSIRVData  exon  11206  11825  .  +  0  gene_id "SIRV6"; transcript_id "SIRV612"; exon_assignment "SIRV612_9";
SIRV6  LexogenSIRVData  exon  3106  3164  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_0";
SIRV6  LexogenSIRVData  exon  7105  7448  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_1";
SIRV6  LexogenSIRVData  exon  7806  7923  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_2";
SIRV6  LexogenSIRVData  exon  10725  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_3";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_4";
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SIRV6  LexogenSIRVData  exon  11206  11824  .  +  0  gene_id "SIRV6"; transcript_id "SIRV613"; exon_assignment "SIRV613_5";
SIRV6  LexogenSIRVData  exon  2517   2620   .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_0";
SIRV6  LexogenSIRVData  exon  2741   2828   .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_1";
SIRV6  LexogenSIRVData  exon  3107   3164   .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_2";
SIRV6  LexogenSIRVData  exon  7806   7923   .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_3";
SIRV6  LexogenSIRVData  exon  10725  10815  .  +  0  gene_id "SIRV6"; transcript_id "SIRV614"; exon_assignment "SIRV614_4";
SIRV6  LexogenSIRVData  exon  10238  10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV615"; exon_assignment "SIRV615_0";
SIRV6  LexogenSIRVData  exon  11032  11108  .  +  0  gene_id "SIRV6"; transcript_id "SIRV615"; exon_assignment "SIRV615_1";
SIRV6  LexogenSIRVData  exon  11206  11330  .  +  0  gene_id "SIRV6"; transcript_id "SIRV615"; exon_assignment "SIRV615_2";
SIRV6  LexogenSIRVData  exon  2286   2620   .  +  0  gene_id "SIRV6"; transcript_id "SIRV616"; exon_assignment "SIRV616_0";
SIRV6  LexogenSIRVData  exon  2741   2814   .  +  0  gene_id "SIRV6"; transcript_id "SIRV616"; exon_assignment "SIRV616_1";
SIRV6  LexogenSIRVData  exon  3107   3164   .  +  0  gene_id "SIRV6"; transcript_id "SIRV616"; exon_assignment "SIRV616_2";
SIRV6  LexogenSIRVData  exon  10725  10788  .  +  0  gene_id "SIRV6"; transcript_id "SIRV616"; exon_assignment "SIRV616_3";
SIRV6  LexogenSIRVData  exon  1545   1820   .  -  0  gene_id "SIRV6"; transcript_id "SIRV617"; exon_assignment "SIRV617_0";
SIRV6  LexogenSIRVData  exon  2359   2547   .  -  0  gene_id "SIRV6"; transcript_id "SIRV618"; exon_assignment "SIRV618_0";
SIRV6  LexogenSIRVData  exon  1125   1186   .  +  0  gene_id "SIRV6"; transcript_id "SIRV619"; exon_assignment "SIRV619_0";
SIRV6  LexogenSIRVData  exon  1304   1381   .  +  0  gene_id "SIRV6"; transcript_id "SIRV619"; exon_assignment "SIRV619_1";
SIRV6  LexogenSIRVData  exon  1469   2120   .  +  0  gene_id "SIRV6"; transcript_id "SIRV619"; exon_assignment "SIRV619_2";
SIRV6  LexogenSIRVData  exon  2286   2620   .  +  0  gene_id "SIRV6"; transcript_id "SIRV619"; exon_assignment "SIRV619_3";
SIRV6  LexogenSIRVData  exon  2741   2828   .  +  0  gene_id "SIRV6"; transcript_id "SIRV619"; exon_assignment "SIRV619_4";
SIRV6  LexogenSIRVData  exon  3024   3164   .  +  0  gene_id "SIRV6"; transcript_id "SIRV619"; exon_assignment "SIRV619_5";
SIRV6  LexogenSIRVData  exon  7105   7448   .  +  0  gene_id "SIRV6"; transcript_id "SIRV619"; exon_assignment "SIRV619_6";
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SIRV6  LexogenSIRVData  exon  9000   11825  .  +  0  gene_id "SIRV6"; transcript_id "SIRV619"; exon_assignment "SIRV619_8";
SIRV6  LexogenSIRVData  exon  9000   10818  .  +  0  gene_id "SIRV6"; transcript_id "SIRV620"; exon_assignment "SIRV620_0";
SIRV6  LexogenSIRVData  exon  11206  11837  .  +  0  gene_id "SIRV6"; transcript_id "SIRV620"; exon_assignment "SIRV620_1";
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[0074] <211> 1393

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[0077] <220>

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[0107] <213> 人工序列

[0108] <220>

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[0113] gaaacggtct gttcctcgtg tcaagttctt tgtccgctta taccgccatc tctcgttgtg 180

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[0136] <211> 700

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[0138] <213> 人工序列

[0139] <220>

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[0155] <211> 1003

[0156] <212> DNA

[0157] <213> 人工序列

[0158] <220>

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[0181] <213> 人工序列

[0182] <220>

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[0319] <212> DNA

[0320] <213> 人工序列

[0321] <220>

[0322] <223> 转录物变体

[0323] <400> 12

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[0325] accctaccga aacagcaata attgtagaag gtagcatatc atgccgagtc atcgacatgc 120

[0326] ctttatcgac acacgacgtg attggagttt actacgttgt agcgagttta gttgaaatag 180

[0327] tttgtgatgt gtaaactaaa acataccaaa tggtaaaact tgtcaccccc atttacattg 240

[0328] cgacagacac agttatggag tggatggaag tgtgttcgac tgtcaagacc cttctataat 300

[0329] agtcgaacca gtacggtaag tgggcaacat gcccatataa gtcgaagcat ttcaaatggt 360

[0330] tcatccagta gacgacgatg tcctagacag tcatgtctct tccccatttg aagtcatgta 420

[0331] gtggttgtct acttttttcat tgaagacgtc cacctcaacg ctatgaacgt tagttgagac 480

[0332] aatgttaaag caaacgacaa cgtcattgtg atctacatac acagtggatg gttagcgtaa 540

[0333] acatggtgga acgtactttg actgcgctgc aagaaatggt tgggtcgatc gtaatgctag 600

[0334] tcgttacatc ggaacaagcc aaaacaaatc attcgctgga tttagaccta ctgcacgacg 660

[0335] acgtcgacac aagacattct tgaaagaaaa aaaaaaaaaa aaaaaaaaaa aaaaaa 716

[0336] <210> 13

[0337] <211> 770

[0338] <212> DNA

[0339] <213> 人工序列

[0340] <220>

[0341] <223> 转录物变体

[0342] <400> 13

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[0344] tgttcgactg tcaagaccct tctataatag tcgaaccagt acggtaagtg ggcaacatgc 120

[0345] ccatataagt cgaagcattt caaatggttc atccagtaga cgacgatgtc ctagacagtc 180

[0346] atgtctgtca catctatcac gcctcctacg ttgtgccata acgaagaata atagtgataa 240

[0347] gagacatcga agctgtcgta gtcgttcgct aaattgctta caatttagtg ctctaagtga 300

[0348] acaatgtttc atcttgagaa gcaaacgaag tagaagttga cgacgcattc gaagacgtgg 360

[0349] acaatgtgac acgagtatcg aaacatgatc caacgaacat cgaagaagtt actactgaac 420

[0350] tacgggtcag cttccccatt tgaagtcatg tagtggttgt ctacttttтc attgaagacg 480

[0351] tccacctcaa cgctatgaac gttagttgag acaatgttaa agcaaacgac aacgtcattg 540

[0352] tgatctacat acacagtgga tggttagcgt aaacatggtg gaacgtactt tgactgcgct 600

[0353] gcaagaaatg gttgggtcga tcgtaatgct agtcgttaca tcggaacaag ccaaaacaaa 660

[0354] tcattcgctg gatttagacc tactgcacga cgacgtcgac acaagacatt cttgaaaggt 720

[0355] aattgacgtg gacgtttcag aaaaaaaaaa aaaaaaaaaa aaaaaaaaaa 770

[0356] <210> 14

[0357] <211> 553

[0358] <212> DNA

[0359] <213> 人工序列

[0360] <220>

[0361] <223> 转录物变体

[0362] <400> 14

[0363] gccgcatcga ccaaatcatg gctttgcact ccaactttgc ctgaatcgtg tcagactata 60

[0364] gcgggacgtt cgaccatact actcattcga ttacgcattc acctgacgag aatagccatt 120

[0365] cttcctgaac atacgttaga agtagttggt taatgcttgt ctacatttga gtgcgaagcc 180

[0366] actaggtttg cactgttgac caccagcacg caatcgcaag atacgcagta atgctaaacc 240

[0367] atacttattt gactttgatg ttctatcact gggttaatgc ctgctgctac ctgactttta 300

[0368] gtcgcgagca caacgcttct tggctacaca tatgctgttg ggaatgtttt ttacacttat 360

[0369] tatgctataa ataccactcc cacagctatt cgaatgactc taatacctct tgcaacttgg 420

[0370] acgaccgtag tacgcattca gtccgagtac caagataatg ctctttcttc tgccactcgt 480

[0371] ctaacttcgt cggctccgtg aacaagcatt cttcctacta ggcaaaaaaa aaaaaaaaaa 540

[0372] aaaaaaaaaa aaa 553

[0373] <210> 15

[0374] <211> 454

[0375] <212> DNA

[0376] <213> 人工序列

[0377] <220>

[0378] <223> 转录物变体

[0379] <400> 15

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[0381] gctgacccgt agttcagtag taacttcttc gatgttcgtt ggatcatgtt tcgatactcg 120

[0382] tgtcacattg tccacgtctt cgaatgcgtc gtcaacttct acttcgtttg cttctcaaga 180

[0383] tgaaacattg ttcacttaga gcactaaatt gtaagcaatt tagcgaacga ctacgacagc 240

[0384] ttcgatgtct cttatcacta ttattcttcg ttatggcaca acgtaggagg cgtgatagat 300

[0385] gtgacagaca tgactgtcta ggacatcgtc gtctactgga tgaaccattt gaaatgcttc 360

[0386] gacttatatg ggcatgttgc ccacttaccg tactggttcg actattatag aagggtcttg 420

[0387] acagaaaaaa aaaaaaaaaa aaaaaaaaaa aaaa 454

[0388] <210> 16

[0389] <211> 2497

[0390] <212> DNA

[0391] <213> 人工序列

[0392] <220>

[0393] <223> 转录物变体

[0394] <400> 16

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[0396] ggattagata gtaaaagtcg aaatctttat attcggttcg atgtactacg ttattcgcga 120

[0397] ctgttctgtc atgatagttt tttatatagt cctaataaaa ggagttttta aagtaaatga 180

[0398] catttcagta gtaaaagttt aagagctttt tgttctgcca gacgttctga tagttgagga 240

[0399] aaacgtgtgg tcagctaata acttgtggta tggagtaaac gaacatccaa cagtatgtac 300

[0400] aatcgtatga gaaaggacaa atctgaagac gatattagag ggagtccaac aagtttgtga 360

[0401] tgattcacgt aaggaaatcg aaatgtaaga ttattcgtca atggaggtat aagacaacac 420

[0402] accaagtaat tatacgcgac gagttttcat gttgacgatc cctgagacta tatcatacaa 480

[0403] aattgaccca aataataaac tcgttccaat agttgaagtg ttgattaaca cattgagaca 540

[0404] agttgtccgt actttaatca tcaaagtttt ggactgacct ataaatgaaa tattcgcgtt 600

[0405] gtcttcagtt taagaagtga tattattttc ggtttcaagc ctatgtggag agatacagga 660

[0406] aataggtaaa ctataactaa tataaatata cgcagacgaa gcctgttaac tttaccaaat 720

[0407] ccaaatagcg ggagacacta aacttacaag aaatgtacgg taagacaggg aaacagggtt 780

[0408] tgaagtttgg aggtacaaaa tcttaatcct tcacaactga atcaacattt acattcggtt 840

[0409] acgttcgggg tttgtagtag taattgttga ggtaatttta attgcactta cagacgtgga 900

[0410] tttggtgaaa cattatgtgg tagattcata tttccgaatc ttaatagacg attttatgat 960

[0411] ggtgatcgtg gtttcttttc aaggtttggt ggacgaaaat gaaaaaatca caatttaacg 1020

[0412] tttcatattc atcacaatcc gaaatcgaga tggagagaaa gtttgactaa actttgttac 1080

[0413] agtatttttg aaggcaatca acctggaact ttggatttca tcaagtaaac acccatattt 1140

[0414] agcgaaaatg caagctaact gcgaactaac aaggtaactc tttttcgatt tcaaaatatg 1200

[0415] gtcagtagca atatgttaag tgatccattt tggaggggtg gggatttgtt caatgaatga 1260

[0416] ggcaataaac caccgcaacc tctgtaattg acgagaaact tgtataaggt catcaaaaag 1320

[0417] aatagatgaa cataaagatt gaatacggct gggtgaggtt aattcagatt tcccaaatta 1380

[0418] tgtagatgaa aagatggtaa gtttattgat aggtaaaaaa tcaagagagg gtaataaaga 1440

[0419] agaaagaata atcaaaagat agagcatgca aacattacat ggtagtattg ttataggcgg 1500

[0420] tatattggta aatgacgatc cttgacttag ttttttacat cgaacggttg caaatcctag 1560

[0421] catacttgat attaatagta gatactgaaa tatatctgag tatatcaagg gaaatcgaga 1620

[0422] tgtaacaata agtcgaggaa attaaggtca atttagtgct tatcatagaa ataactactt 1680

[0423] aagcccttaa cgaactaact caaattaacg aggtagaggt tattctgaat tgtacgaacg 1740

[0424] tagtcgaagt ttgttaccaa gggtaaagcc aaaacaaaac gatttgacaa gagaatctat 1800

[0425] tccatgtagt agtgcgtttg tacgacgttc tattcgatgt aaatcattag gacgagggtt 1860

[0426] tgaagcaact cggaaagatg gtcggttaga atttaaaagt actgaacgga attaacgaag 1920

[0427] ttggctacta cctaatagtc tttgcttagg atttagtagt tcgcaattgg gtcaaagtgg 1980

[0428] tcgctttggt cgtcgacgtc aagactcaac aagtcattta ccgctgtacg aaccatctca 2040

[0429] tttaacaggt tctcaaccaa atagcggtag gagtagaaag cacttaccat cgtacgaact 2100

[0430] ttgacaacga aaggttcaaa ggtaaccaag gcgtagtagt gagttaggtc aatgtataaa 2160

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[0432] attattagac aagatagtcc gttctttagt cgaagttctt gttgtaataa caaaagtaga 2280

