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(54) Titre : VECTEURS ADENOVIRAUX SEROTYPE 34, ACIDES NUCLEIQUES ET VIRUS PRODUITS PAR CES MOYENS

(54) Title: ADENOVIRUS SEROTYPE 34 VECTORS, NUCLEIC ACIDS AND VIRUS PRODUCED THEREBY

(57) Abrégé/Abstract:
Adenoviral serotypes differ in their natural tropism. The various serotypes of adenovirus have been found to differ in at least their capsid proteins (e.g., penton-base and hexon proteins), proteins responsible for cell binding (e.g, fiber proteins), and proteins involved in adenovirus replication. This difference in tropism and capsid proteins among serotypes has led to the many research efforts aimed at redirecting the adenovirus tropism by modification of the capsid proteins. The present invention bypasses such requirement for capsid protein modification as it presents a recombinant, replication-defective adenovirus of serotype 34, a rare adenoviral serotype, and methods for generating the alternative, recombinant adenovirus. Additionally, means of employing the recombinant adenovirus for the delivery and expression of exogenous genes are provided.

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(54) Title: ADENOVIRUS SEROTYPE 34 VECTORS, NUCLEIC ACIDS AND VIRUS PRODUCED THEREBY

(57) Abstract: Adenoviral serotypes differ in their natural tropism. The various serotypes of adenovirus have been found to differ in at least their capsid proteins (*e.g.,* penton-base and hexon proteins), proteins responsible for cell binding (*e.g,* fiber proteins), and proteins involved in adenovirus replication. This difference in tropism and capsid proteins among serotypes has led to the many research efforts aimed at redirecting the adenovirus tropism by modification of the capsid proteins. The present invention bypasses such requirement for capsid protein modification as it presents a recombinant, replication-defective adenovirus of serotype 34, a rare adenoviral serotype, and methods for generating the alternative, recombinant adenovirus. Additionally, means of employing the recombinant adenovirus for the delivery and expression of exogenous genes are provided.

WO 2004/097016 A1

TITLE OF THE INVENTION
ADENOVIRUS SEROTYPE 34 VECTORS, NUCLEIC ACIDS AND VIRUS PRODUCED THEREBY

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. provisional application serial no. 60/458,825, filed on March 28, 2003.

BACKGROUND OF THE INVENTION

Adenoviruses are nonenveloped, icosahedral viruses that have been identified in several avian and mammalian hosts; Horne *et al.*, 1959 *J. Mol. Biol.* 1:84-86; Horwitz, 1990 In *Virology*, eds. B.N. Fields and D.M. Knipe, pps. 1679-1721. The first human adenoviruses (Ads) were isolated over four decades ago. Since then, over 100 distinct adenoviral serotypes have been isolated which infect various mammalian species, 51 of which are of human origin; Straus, 1984, In *The Adenoviruses*, ed. H. Ginsberg, pps. 451-498, New York:Plenus Press; Hierholzer *et al.*, 1988 *J. Infect. Dis.* 158:804-813; Schnurr and Dondero, 1993, *Intervirology*; 36:79-83; Jong *et al.*, 1999 *J Clin Microbiol.*, 37:3940-5. The human serotypes have been categorized into six subgenera (A-F) based on a number of biological, chemical, immunological and structural criteria which include hemagglutination properties of rat and rhesus monkey erythrocytes, DNA homology, restriction enzyme cleavage patterns, percentage G+C content and oncogenicity; Straus, *supra*; Horwitz, *supra.*

The adenovirus genome is very well characterized. It consists of a linear double-stranded DNA molecule of approximately 36,000 base pairs, and despite the existence of several distinct serotypes, there is some general conservation in the overall organization of the adenoviral genome with specific functions being similarly positioned.

Adenovirus has been a very attractive target for delivery of exogenous genes. The biology of adenoviruses is very well understood. Adenovirus has not been found to be associated with severe human pathology in immuno-competent individuals. The virus is extremely efficient in introducing its DNA into the host cell and is able to infect a wide variety of cells. Furthermore, the virus can be produced at high virus titers in large quantities. In addition, the virus can be rendered replication defective by deletion of the essential early-region 1 (El) of the viral genome; Brody et al, 1994 *Ann N Y Acad Sci.*, 716:90-101.