[0433] gcagattacg atccgaaatt tcatggacac agatatttga gatcaacatt tgattcgttg 2340

[0434] acgtatttat gttgattcgg ttagcgagag ttacaaagtt agtaatagaa agaaagagga 2400

[0435] aataataatc aaaagattaa gcatgcaaac attaagagga cacatatgta ttggtggcat 2460

[0436] ttgcgttaaa aaaaaaaaaa aaaaaaaaaa aaaaaaa 2497

[0437] <210> 17

[0438] <211> 1837

[0439] <212> DNA

[0440] <213> 人工序列

[0441] <220>

[0442] <223> 转录物变体

[0443] <400> 17

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[0445] cagtatgtac aatcgtatga gaaaggacaa atctgaagac gatattagag ggagtccaac 120

[0446] aagtttgtga tgattcacgt aaggaaatcg aaatgtaaga ttattcgtca atggaggtat 180

[0447] aagacaacac accaagtaat tatacgcgac gagttttcat gttgacgatc cctgagacta 240

[0448] tatcatacaa aattgaccca aataataaac tcgttccaat agttgaagtg ttgattaaca 300

[0449] cattgagaca agttgtccgt actttaatca tcaaagtttt ggactgacct ataaatgaaa 360

[0450] tattcgcgtt gtcttcagtt taagaagtga tattattttc ggtttcaagc ctatgtggag 420

[0451] agatacagga aataggtaaa ctataactaa tataaatata cgcagacgaa gcctgttaac 480

[0452] tttaccaaat ccaaatagcg ggagacacta aacttacaag aaatgtacgg taagacaggg 540

[0453] aaacagggtt tgaagtttgg aggtacaaaa tcttaatcct tcacaactga atcaacattt 600

[0454] acattcggtt acgttcgggg tttgtagtag taattgttga ggtaatttta attgcactta 660

[0455] cagacgtgga tttggtgaaa cattatgtgg tagattcata tttccgaatc ttaatagacg 720

[0456] attttatgat ggtgatcgtg gtttcttttc aaggtttggt ggacgaaaat gaaaaaatca 780

[0457] caatttaacg tttcatattc atcacaatcc gaaatcgaga tggagagaaa gtttgactaa 840

[0458] actttgttac agtatttttg aaggcaatca acctggaact ttggatttca tcaagtaaac 900

[0459] acccatattt agcgaaaatg caagctaact gcgaactaac aaggtaactc tttttcgatt 960

[0460] tcaaaatatg gtcagtagca atatgttaag tgatccattt tggaggggtg gggatttgtt 1020

[0461] caatgaatga ggcaataaac caccgcaacc tctgtaattg acgagaaact tgtataaggt 1080

[0462] catcaaaaag aatagatgaa cataaagatt gaatacggct gggtgaggtt aattcagatt 1140

[0463] tcccaaatta tgtagatgaa aagatggtaa gtttattgat aggtaaaaaa tcaagagagg 1200

[0464] gtaataaaga agaaagaata atcaaaagat agagcatgca aacattacat ggtagtattg 1260

[0465] ttataggcgg tatattggta aatgacgatc cttgacttag ttttttacat cgaacggttg 1320

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[0467] gaaatcgaga tgtaacaata agtcgaggaa attaaggtca atttagtgct tatcatagaa 1440

[0468] ataactactt aagcccttaa cgaactaact caaattaacg aggtagaggt tattctgaat 1500

[0469] tgtacgaacg tagtcgaagt ttgttaccaa gggtaaagcc aaaacaaaac gatttgacaa 1560

[0470] gagaatctat tccatgtagt agtgcgtttg tacgacgttc tattcgatgt aaatcattag 1620

[0471] gacgagggtt tgaagcaact cggaaagatg gtcggttaga atttaaaagt actgaacgga 1680

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[0473] gtcaaagtgg tcgctttggt cgtcgacgtc aagactcaac aagtcattta ccgctgtacg 1800

[0474] aaccatcaaa aaaaaaaaaa aaaaaaaaaa aaaaaaa 1837

[0475] <210> 18

[0476] <211> 2048

[0477] <212> DNA

[0478] <213> 人工序列

[0479] <220>

[0480] <223> 转录物变体

[0481] <400> 18

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[0483] gaaatcttta tattcggttc gatgtactac gttattcgcg actgttctgt catgatagtt 120

[0484] ttttatatag tcctaataaa aggagttttt aaagtaaatg acatttcagt agtaaaagtt 180

[0485] taagagcttt ttgttctgcc agacgttctg atagttgagg aaaacgtgtg gtcagctaat 240

[0486] aacttgtggt atggagtaaa cgaacatcca acagtatgta caatcgtatg agaaaggaca 300

[0487] aatctgaaga cgatattaga gggagtccaa caagtttgtg atgattcacg taaggaaatc 360

[0488] gaaatgtaag attattcgtc aatggaggta taagacaaca caccaagtaa ttatacgcga 420

[0489] cgagttttca tgttgacgat ccctgagact atatcataca aaattgaccc aaataataaa 480

[0490] ctcgttccaa tagttgaagt gttgattaac acattgagac aagttgtccg tactttaatc 540

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[0492] atattatttt cggtttcaag cctatgtgga gagatacagg aaataggtaa actataacta 660

[0493] atataaatat acgcagacga agcctgttaa ctttaccaaa tccaaatagc gggagacact 720

[0494] aaacttacaa gaaatgtacg gtaagacagg gaaacagggt ttgaagtttg gaggtacaaa 780

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[0497] gtagattcat atttccgaat cttaatagac gattttatga tggtgatcgt ggtttctttt 960

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[0499] cgaaatcgag atggagagaa agtttgacta aactttgtta cagtattttt gaaggcaatc 1080

[0500] aacctggaac tttggatttc atcaagtaaa cacccatatt tagcgaaaat gcaagctaac 1140

[0501] tgcgaactaa caaggtaact ctttttcgat ttcaaaatat ggtcagtagc aatatgttaa 1200

[0502] gtgatccatt ttggaggggt ggggatttgt tcaatgaatg aggcaataaa ccaccgcaac 1260

[0503] ctctgtaatt gacgagaaac ttgtataagg tcatcaaaaa gaatagatga acataaagat 1320

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[0523] <400> 19
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[0542] gcgaaaaaaa aaaaaaaaaa aaaaaaaaaa aaa 1113
[0543] <210> 20
[0544] <211> 466
[0545] <212> DNA

[0546] <213> 人工序列

[0547] <220>

[0548] <223> 转录物变体

[0549] <400> 20

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[0551] aacaagtatc gcgtatggat tagatagtaa aagtcgaaat ctttatattc ggttcgatgt 120

[0552] actacgttat tcgcgactgt tctgtcatga tagtttttta tatagtccta ataaaaggag 180

[0553] tttttaaagt aaatgacatt tcagtagtaa aagtttaaga gctttttgtt ctgccagacg 240

[0554] ttctgatagt tgaggaaaac gtgtggtcag ctaataactt gtggtatgtt tggaggtaca 300

[0555] aaatcttaat ccttcacaac tgaatcaaca tttacattcg gttacgttcg gggtttgtag 360

[0556] tagtaattgt tgaggtaatt ttaattgcac ttacagacgt ggatttggtg aaacattatg 420

[0557] tggtagattc atatttaaaa aaaaaaaaaa aaaaaaaaaa aaaaaa 466

[0558] <210> 21

[0559] <211> 2403

[0560] <212> DNA

[0561] <213> 人工序列

[0562] <220>

[0563] <223> 转录物变体

[0564] <400> 21

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[0566] ggtacgaatt acgaacacct taacattagg gaaacttaga tagttgtaca aagtaacgta 120

[0567] taacaagtat cgcgtatgga gtaaacgaac atccaacagt atgtacaatc gtatgagaaa 180

[0568] ggacaaatct gaagacgata ttagagggag tccaacaagt ttgtgatgat tcacgtaagg 240

[0569] aaatcgaaat gtaagattat tcgtcaatgg aggtataaga caacacacca agtaattata 300

[0570] cgcgacgagt tttcatgttg acgatccctg agactatatc atacaaaatt gacccaaata 360

[0571] ataaactcgt tccaatagtt gaagtgttga ttaacacatt gagacaagtt gtccgtactt 420

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[0574] aactaatata aatatacgca gacgaagcct gttaacttta ccaaatccaa atagcgggag 600

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[0631] <220>

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[0668] <220>

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[0749] acgtatggtc tgtttacata agctcaaaaa taattttaca gggtaaaacg tcaatcatta 240

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[0803] <213> 人工序列

[0804] <220>

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[0809] aggaaaatgg gtaaggcata tgccttacta aattgtgtaa aagaagttct aataagaacc 180

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[0827] gaacaactaa aagaactaaa agagaagaac gacgtgcacg tgctaattat gcgaattaac 180

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[0834] aggacgatgg ccactacgga gtggaacaca aaggtaaagt tgcaataata accagtacaa 600

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[0839] <213> 人工序列

[0840] <220>

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[1370] <210> 50

[1371] <211> 604

[1372] <212> DNA

[1373] <213> 人工序列

[1374] <220>

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[1381] tcttcggtct tacaaatgtt gcaatgccct gtgagctact tatgaaacat gaatggtcgg 300

[1382] tcttgtggtc gcttttgtcg aaatcaccga agtgcgtata attgatgaac gagtcgaagt 360

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[1389] <211> 1999

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[1392] <220>

[1393] <223> 转录物变体

[1394] <400> 51

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[1401] aagtctttga agggttggac atagcgagtt gtgtagaaag ttacgaagac ttcaacagaa 420

[1402] aaagagttta aaaggaccac gtatgccaaa tcgacaacaa tatagtcgtt ctattctgcg 480

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[1428] aaaaaaaaaa aaaaaaaaa 1999

[1429] <210> 52

[1430] <211> 1567

[1431] <212> DNA

[1432] <213> 人工序列

[1433] <220>

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[1435] <400> 52

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[1441] gtcgcccagc ggtggcatat gtcttgccta acgtttctag accgatcagc ctcacgagta 360

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[1443] ctattgtcgg cctggatgca attgtgctcg ccatttcaac tagtgcagtt gctaaagtgc 480

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[1467] <220>

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[1469] <400> 53

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[1506] <210> 55
[1507] <211> 604
[1508] <212> DNA
[1509] <213> 人工序列
[1510] <220>
[1511] <223> 转录物变体

[1512] <400> 55

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[1523] aaaa 604

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[1525] <211> 407

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[1527] <213> 人工序列

[1528] <220>

[1529] <223> 转录物变体

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[1534] ttcaacaaga gagttaggta gtgccgcttg aaaaagtaat agtgcaaata agaaaaagaa 240

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[1536] aagaaattta aatttaattt accatttcgt cattgtatat gcggtaaacg taaatttaca 360

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[1538] <210> 57

[1539] <211> 515

[1540] <212> DNA

[1541] <213> 人工序列

[1542] <220>

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[1548] ctacggtcaa agacgcttcc acaccacatg ctctcatgta gcctacctta cgaagaaatc 240

[1549] gcacaagtcg gtcgcccagc ggtggcatat gtcttgccta acgtttctag accgatcagc 300

[1550] ctcacgagta gcctgcttgt ggtgtttata gtttacgcta gtccaatctg tatcgtgccg 360

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[1552] gctataatct acgcaataga ggcaccagcg gtcgttgaag ccgaagacgc tatttcggtg 480

[1553] gcttgaaaaa aaaaaaaaaa aaaaaaaaaa aaaaa 515

[1554] <210> 58

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[1556] <212> DNA

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[1558] <220>

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[1560] <400> 58

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[1583] <212> DNA

[1584] <213> 人工序列

[1585] <220>

[1586] <223> 转录物变体

[1587] <400> 59

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[1591] acaagacgcc attgcaaaac gtctatacgc tacggtcaaa gacgcttcca caccacatgg 240

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[1594] cctaccttac gaagaaatcg cacaagtcgg tcgcccagcg gtggcatatg tcttgcctaa 420

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[1597] <210> 60

[1598] <211> 1558

[1599] <212> DNA

[1600] <213> 人工序列

[1601] <220>

[1602] <223> 转录物变体

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[1606] ttgttggaca aacagttatg cgtaactgta aagcaaggtg cccaaagtag actgagcgac 180

[1607] agtcgaaacc agccccaatg aacaagacgc cattgcaaaa cgtctatacg ctacggtcaa 240

[1608] agacgcttcc acaccacatg ctctcatgta gcctaccttа cgaagaaatc gcacaagtcg 300

[1609] gtcgcccagc ggtggcatat gtcttgccta acgtttctag accgatcagc ctcacgagta 360

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[1617] acaagagagt taggtagtgc cgcttgaaaa agtaatagtg caaataagaa aaagaagcga 840

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[2021] <220>

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[2689] <220>

[2690] <223> 转录物变体

[2691] <400> 99

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[2698] tgctaccaag cgacctaacc accttcaccg tcttacgaga cgttaaccta acgcaaatgc 420

[2699] caccaataca tatgtgtcct cttaatgttt gcatgcttaa tcttttgatt attatttcct 480

[2700] ctttctttct attactaact ttgtaactct cgctaaccga atcaacataa atacgtcaac 540

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[2703] <211> 161

[2704] <212> DNA

[2705] <213> 人工序列

[2706] <220>

[2707] <223> 转录物变体

[2708] <400> 100

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[2710] tttactactg aaatgtcatt tactttaaaa actcctttta ttaggactat ataaaaaact 120

[2711] atcatgacag aacagtcgcg aataacgtag tacatcgaac c 161

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[2716] <220>

[2717] <223> 转录物变体

[2718] <400> 101

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[2721] taatacaaat ccttttactt atgctccgtg atacagaaca actaaaagaa ctaaaagaga 180

[2722] agaacgacgt gcacgtgcta attatgcgaa ttaacatcgg gttagaaaaa gtaaactaaa 240

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[2724] gaatgtatgt aattattcgc aagggttcca taaggcacat atacaaattt agaaacaacc 360

[2725] cgttacatta acaaaggtga acggtgtttc acagatatta gaccattagg taaccaatga 420

[2726] catttcacta tcgaaaaggg tatagtatta actactacaa ctaatccgac tcgtcgaggt 480

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[2760] <213> 人工序列
[2761] <220>
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[2767] acgtatggtc tgtttacata agctcaaaaa taattttaca gggtaaaacg tcaatcatta 240
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[2769] cgtgtaaaaa caagaggttt tattaatatt gggtatatta gatgtatccg tcgattaacc 360
[2770] caccataacc aaactaaatt aaagcaacga cttatgcgaa atcctccttg tttacaaact 420
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[2772] tatcctcagt actgtaatga taaacaccga cgaagtctac atcgttgcaa cggaaaattc 540
[2773] catgaaagtc gtatgtttta tggtaaactt ccgaatttag caaaaagggt tgtaaaaggt 600
[2774] atacgtcatc atggtaagaa atacagctgt attagtatat aaggttgtag aaaaccacat 660
[2775] aataatatgt ctttagcact agacatcaga tgttaatgac ctaacgatta tagtgctgaa 720
[2776] caacgtctac gacaatataa acctttgcaa agactggtca aacatcaatg ttaaacacgt 780
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[2817] tttgctgttg 670
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[2819] <211> 592
[2820] <212> DNA
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[2827] aggaaaatgg gtaaggcata tgccttacta aattgtgtaa aagaagttct aataagaacc 180
[2828] ggaatgtatg taattattcg caagggttcc ataaggcaca tatacaaatt tagaaacaac 240
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[2836] <211> 626
[2837] <212> DNA
[2838] <213> 人工序列
[2839] <220>
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[2852] caaaagcata cgtggaaggt gacaag 626
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[2854] <211> 617
[2855] <212> DNA

[2856] <213> 人工序列

[2857] <220>

[2858] <223> 转录物变体

[2859] <400> 106

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[2862] agacgaggat tacggaataa ttaatatagt gcttgttcca atcggcccgg cttcagtcat 180

[2863] tcccggtggc gaagccatgt caccaataaa aactatcggc ggcaatggaa gtggtttttc 240

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[2869] ttacggctgt ggtgtaatcg attgcgaaat agcatgacaa aaaacttaca gtttagaagg 600

[2870] tggcggtatt acttaag 617

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[2872] <211> 2105

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[2874] <213> 人工序列

[2875] <220>

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[2877] <400> 107

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[2880] ctaaattgtg taaaagaagt tctaataaga accggaatgt atgtaattat tcgcaagggt 180

[2881] tccataaggc acatatacaa atttagaaac aacccgttac attaacaaag gtgaacggtg 240

[2882] tttcacagat attagaccat taggtaacca atgacatttc actatcgaaa agggtatagt 300

[2883] attaactact acaactaatc cgactcgtcg aggtgattta tacaggactg caggtagcaa 360

[2884] acgacgaggt ggacgagggt aaggtggccg acgaaaggga ggacatgcac ctagttgaac 420

[2885] acgactagga ggacgatggc cactacggag tggaacacaa aggtaaagtt gcaataataa 480

[2886] ccagtacaac aaaagcatac gtggaaggtg acaagcaaac gatgtcttga acaacaccgt 540

[2887] cttcattgtt taccatttgc tgttggattt gatatttaga gcgtatgttg aagaagttgg 600

[2888] aactctggac acattagaga cttattggat cgatcaagag gaatgcaata cgaagtagtt 660

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[2890] acactagaca tcagatgtta atgacctaac gattatagtg ctgaacaacg tctacgacaa 780

[2891] tataaacctt tgcaaagact ggtcaaacat caatgttaaa cacgtccaga taaaagcaaa 840

[2892] aaggtaagac gaggattacg gaataattaa tatagtgctt gttccaatcg gcccggcttc 900

[2893] agtcattccc ggtggcgaag ccataacatt taaaaatagc ctgttaactt caagctgtag 960

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[2914] <210> 108
[2915] <211> 570
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[2918] <220>
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[2929] taataaccag tacaacaaaa gcatacgtgg aaggtgacaa gcaaacgatg tcttgaacaa 540
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[2935] <220>
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[2940] gtccagttcg cgtggtgaat gacagattgc tactgttacc attggcgata ctacgttggc 180
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[4185] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 8340
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[4187] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 8460
[4188] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 8520
[4189] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 8580
[4190] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 8640
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[4200] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 9240
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[4207] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 9660
[4208] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 9720
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[4217] tctcggaaca ctagctgagg tggcttaaaa acattccgta actgagtggt caccgggggt 10260
[4218] gaaacatgct gagggttcta ccttaacggg aaggtgaaac tctccaatgt ctttgaaagg 10320
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[4220] gacgtcatta ataacgattc cgttcttccc gttcgtgtct ataaggatat tctttcattg 10440
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[4222] cttggagttg ttttaggaga cggagtagta gagaaaactt gtggcacctt cccagtcggt 10560
[4223] tccctacaga ctctccttag tagctcctaa gatcgtcgag ttacacgacg acattgttcc 10620
[4224] gactgacgta gaggcattac ttt 10643
[4225] <210> 150
[4226] <211> 4911
[4227] <212> DNA
[4228] <213> 人工序列
[4229] <220>
[4230] <223> SIRV2-基因
[4231] <220>
[4232] <221> 变异
[4233] <222> 161
[4234] <223> 对于该实例和所有下面实例中的'n': n = a,c,g,t中的任意一个
[4235] <400> 150
[4236] gttggtgtat ttatccgcta cgtggtggat gaacatggat gcgaacgaca tttcgaaata 60
[4237] tacgcaatga tatccaaccc taccgaaaca gcaataattg tagaaggtag catatcatgc 120
[4238] cgagtcatcg acatgccttt atcgacacac gacgtgattg nnnnnnnnnn nnnnnnnnnn 180
[4239] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 240
[4240] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 300
[4241] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 360

[4242] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 420
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[4247] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 720
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[4249] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 840
[4250] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 900
[4251] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 960
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[4256] tacattgcga cagacacagt tatgnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 1260
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[4262] gacagtcatg tctgtcacat ctatcacgcc tcctacgttg tgccataacg aagaataata 1620
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[4264] taagtgaaca atgtttcatc ttgagaagca aacgaagtag aagttgacga cgcattcgaa 1740
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[4271] acatggtgga acgtactttg actgcgctgc aagaaatggt tgggtcgatc gtaatgctag 2160
[4272] tcgttacatc ggaacaagcc aaaacaaatc attcgctgga tttagaccta ctgcacgacg 2220
[4273] acgtcgacac aagacattct tgaaaggtaa ttgacgtgga cgtttcagnn nnnnnnnnnn 2280
[4274] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 2340
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[4279] gctcagcgct agtccatgaa aatgtcctag ctttgaacgt ttatcaaatg caagttgtgg 2640
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[4281] attaccattc ggcggtaaca aacgtaagtt gtcactgcac tcatgagcat gaagttagac 2760
[4282] cagtagttgg gtcagaaatt agacgtggtt tagtctggtt accgtgnnnn nnnnnnnnnn 2820
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[4285] caaagaagaa acggttaata cgattgagga gaaatattca atccaacggc aactattaac 3000
[4286] gtttcaacta gaatctacgt ttcatacgcg nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 3060
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[4288] cgttcttgca attaaagaaa cgatgtagaa aacgctttgg ttggcgacaa cttgggcggc 3180
[4289] aaaataatta tggtaggtaa ttgaagtagc gttaaaacgc aaaaagaagg aagcacgnnn 3240
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[4315] cgctatagtc tgacacgatt caggcaaagt tggagtgcaa agccatgatt tggtcgatgc 4800
[4316] ggcaaatgtt gcttaggact attctatggt cttgcgtaat tgtgaagatt tgccagttat 4860
[4317] ctaaggagac gtggtgattc gctctatagc tgtatctaat ctgccagatt g 4911
[4318] <210> 151
[4319] <211> 8943
[4320] <212> DNA
[4321] <213> 人工序列
[4322] <220>
[4323] <223> SIRV3-基因
[4324] <220>
[4325] <221> 变异

[4326] <222> 168

[4327] <223> 对于该实例和所有下面实例中的'n': n = a,c,g,t中的任意一个

[4328] <400> 151

[4329] atgacgagaa gcatttcaag aaagcgttgt agcttaaaaa gaacgttgcg gtgctaaagg 60

[4330] agaaagtcga aaaagcgaag gagttaaaac aaaagccggt tattaaatgc tggaagaagg 120

[4331] aagaacaaca actaaacaag gttgtcaaga gcattaagga agccgtannn nnnnnnnnnn 180

[4332] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 240

[4333] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 300

[4334] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 360

[4335] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 420

[4336] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 480

[4337] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nngtttcaac 540

[4338] aatgcccaag ttgacattat tccaaaacgt ttcgtagaaa tgaaagcgct tcgagtaatt 600

[4339] aggcgcaaac ttacaggacg ccatggcata tgggtggtag aaccaacgat ggaagcgagt 660

[4340] agcgcaatgc cttagcgcac gcctacacta actgcttacg aagttggagc aaaagaaact 720

[4341] gaacgtgtca gccaaaattg ccaagaaaca ggagctacca aaagnnnnnn nnnnnnnnnn 780

[4342] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 840

[4343] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 900

[4344] nntggccaaa caacactcgc aaagaattta tgtgcgcttg gcaggtggag aagcaaatac 960

[4345] ttggataccg aatttagagg ccataggtta tggaaaaagt cagtgnnnnn nnnnnnnnnn 1020

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[4350] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 1320

[4351] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 1380

[4352] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 1440

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[4354] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 1560

[4355] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 1620

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[4359] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 1860

[4360] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 1920

[4361] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 1980

[4362] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 2040

[4363] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 2100

[4364] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 2160

[4365] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 2220

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[4367] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 2340

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[4379] nnngtacgaa ttacgaacac cttaacatta gggaaactta gatagttgta caaagtaacg 3060
[4380] tataacaagt atcgcgtatg nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 3120
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[4947] gtgacc 12606
[4948] <210> 154
[4949] <211> 10837
[4950] <212> DNA
[4951] <213> 人工序列
[4952] <220>
[4953] <223> SIRV6-基因
[4954] <220>
[4955] <221> 变异

[4956] <222> 187

[4957] <223> 对于该实例和所有下面实例中的'n': n = a,c,g,t中的任意一个

[4958] <400> 154

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[4960] ggaaaaaggt agtcaagaaa ccatcaagct taaatgtcgg gaaattgggt ttgcgccgcc 120

[4961] ttcaggggca gcgatggggg cgacaattgt ggaccgtatg gactccatta tgctgggact 180

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[4963] nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 300

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[4965] ctaaggtctt aaaatcgttg gnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn 420