Replication-defective adenovirus vectors have been used extensively as gene transfer vectors for vaccine and gene therapy purposes. These vectors are propagated in cell

lines that provide E1 gene products *in trans*. Supplementation of the essential E1 gene products *in trans* is very effective when the vectors are from the same or a very similar serotype. E1-deleted group C serotypes (Ad1, Ad2, Ad5 and Ad6), for instance, grow well in 293 or PER.C6 cells which contain and express the Ad5 E1 region. However, the Ad5 E1 sequences in 293 or PER.C6 cells do not fully complement the replication of all serotypes other than group C. This is perhaps due to the inability of the Ad5 (group C) E1B 55K gene product to functionally interact with the E4 gene product(s) of the non-group C serotypes. Although the interaction is conserved within members of the same subgroup, it has not been found to be well conserved between subgroups. In order to successfully and efficiently rescue recombinant adenovirus of alternative, non-group C serotypes, a cell line expressing the E1 region of the serotype of interest would have to be generated. Alternatively, available Ad5E1-expressing cell lines could be modified to express Ad5E4 (or Orf6) in addition to Ad5E1. These additional, sometimes tedious and daunting tasks, impeded the production of recombinant, non-group C adenoviral vectors.

An efficient means for the propagation and rescue of alternative serotypes in an Ad5 E1-expressing cell line (such as PER.C6 or 293) was disclosed in pending U.S. provisional application (Serial No. 60/405,182, filed August 22, 2002). This method involves the incorporation of a critical E4 region into the adenovirus to be propagated. The critical E4 region is native to a virus of the same or highly similar serotype as that of the E1 gene product(s), particularly the E1B 55K region, of the complementing cell line, and comprises, in the least, nucleic acid encoding E4 Orf6.

Presently, two well-characterized adenovirus serotypes from subgroup C, Ad5 and Ad2, are the most widely used gene delivery vectors. There is a need to develop alternate Ad serotypes as gene transfer vectors since neutralizing antibodies in the general population may limit primary dosing or redosing with the same serotype. The prevalence of neutralizing antibody can vary from serotype to serotype. Neutralizing antibodies to some serotypes such as Ad5 are common, while antibodies to others are relatively rare. Alternate serotypes, furthermore, possess alternate tropisms which may lead to the elicitation of superior immune responses when used for vaccine or gene therapy purposes.

Adenovirus serotype 34, a subgroup B adenovirus, was originally isolated in 1972 and established as a recognized reference strain in 1975 (J.C. Hierholzer *et al.*, 1975 *J. Clin. Microbiol.* 1:366-376). Its antigenic relationship to 46 other human adenoviruses determined in reference horse antisera has been discussed; J.C. Hierholzer *et al.*, 1991 *Arch. Virol.* 121:179-197. Partial sequence information is available for Ad34. There have been several disclosures relating to Ad34 hexon sequences. The complete sequence of Ad34 hexon with some 5' and 3'

flanking sequence (3358 bp) was deposited in GenBank (Accession No. AB052911) by Mukouyama. A partial sequence of Ad34 hexon (1449 bp) was disclosed in Takeuchi *et al.*, 1999 *J. Clin. Microbiol.* 37:3392-3394, and GenBank (Accession No. AB018426). A partial sequence of Ad34 hexon (253 bp) was disclosed in Allard *et al.*, 2001 *J. Clin. Microbiol.* 39: 498-505 , and deposited in GenBank (Accession No. AF161573). Perera and Cardosa deposited two partial sequences of Ad34 hexon (571bp and 301 bp) with GenBank (Accession Nos. AJ272610 and AJ250786). Sequence for the Ad34 fiber gene was deposited by Arun, Mukouyama and Inada with GenBank (Accession No. AB073168). The sequence of the virus associated RNA region (VA RNA1 & 2) for Ad34 (162 bp) was disclosed by Kidd *et al.*, 1995 *Virology* 207:32-45, and GenBank (Accession No. U10677). Moreover, the sequence of the virus associated RNA region for Ad34 and partial sequence for the pre-terminal protein and 52/55K proteins (354 bp) was disclosed in Ma & Matthews, 1996 *J. Virol.* 70: 5083-99, and GenBank (Accession No. U52571). Adhikary, Mukouyama and Inada disclosed the sequence of the Ad34 genes for L4 100kDa, L4pVIII, E3 12.3kDa, E3 14.9kDa, E3 gp18.5kDa, E3 20.3kDa, E3 20.5kDa, E3 10.2kDa, E3 15.2kDa1, E3 15.2kDa2, and partial fiber sequence (4828 bp) and deposited the sequence with GenBank (Accession No. AB079724). The sequence of the right end of the viral genome (1038 bp) was disclosed in Chen & Horwitz, 1990 *Virology* 179:567-75, and GenBank (Accession No. M62712).