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[7739] <220>

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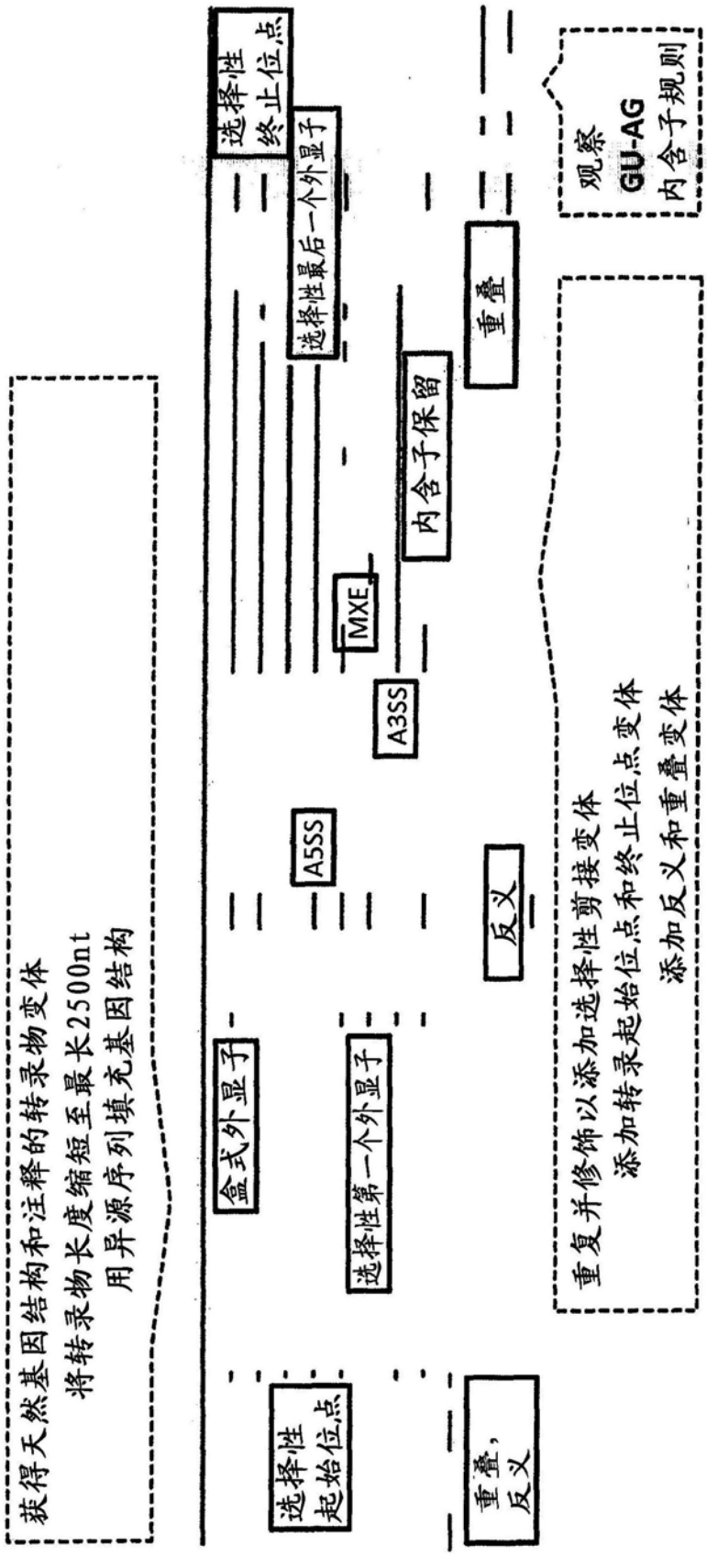

获得天然基因结构和注释的转录物变体
将转录物长度缩短至最长2500nt
用异源序列填充基因结构
盒式外显子
选择性起始位点
选择性第一个外显子
选择性最后一个外显子
选择性终止位点
A5SS
A3SS
MXE
内含子保留
重叠
反义
重叠，反义
重复并修饰以添加选择性剪接变体
添加转录起始位点和终止位点变体
添加反义和重叠变体
观察
GU-AG
内含子规则

图1

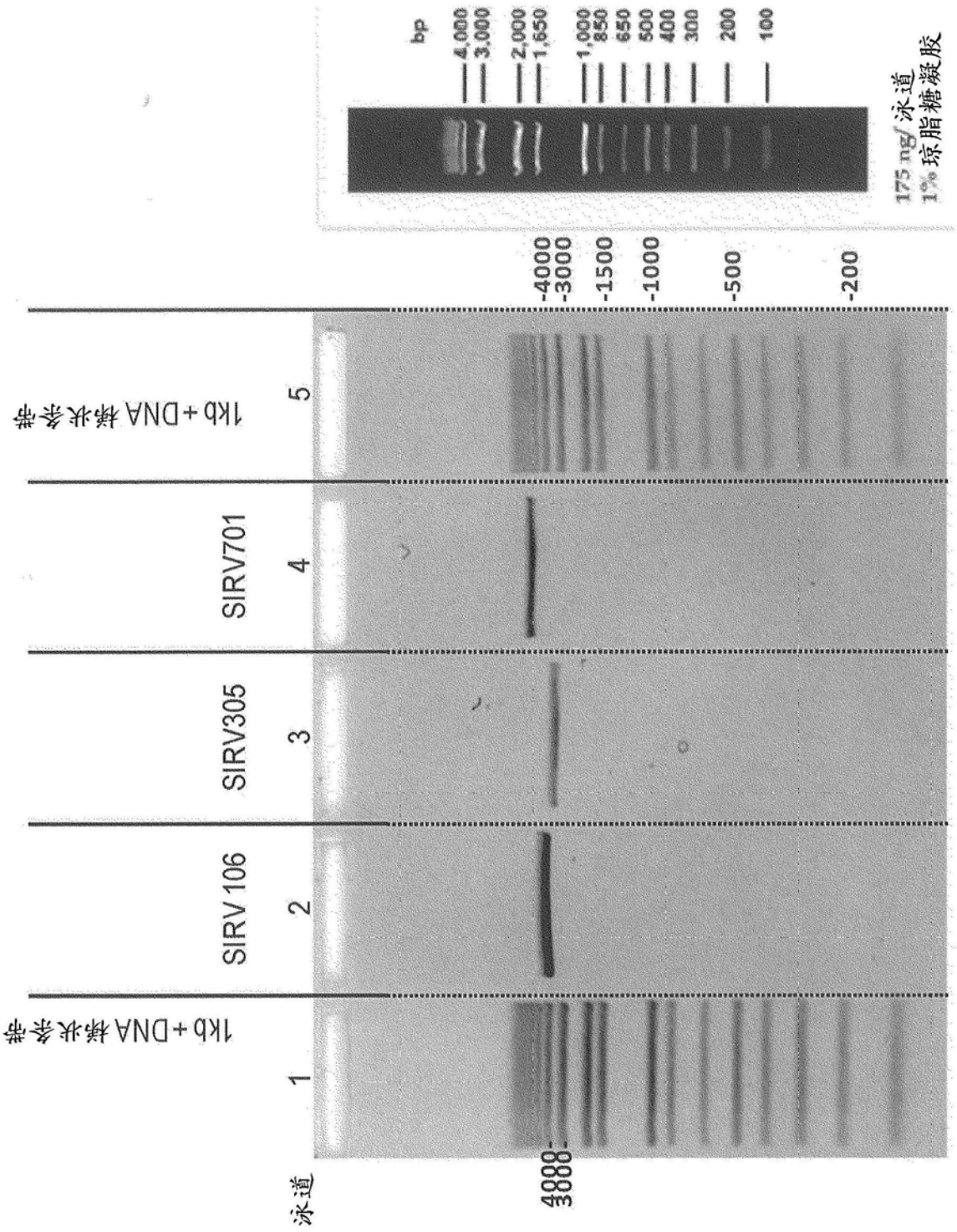

bp
4,000
3,000
2,000
1,650
1,000
850
650
500
400
300
200
100
175 ng/泳道
1%琼脂糖凝胶
-4000
-3000
-1500
-1000
-500
-200
泳道
1
2
3
4
5
SIRV 106
SIRV305
SIRV701
1kb+DNA梯状条带
1kb+DNA梯状条带
4888

图2

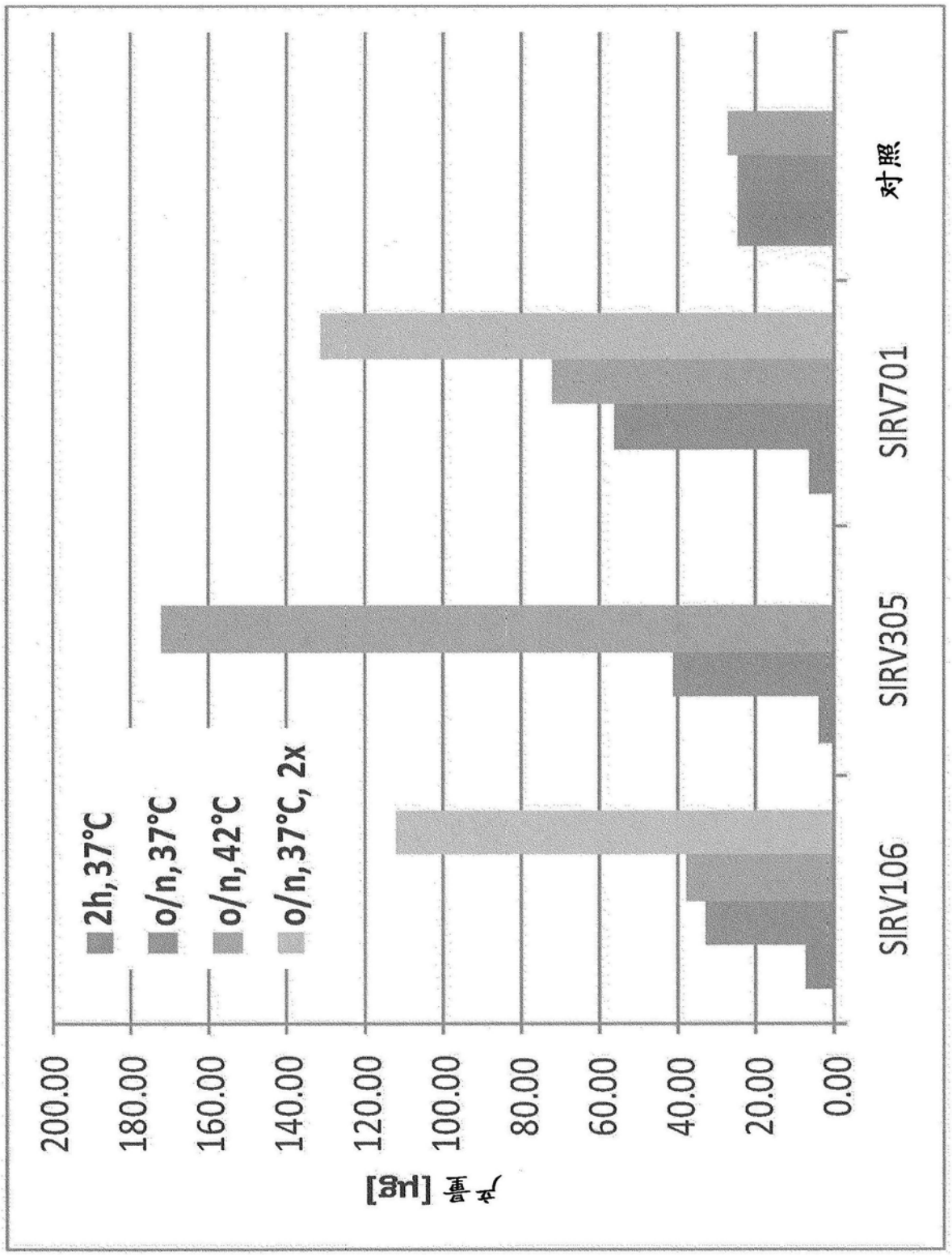

200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
产量 [μg]
2h,37°C
o/n,37°C
o/n,42°C
o/n,37°C, 2x
SIRV106
SIRV305
SIRV701
对照