The fields of vaccines and gene therapy would greatly benefit from additional knowledge concerning alternative adenoviral serotypes, particularly those serotypes such as Ad34 which are not well represented in the human population. Of particular interest are recombinant adenoviral vectors based on alternative adenoviral serotypes, and means of obtaining such recombinant adenoviral vectors. This need in the art is met with the disclosure of the present application related to recombinant adenoviral vectors based on adenoviral serotype 34.

SUMMARY OF THE INVENTION

The present invention relates to recombinant, replication-deficient adenovirus vectors of serotype 34, a rare adenoviral serotype, and methods for generating the recombinant adenovirus based on the alternative serotype. Additionally, means of employing the recombinant adenovirus for the delivery and expression of exogenous genes are provided. The invention, thus, encompasses recombinant, replication-defective adenoviral vectors of serotype 34 which comprise one or more transgenes operatively linked to regulatory sequences which promote effective expression of the respective transgene(s). Host administration of such recombinant

adenovirus serotype 34 vectors, whether administered alone or in a combined modality and/or prime boost regimen, results in the efficient expression of the incorporated transgene and effectively induces an immune response capable of specifically recognizing the particular antigen administered (*e.g.*, HIV). Furthermore, the recombinant virus should evade pre-existing immunity to adenovirus serotypes which are more commonly encountered in the human population (*e.g.*, Ad5 and Ad2). The disclosed methods, thus, present an enhanced means for inducing an immune response against a particular antigen of interest (*e.g.*, HIV). Accordingly, the resultant immune response should offer a prophylactic advantage to previously uninfected individuals and/or provide a therapeutic effect by reducing viral load levels within an infected individual, thus prolonging the asymptomatic phase of infection.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates the homologous recombination scheme utilized to recover pAd34ΔE1ΔE4Ad5Orf6.

Figure 2 illustrates the homologous recombination scheme utilized to recover pMRKAd34ΔE1ΔE4Ad5Orf6.

Figures 3A-1 to 3A-9 illustrate a nucleic acid sequence for wild-type adenovirus serotype 34 (SEQ ID NO: 1). The ATCC product number for Ad34 is VR-716.

Figure 4 illustrates the time course of SEAP expression using MRKAd5 and Ad34 vectors in rhesus macaques. Data represent cohort geometric means.

Figure 5 illustrates, in tabular format, T cell responses induced using MRKAd5 and Ad34 vectors expressing HIV-1 gag. Data are expressed in numbers of spot-forming cells per million PBMC (SFC/10^6 PBMC). "a" refers to a 20-mer peptide pool with 10-aa overlap and encompassing the entire HIV-1 CAM1 gag.

Figure 6 illustrates, in tabular format, the levels of CD4+ and CD8+ Gag-specific T cells in Ad34-immunized macaques at week 12. "a" refers to a 20-mer peptide pool with 10-aa overlap and encompassing the entire HIV-1 CAM1 gag.

Figure 7 illustrates the nucleic acid sequence (SEQ ID NO: 3) of the optimized human HIV-1 gag open reading frame.

Figure 8 illustrates the nucleic acid sequence encoding the gag expression cassette (SEQ ID NO: 4). The various regions of the figure are as follows: (1) a first underlined segment of nucleic acid sequence encoding the immediate early gene promoter region from human cytomegalovirus; (2) a first segment of lowercase letters which is not underlined, which segment of DNA contains a convenient restriction enzyme site; (3) a region in caps which contains the

coding sequence of HIV-1 gag; (4) a second segment of lowercase letters which is not underlined, which segment of DNA contains a convenient restriction enzyme site; and (5) a second underlined segment, this segment containing nucleic acid sequence encoding a bovine growth hormone polyadenylation signal sequence.

Figure 9 illustrates the nucleic acid sequence encoding the SEAP expression cassette (SEQ ID NO: 5). The various regions of the figure are as follows: (1) a first underlined segment of nucleic acid sequence encoding the immediate early gene promoter region from human cytomegalovirus; (2) a first segment of lowercase letters which is not underlined, which segment of DNA contains a convenient restriction enzyme site; (3) a region in caps which contains the coding sequence of the human placental SEAP gene; (4) a second segment of lowercase letters which is not underlined, which segment of DNA contains a convenient restriction enzyme site; and (5) a second underlined segment, this segment containing nucleic acid sequence encoding a bovine growth hormone polyadenylation signal sequence.

Figures 10A-1 to 10A-47 illustrate the nucleotide sequence of the pMRKAd5HIV-1gag vector (SEQ ID NO: 6 [coding] and SEQ ID NO: 7 [non-coding]).

Figures 11A-1 to 11A-10 illustrate a nucleic acid sequence for wild-type adenovirus serotype 35 (SEQ ID NO: 13). The ATCC product number for Ad35 is VR-718.

Figure 12 illustrates, in tabular format, T cell responses induced using a heterologous Ad34 prime/Ad35 boost regimen in macaques. "a" refers to a 20-mer peptide pool with 10-aa overlap and encompassing the entire HIV-1 CAM1 gag.

Figure 13 illustrates, in tabular format, the levels of CD4+ and CD8+ Gag-specific T cells in Ad34 primed/Ad35 boosted macaques at week 28. "a" refers to a 20-mer peptide pool with 10-aa overlap and encompassing the entire HIV-1 CAM1 gag.

DETAILED DESCRIPTION OF THE INVENTION

Rare adenoviral serotypes possess an inherent advantage over the more commonly exploited adenoviral serotypes (for instance, adenoviral serotypes 2 and 5) since preexisting immunity is unlikely to limit their efficient delivery and expression of exogenous genes to their target site. Different adenoviral serotypes also exhibit distinct tropisms by reason of their varying capsid structure and, thus, present the potential for targeting different tissues and possibly leading to the elicitation of superior immune responses when used for vaccine or gene therapy purposes. These rare adenoviral serotypes when rendered replication-defective, however, can be difficult to propagate and rescue in currently available adenoviral propagation cell lines.

Applicants have recently managed to successfully rescue and propagate one such rare, replication-defective alternative serotype, adenovirus serotype 34, a subgroup B adenovirus, and herein demonstrate the effective functioning of the adenovirus in the delivery and expression of exogenous transgenes.

Accordingly, the present invention relates to a recombinant adenoviral vector of serotype 34 suitable for use in gene therapy or vaccination protocols. The nucleic acid sequence for wild-type adenovirus serotype 34 (SEQ ID NO: 1) is illustrated in Figures 3A-1 to 3A-9, although any functional homologue or different strain of adenovirus serotype 34 can be utilized in accordance with the methods of the present invention, as one of ordinary skill in the art will appreciate. Ad34 sequence has been noted to differ in a few regions. The following sites are just a sampling of sequence variation that can be found in Ad34: (1) around base pair 10640 of SEQ ID NO: 1, a series of thirteen ("13") rather than twelve ("12") "T"s follow the sequence gtgagtccta (SEQ ID NO: 8); (2) around base pair 15372 of SEQ ID NO: 1, a series of fifteen ("15") or seventeen ("17") rather than sixteen ("16") "A"s follow the sequence ccgcactttct (SEQ ID NO: 9); (3) around base pair 17325 of SEQ ID NO: 1, a series of thirteen ("13") rather than twelve ("12") "A"s follow the sequence attgacattgg (SEQ ID NO: 10); and (4) around base pair 25717 of SEQ ID NO: 1, the sequence cagtctggagga (SEQ ID NO: 11) following the sequence ggagga (SEQ ID NO: 12) is deleted. Adenovirus serotypes have been distinguished through a number of art-appreciated biological, chemical, immunological and structural criteria which include hemagglutination properties of rat and rhesus monkey erythrocytes, DNA homology, restriction enzyme cleavage patterns, percentage G+C content and oncogenicity; Straus, *supra*; Horwitz, *supra*. A given serotype can be identified by a number of methods including restriction mapping of viral DNA; analyzing the mobility of viral DNA; analyzing the mobility of virion polypeptides on SDS-polyacrylamide gels following electrophoresis; comparison of sequence