图3

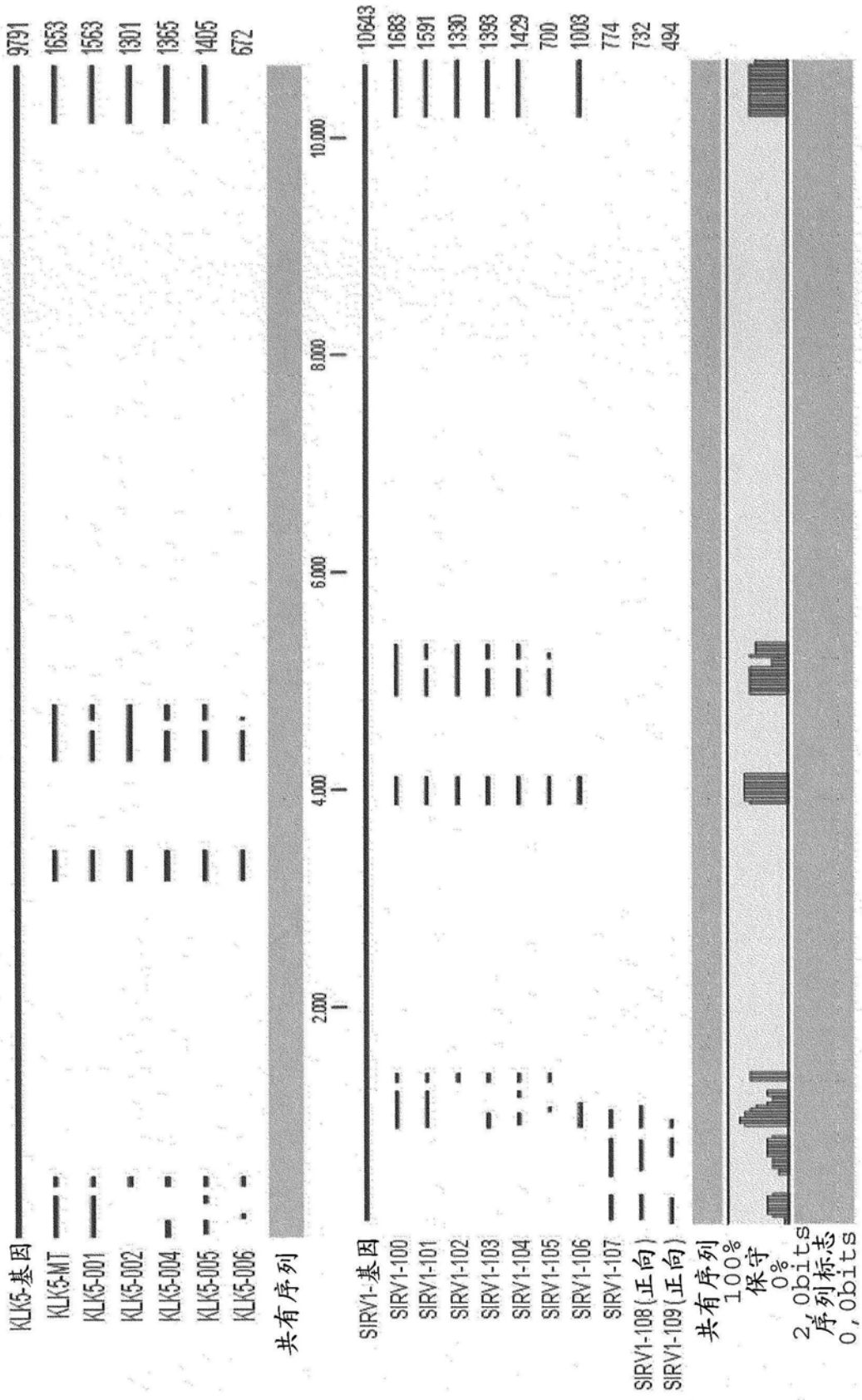

KLK5-基因
KLK5-MT
KLK5-001
KLK5-002
KLK5-004
KLK5-005
KLK5-006
共有序列
SIRV1-基因
SIRV1-100
SIRV1-101
SIRV1-102
SIRV1-103
SIRV1-104
SIRV1-105
SIRV1-106
SIRV1-107
SIRV1-108(正向)
SIRV1-109(正向)
共有序列
100%
保守
0%
2, 0bits
序列标志
0, 0bits
2.000
4.000
6.000
8.000
10.000
9791
1653
1563
1301
1365
1405
672
10643
1683
1591
1330
1393
1429
700
1003
774
732
494

图4

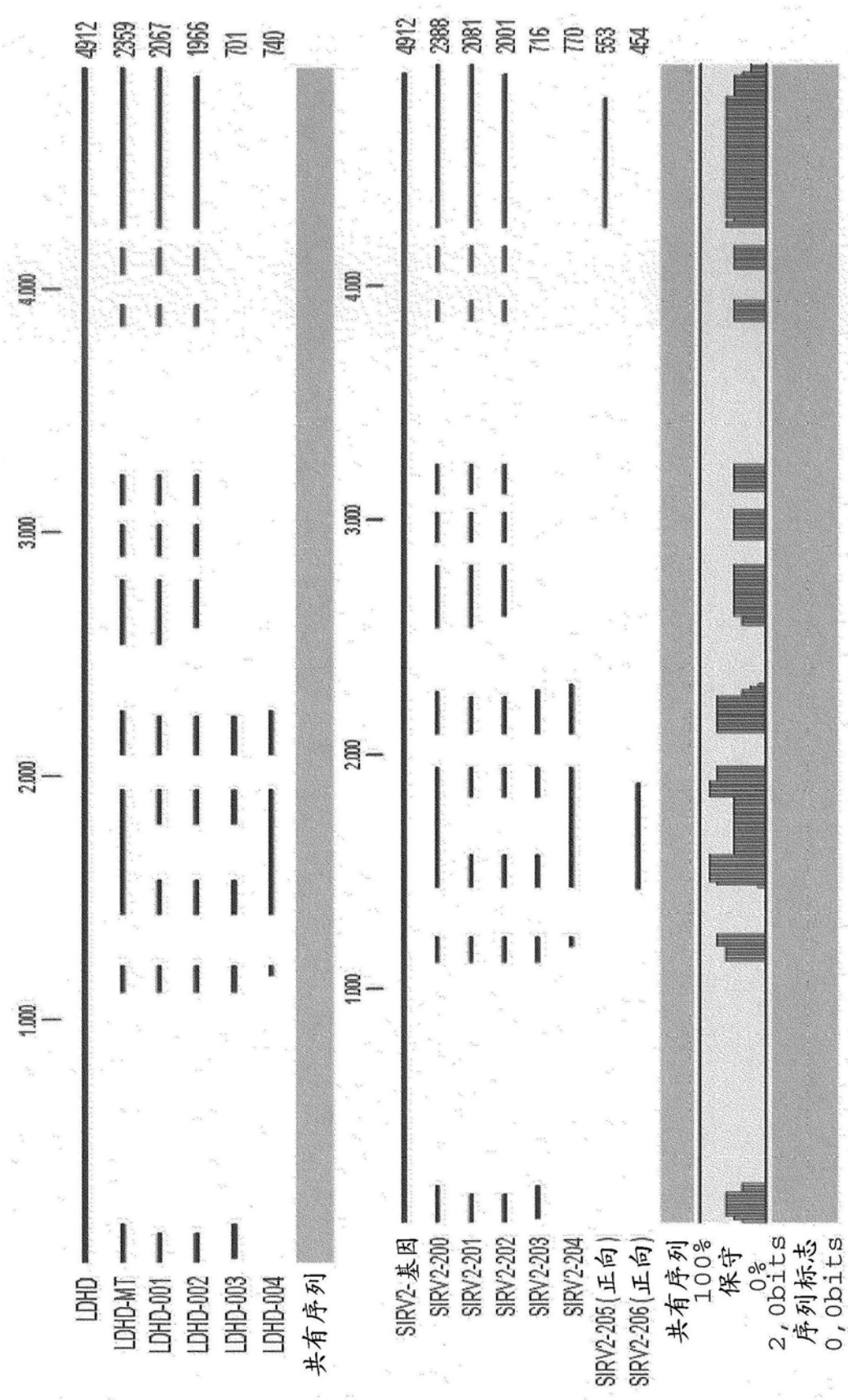

1,000
2,000
3,000
4,000
LDHD 4912
LDHD-MT 2359
LDHD-001 2067
LDHD-002 1966
LDHD-003 701
LDHD-004 740
共有序列
SIRV2-基因 4912
SIRV2-200 2388
SIRV2-201 2081
SIRV2-202 2001
SIRV2-203 716
SIRV2-204 770
SIRV2-205(正向) 553
SIRV2-206(正向) 454
共有序列
100%
保守
0%
2,0bits
序列标志
0,0bits

图5

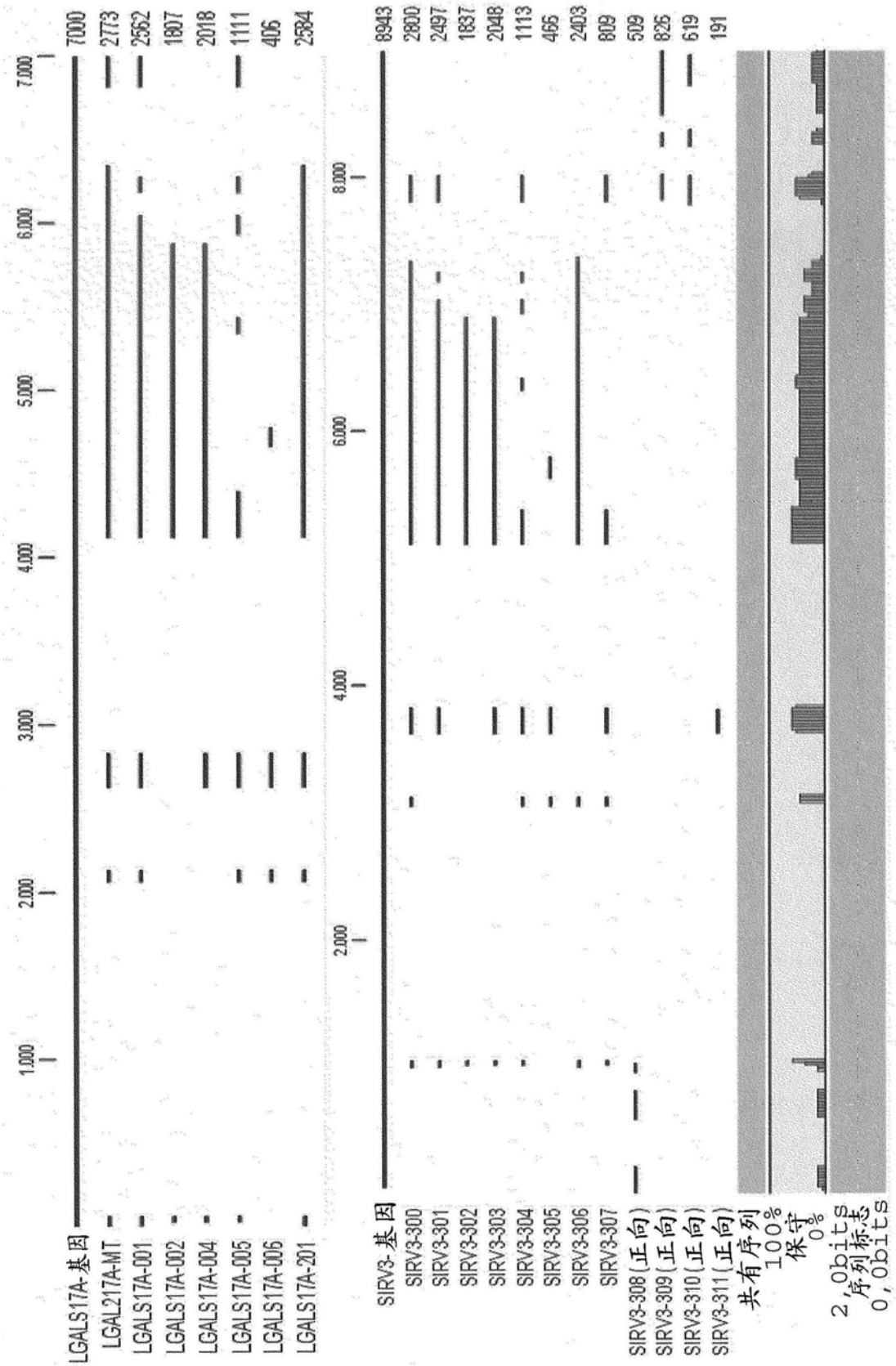

LGALS17A-基因
LGAL217A-MT
LGALS17A-001
LGALS17A-002
LGALS17A-004
LGALS17A-005
LGALS17A-006
LGALS17A-201
SIRV3-基因
SIRV3-300
SIRV3-301
SIRV3-302
SIRV3-303
SIRV3-304
SIRV3-305
SIRV3-306
SIRV3-307
SIRV3-308(正向)
SIRV3-309(正向)
SIRV3-310(正向)
SIRV3-311(正向)
共有序列
100%
保守
0%
2,0bits
序列标志
0,0bits
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
7000
2773
2562
1807
2018
1111
405
2584
8943
2800
2497
1837
2048
1113
465
2403
809
509
826
619
191

图6

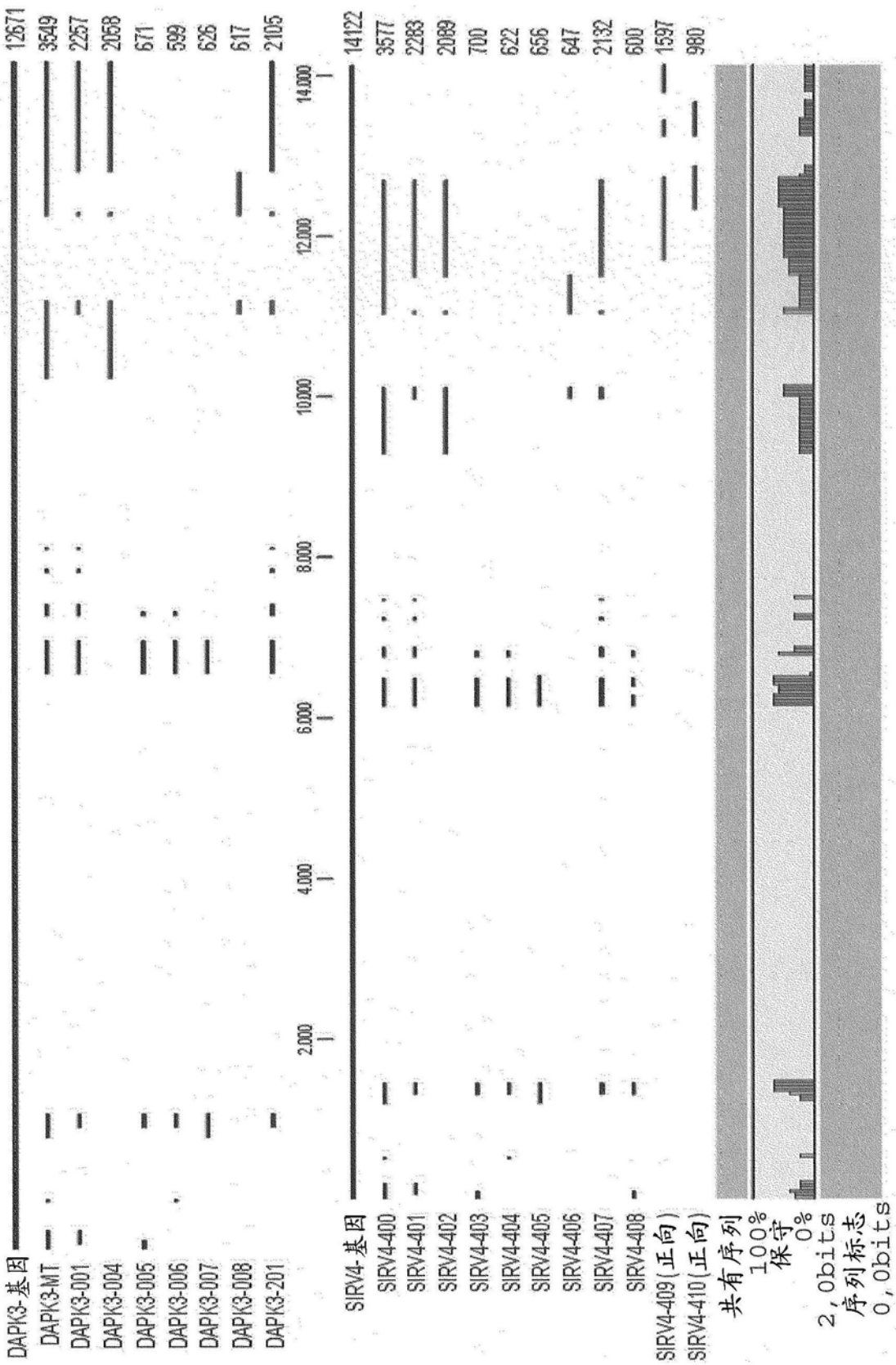

DAPK3-基因
DAPK3-MT
DAPK3-001
DAPK3-004
DAPK3-005
DAPK3-006
DAPK3-007
DAPK3-008
DAPK3-201
SIRV4-基因
SIRV4-400
SIRV4-401
SIRV4-402
SIRV4-403
SIRV4-404
SIRV4-405
SIRV4-406
SIRV4-407
SIRV4-408
SIRV4-409(正向)
SIRV4-410(正向)
共有序列
100%
保守
0%
2,0bits
序列标志
0,0bits
12671
3549
2257
2058
671
599
626
617
2105
14122
3577
2283
2089
700
622
656
647
2132
600
1597
980
2.000
4.000
6.000
8.000
10.000
12.000
14.000

图7

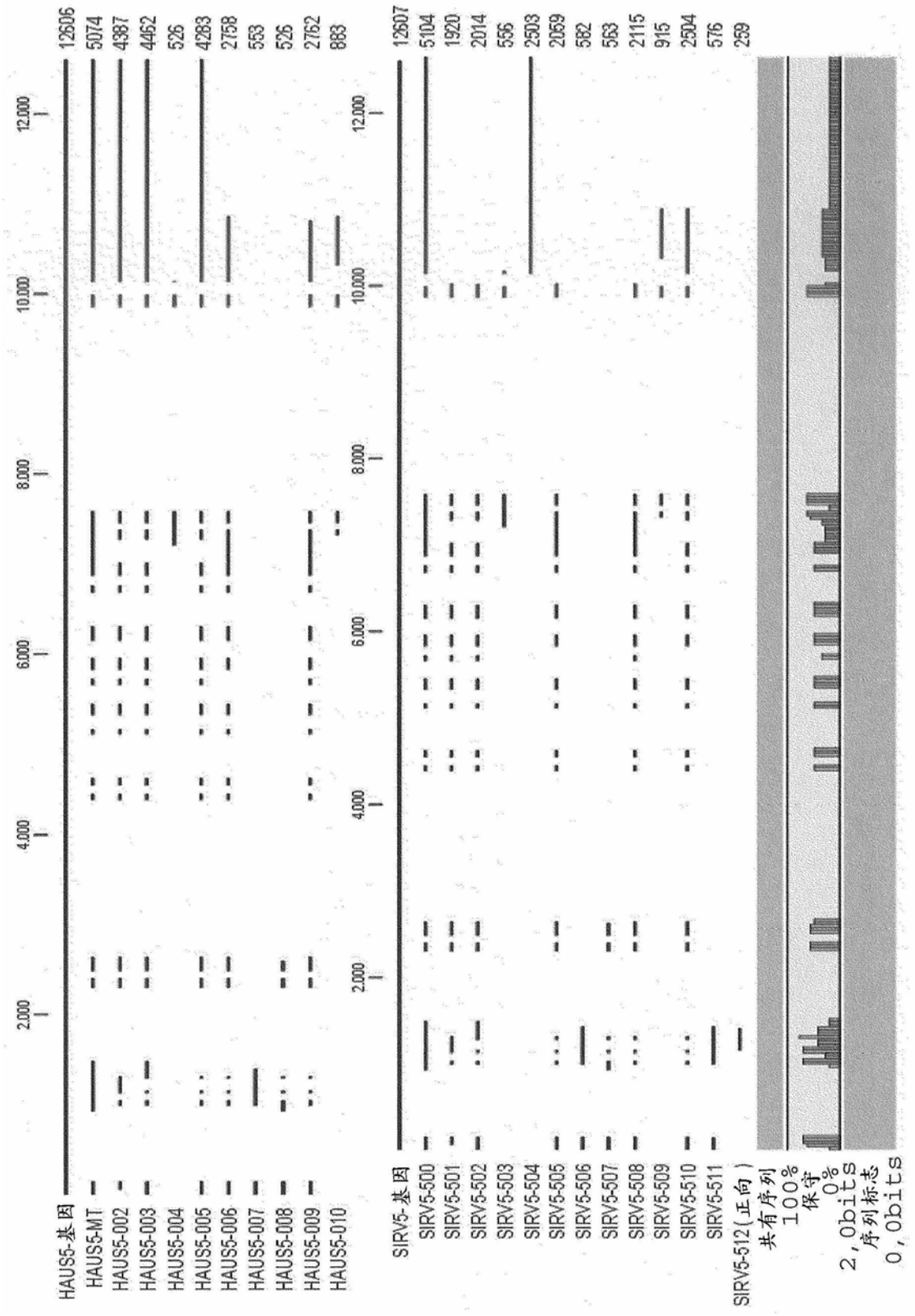

HAUS5-基因
HAUS5-MT
HAUS5-002
HAUS5-003
HAUS5-004
HAUS5-005
HAUS5-006
HAUS5-007
HAUS5-008
HAUS5-009
HAUS5-010
SIRV5-基因
SIRV5-500
SIRV5-501
SIRV5-502
SIRV5-503
SIRV5-504
SIRV5-505
SIRV5-506
SIRV5-507
SIRV5-508
SIRV5-509
SIRV5-510
SIRV5-511
SIRV5-512(正向)
共有序列
100%
保守
0%
2,0bits
序列标志
0,0bits

图8

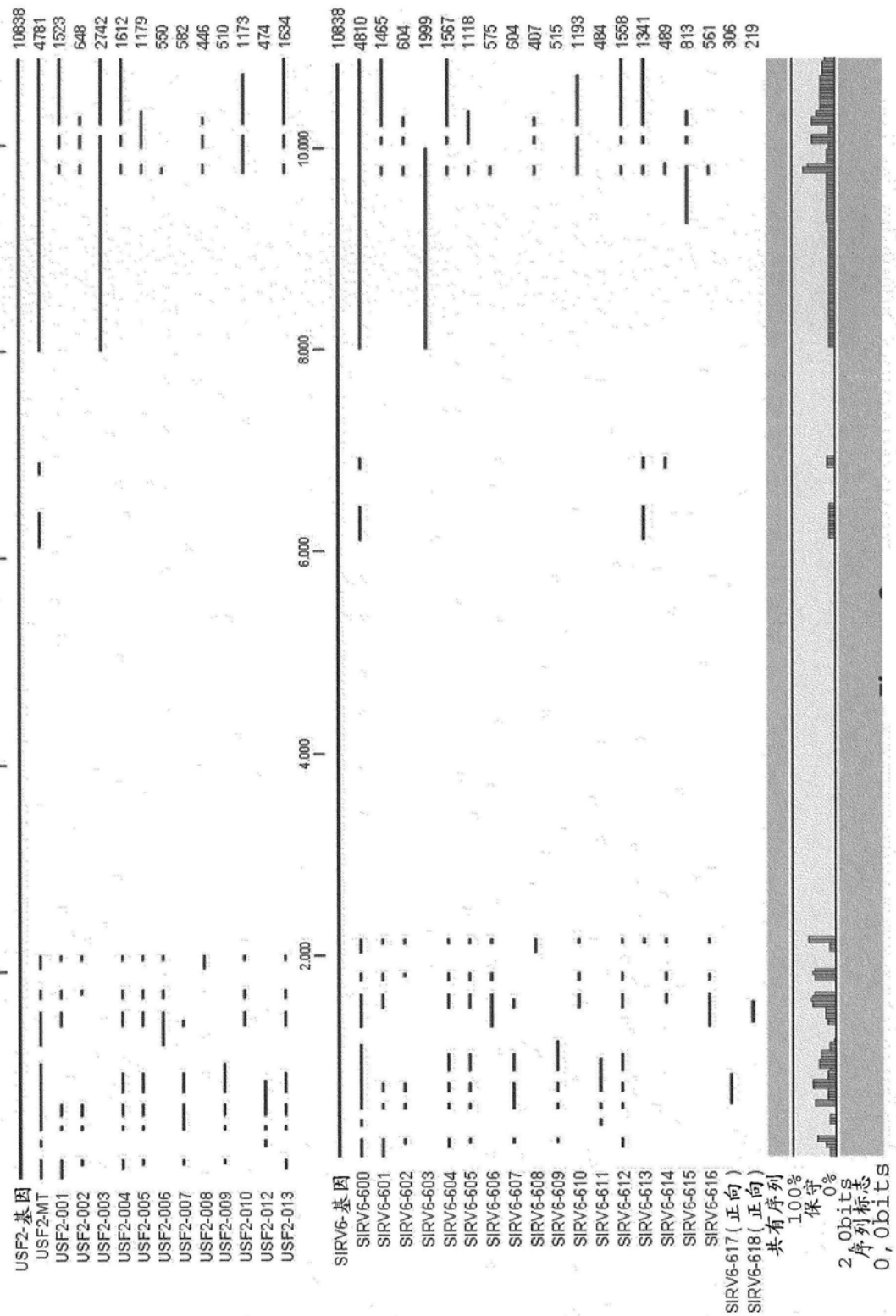

USF2-基因
USF2-MT
USF2-001
USF2-002
USF2-003
USF2-004
USF2-005
USF2-006
USF2-007
USF2-008
USF2-009
USF2-010
USF2-012
USF2-013
SIRV6-基因
SIRV6-600
SIRV6-601
SIRV6-602
SIRV6-603
SIRV6-604
SIRV6-605
SIRV6-606
SIRV6-607
SIRV6-608
SIRV6-609
SIRV6-610
SIRV6-611
SIRV6-612
SIRV6-613
SIRV6-614
SIRV6-615
SIRV6-616
SIRV6-617(正向)
SIRV6-618(正向)
共有序列
100%
保守
0%
2.0bits
序列标志
0.0bits