information to known sequence particularly from capsid genes (*e.g.*, hexon) which contain sequences that define a serotype; and comparing a sequence with reference sera for a particular serotype available from the ATCC. Classification of adenovirus serotypes by SDS-PAGE has been discussed in Wadell *et al.*, 1980 *Ann. N.Y. Acad. Sci.* 354:16-42. Classification of adenovirus serotypes by restriction mapping has been discussed in Wadell *et al.*, *Current Topics in Microbiology and Immunology* 110:191-220. Adenovirus serotype 34, a subgroup B adenovirus, was originally isolated in 1972 and was established as a recognized reference strain in 1975 (J.C. Hierholzer *et al.*, 1975 *J. Clin. Microbiol.* 1:366-376). Its antigenic relationship to 46 other human adenoviruses determined in reference horse antisera has been discussed in the art; J.C. Hierholzer *et al.*, 1991 *Arch. Virol.* 121:179-197.

Adenovirus serotype 34 vectors in accordance with the present invention are at least partially deleted in E1 and devoid (or essentially devoid) of E1 activity, rendering the vector incapable of replication in the intended host. Preferably, the E1 region is completely deleted or inactivated. The adenoviruses may contain additional deletions in E3, and other early regions, albeit in situations where E2 and/or E4 is deleted, E2 and/or E4 complementing cell lines may be required to generate recombinant, replication-defective adenoviral vectors.

Adenoviral vectors of use in the methods of the present invention can be constructed using well known techniques, such as those reviewed in Hitt *et al.*, 1997 "Human Adenovirus Vectors for Gene Transfer into Mammalian Cells" *Advances in Pharmacology* 40:137-206, which is hereby incorporated by reference. Often, a plasmid or shuttle vector containing the heterologous nucleic acid of interest is generated which comprises sequence homologous to the specific adenovirus of interest. The shuttle vector and viral DNA or second plasmid containing the cloned viral DNA are then co-transfected into a host cell where homologous recombination occurs and results in the incorporation of the heterologous nucleic acid into the viral nucleic acid. Preferred shuttle vectors and cloned viral genomes contain adenoviral and plasmid portions. For shuttle vectors used in the construction of replication-defective vectors, the adenoviral portion typically contains non-functional or deleted E1 and E3 regions and the gene expression cassette, flanked by convenient restriction sites. The plasmid portion of the shuttle vector typically contains an antibiotic resistance marker under the transcriptional control of a prokaryotic promoter. Ampicillin resistance genes, neomycin resistance genes and other pharmaceutically acceptable antibiotic resistance markers may be used. To aid in the high level production of the nucleic acid by fermentation in prokaryotic organisms, it is advantageous for the shuttle vector to contain a prokaryotic origin of replication and be of high copy number. A number of commercially available prokaryotic cloning vectors

provide these benefits. Non-essential DNA sequences are, preferably removed. It is also preferable that the vectors not be able to replicate in eukaryotic cells. This minimizes the risk of integration of nucleic acid vaccine sequences into the recipients' genome. Tissue-specific promoters or enhancers may be used whenever it is desirable to limit expression of the nucleic acid to a particular tissue type.

Homologous recombination of the shuttle vector and wild-type adenovirus 34 viral DNA (Ad34 backbone vector) results in the generation of adenoviral pre-plasmids (see, for instance, pAd34ΔE1ΔE4Ad5Orf6, pMRKAd34ΔE1ΔE4Ad5Orf6, pAd34ΔE1gagΔE4Ad5Orf6, and pAd34ΔE1SEAPΔE4Ad5Orf6). Upon linearization, the pre-plasmids are capable of replication in PER.C6® cells or alternative E1-complementing cell lines. Infected cells and media can then be harvested once viral replication is complete.