图9

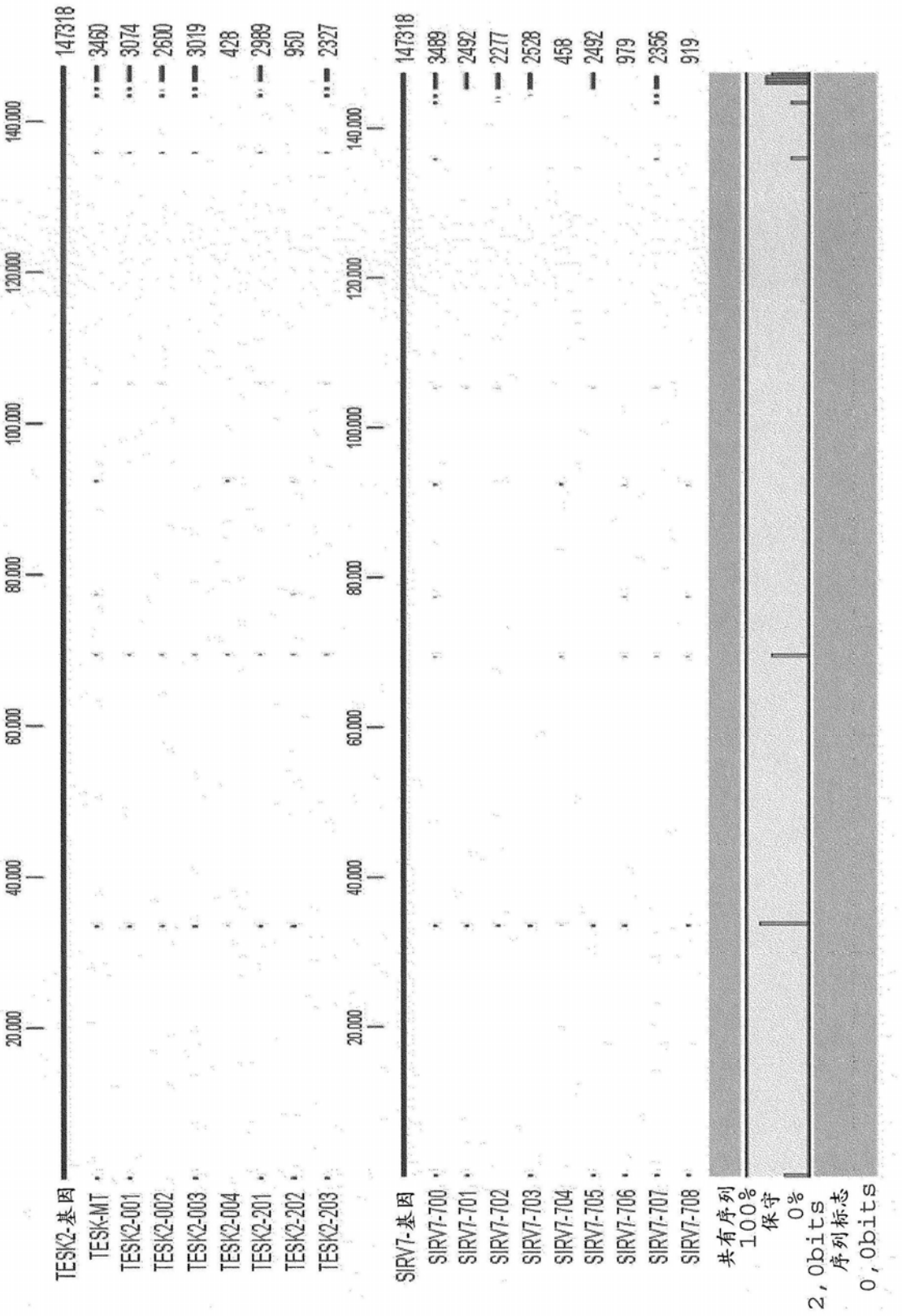

TESK2-基因
TESK-MT
TESK2-001
TESK2-002
TESK2-003
TESK2-004
TESK2-201
TESK2-202
TESK2-203
SIRV7-基因
SIRV7-700
SIRV7-701
SIRV7-702
SIRV7-703
SIRV7-704
SIRV7-705
SIRV7-706
SIRV7-707
SIRV7-708
147318
3460
3074
2600
3019
428
2989
950
2327
3489
2492
2277
2528
458
2492
979
2366
919
20,000
40,000
60,000
80,000
100,000
120,000
140,000
共有序列
100%
保守
0%
2,0bits
序列标志
0,0bits

图10

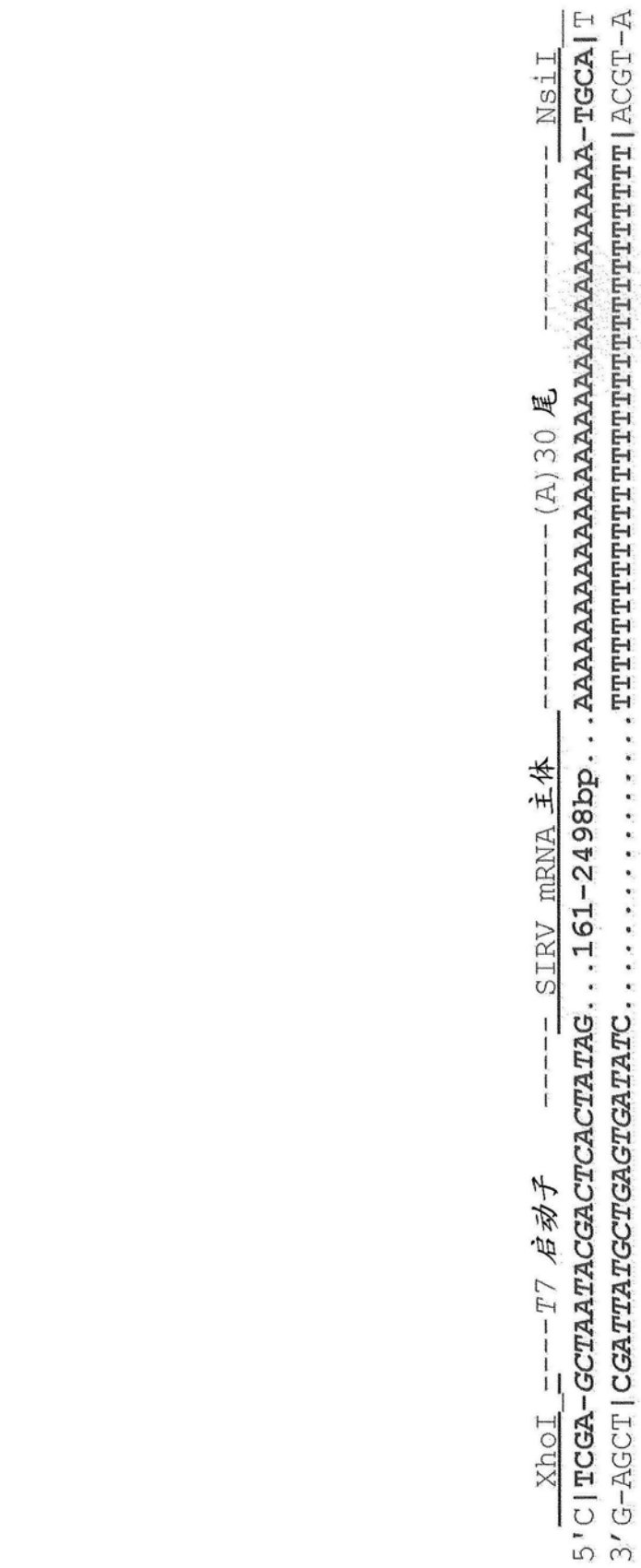

XhoI
T7 启动子
SIRV mRNA 主体
(A)30 尾
NsiI
5'C|TCGA-GCTAATACGACTCACTATAG...161-2498bp...AAAAAAAAAAAAAAAAAAAAAAAAAAAA-TGCA|T
3'G-AGCT|CGATTATGCTGAGTGATATC.....TTTTTTTTTTTTTTTTTTTTTTTTTTTT|ACGT-A

图11

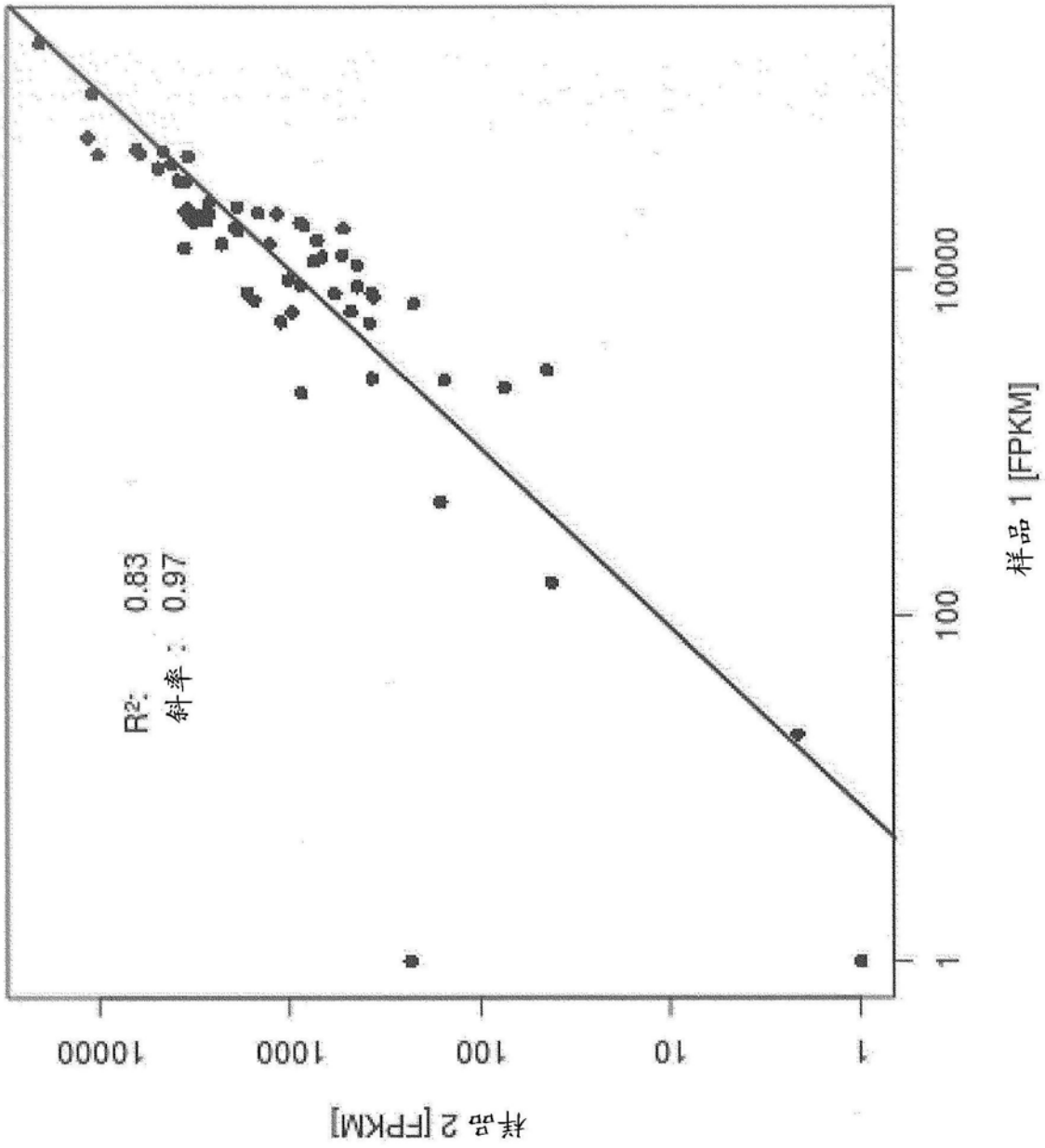


图12

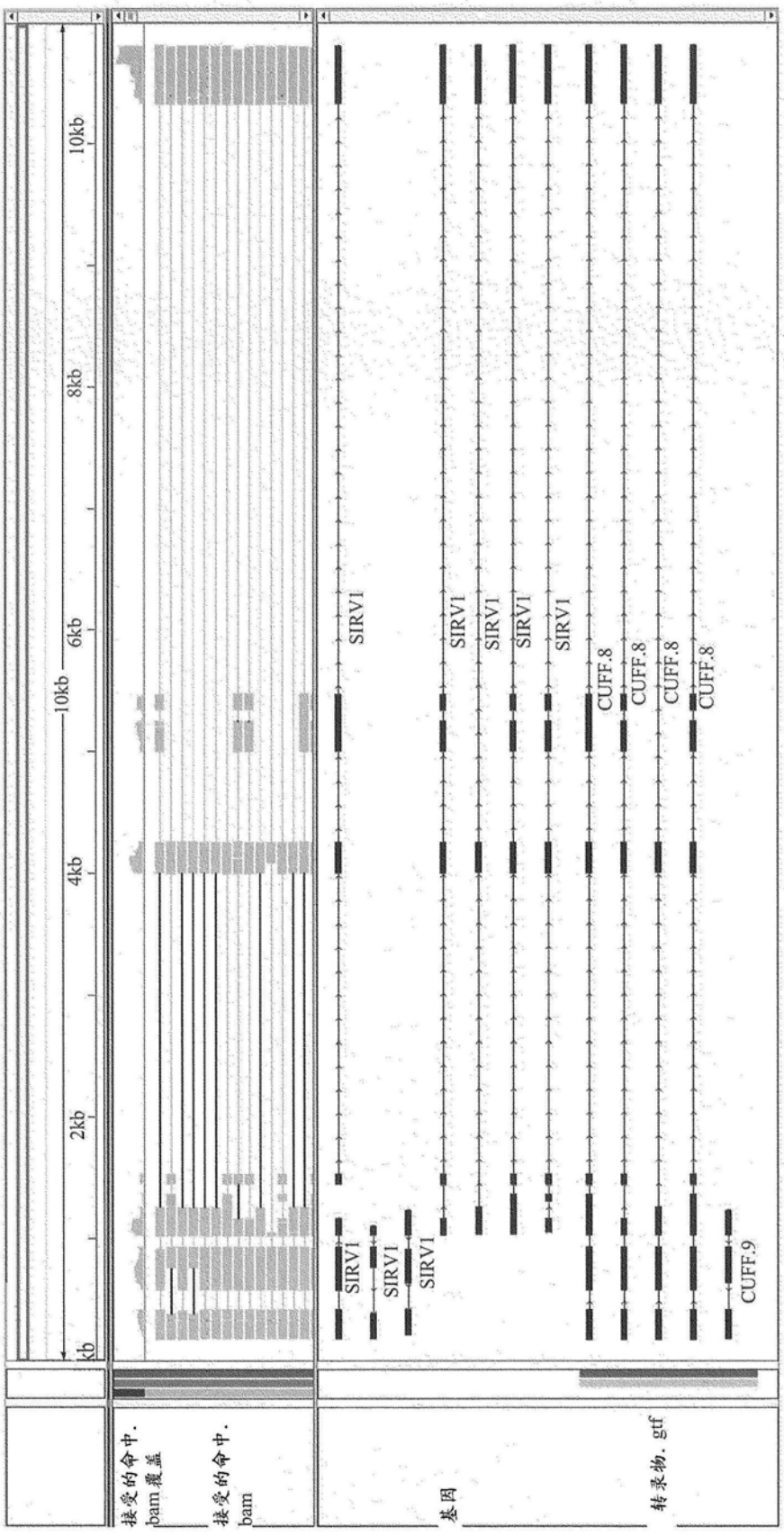

10kb
6kb
4kb
2kb
kb
8kb
10kb
接受的命中.bam覆盖
接受的命中.bam
基因
转录物.gtf
SIRV1
SIRV1
SIRV1
SIRV1
SIRV1
SIRV1
SIRV1
SIRV1
CUFF.8
CUFF.8
CUFF.8
CUFF.8
CUFF.9

图13

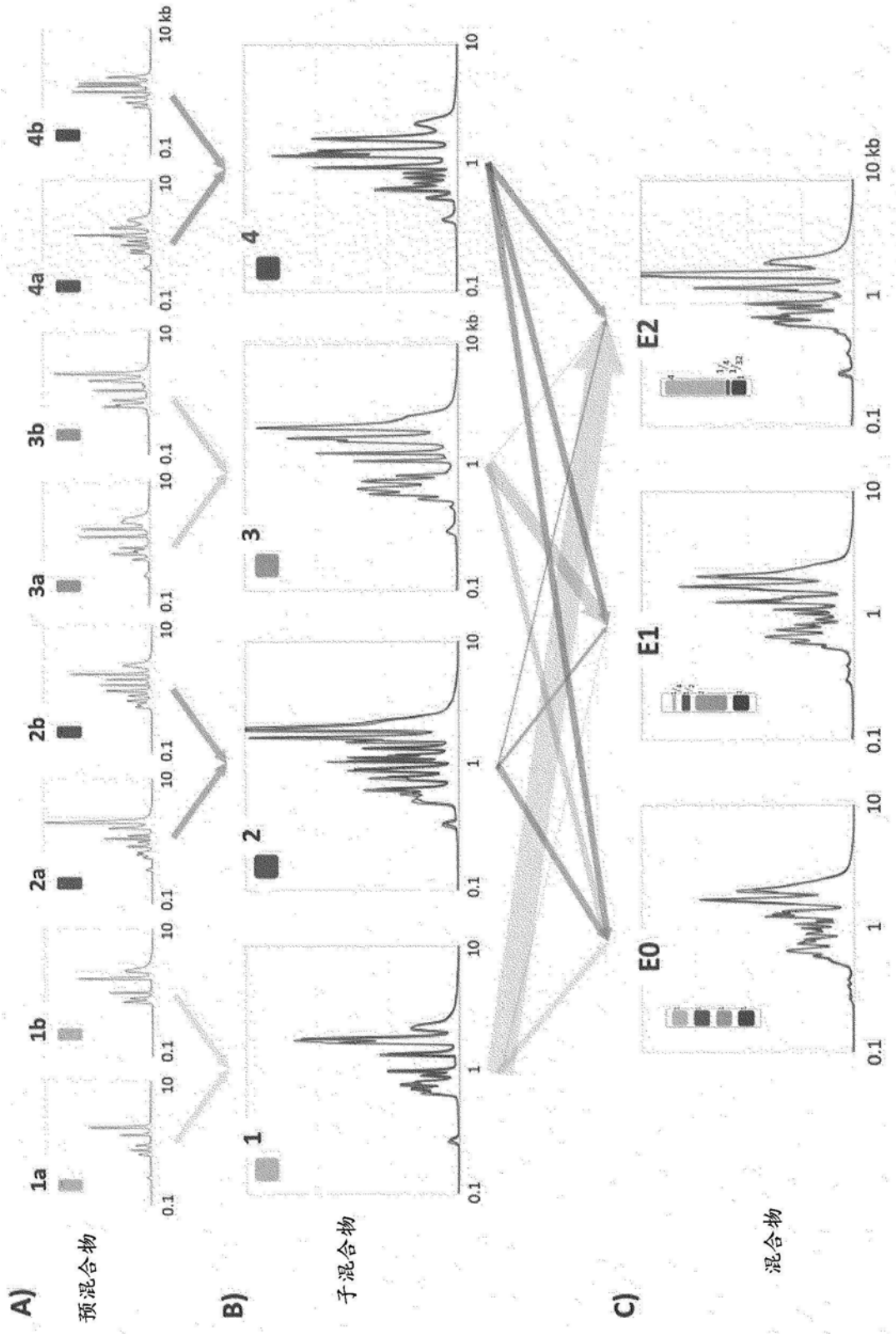


图14

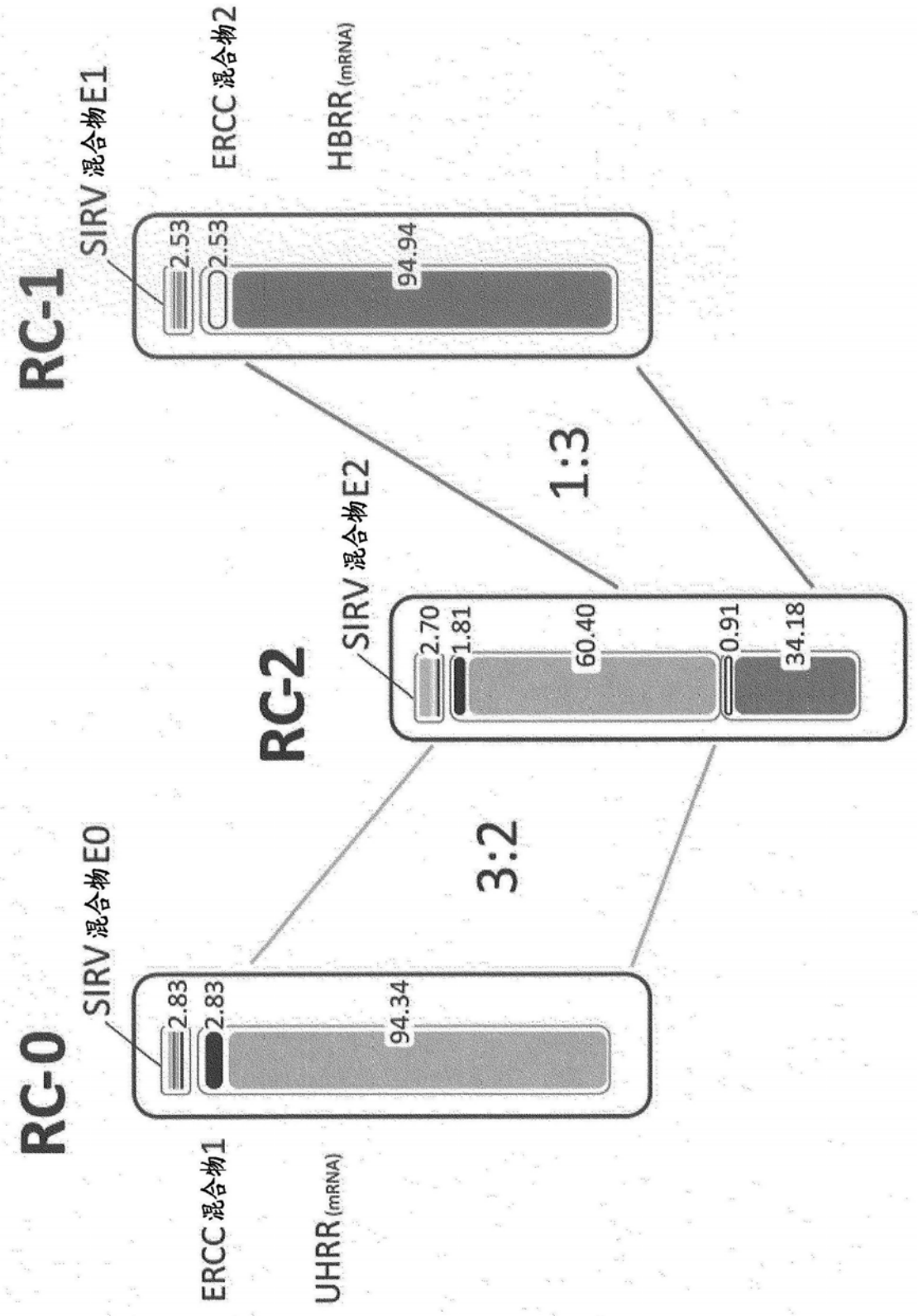

RC-0
SIRV 混合物E0
2.83
2.83
94.34
ERCC 混合物1
UHRR (mRNA)
3:2
RC-2
SIRV 混合物E2
2.70
1.81
60.40
0.91
34.18
1:3
RC-1
SIRV 混合物E1
2.53
2.53
94.94
ERCC 混合物2
HBRR (mRNA)

图15

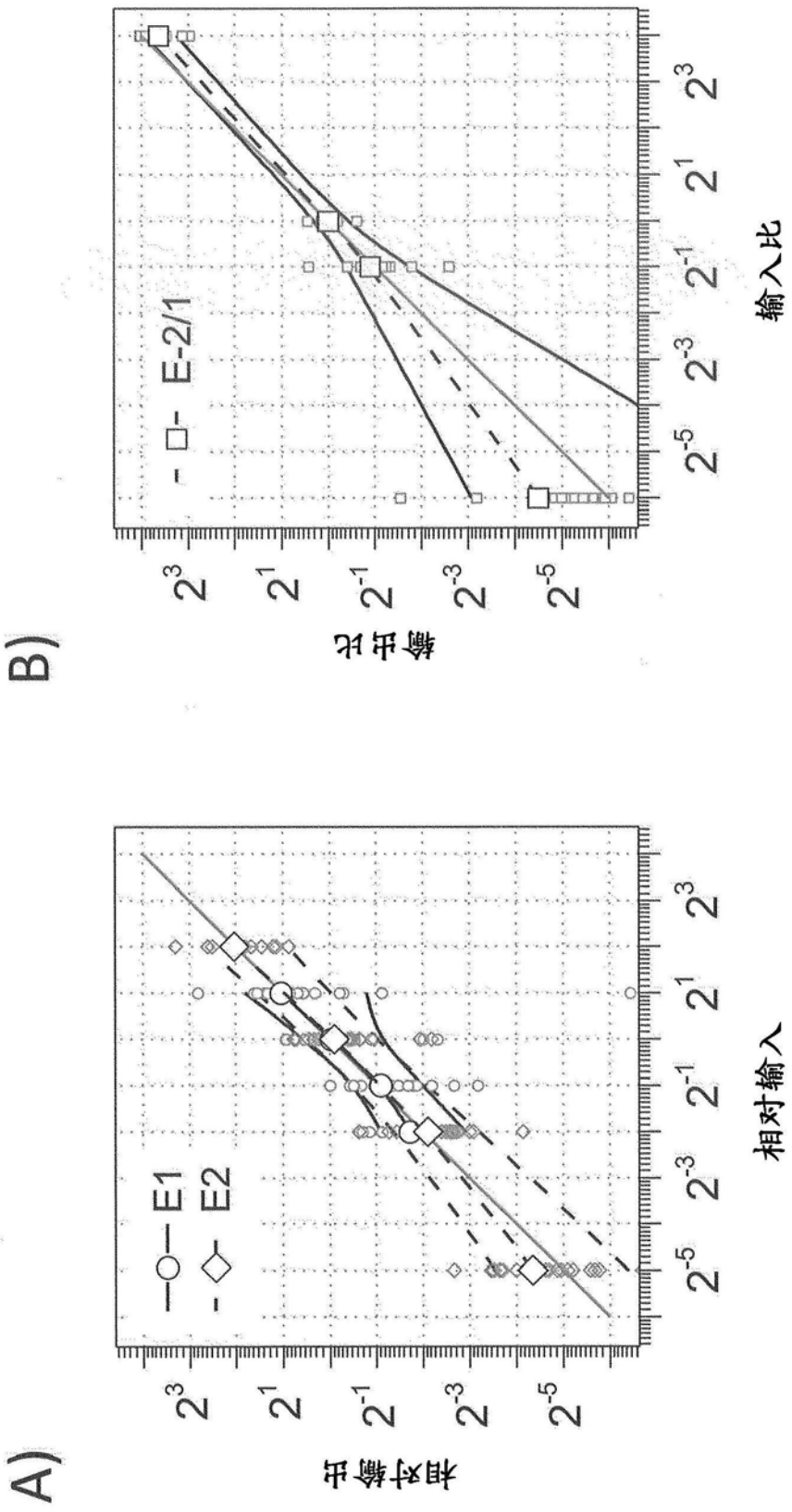


图16