A packaging cell will generally be needed in order to produce sufficient amount of adenovirus. The packaging cell should contain elements which are necessary for the production of the specific adenovirus of interest. It is preferable that the packaging cell and the vector not contain overlapping elements which could lead to replication competent virus by recombination. Specific examples of cells which are suitable for the propagation of recombinant Ad34 E1-deleted vectors express the early region 1 (E1) of adenovirus 34 or another group B serotype. Alternatively, propagation cell lines can be used which express adenoviral E1 and E4 regions (particularly, E4 open reading frame 6 ("ORF6")) which are derived from the same serotype but different subgroup than Ad34 (*e.g.,* Ad5 E1 and E4); *see, e.g.,* Abrahamsen *et al.*, 1997 *J. Virol.* 8946-8951, and U.S. Patent No. 5,849,561. Additionally, a cell line could be used that expresses E1B from Ad34 in addition to (1) E1A or (2) E1A and E1B from a serotype of a different subgroup. In copending U.S. provisional application serial no. 60/405,182, filed August 22, 2002, a strategy was disclosed for the efficient propagation and rescue of alternative adenoviral serotypes. The method is based on incorporating, into the genome of the adenovirus vector, an E4 region (or portion thereof including E4 ORF6) of the same or highly similar serotype as that of the E1 gene product(s), particularly E1B, being expressed by the complementing cell line. Examples 1-4 demonstrate the viability of such a method through the incorporation of an Ad5E4 region and its propagation in PER.C6 cells (which cells express Ad5E1). The wildtype adenovirus serotype 5 sequence is known and described in the art; *see* Chroboczek *et al.*, 1992 *J. Virol.* 186:280, which is hereby incorporated by reference. Placement of the E4 region or ORF6-containing portion is not critical. The critical step is making sure that either a promoter is supplied or the gene is strategically placed so that it runs off a promoter native to the vector (*e.g.,* such as the E4 promoter). The native E4 region of the vector can be

replaced, deleted or left intact. This method is, thus, suitable for use in the propagation and rescue of the adenoviral vectors of the present invention.

Typically, propagation cells are human cells derived from the retina or kidney, although any cell line capable of expressing the appropriate E1 and/or E4 region(s) can be utilized in the present invention. Embryonal cells such as amniocytes have been shown to be particularly suited for the generation of El complementing cell lines. Several cell lines are available. These include but are not limited to the known cell lines PER.C6 (ECACC deposit number 96022940), 911, 293, and El A549.

The present invention encompasses methods for producing a recombinant, replication-defective adenovirus of serotype 34 in an adenoviral E1-complementing cell line, comprising transfecting a recombinant, replication-defective adenoviral vector of serotype 34 in an adenoviral E1-complementing cell and allowing for the production of viral particles. The viral particles so produced form another aspect of the present invention. Host cells comprising the recombinant, replication-defective adenoviral serotype 34 vectors of the present invention form yet another aspect of the present invention; host cells being defined as a population of cells not including a transgenic human being. Recombinant, replication-defective adenovirus harvested in accordance with the methods of the present invention are encompassed herein as well. This harvested material may be purified, formulated and stored prior to host administration.

Adenoviral vectors in accordance with the present invention are very well suited to effectuate expression of desired proteins, especially in situations where an individual's immune response effectively prevents administration or readministration via the more commonly employed adenoviral serotypes. Accordingly, specific embodiments of the present invention are recombinant, replication-defective adenoviral vectors of serotype 34 which comprise a heterologous nucleic acid of interest. The nucleic acid of interest can be a gene, or a functional part of a gene. The nucleic acid can be DNA and/or RNA, can be double or single stranded, and can exist in the form of an expression cassette. The nucleic acid can be inserted in an E1 parallel (transcribed 5' to 3') or anti-parallel (transcribed in a 3' to 5' direction relative to the vector backbone) orientation. The nucleic acid can be codon-optimized for expression in the desired host (*e.g.,* a mammalian host). The heterologous nucleic acid can be in the form of an expression cassette. A gene expression cassette will typically contain (a) nucleic acid encoding a protein or antigen of interest; (b) a heterologous promoter operatively linked to the nucleic acid encoding the protein; and (c) a transcription termination signal.

In specific embodiments, the heterologous promoter is recognized by an eukaryotic RNA polymerase. One example of a promoter suitable for use in the present invention is the immediate early human cytomegalovirus promoter (Chapman *et al.*, 1991 *Nucl. Acids Res.* 19:3979-3986). Further examples of promoters that can be used in the present invention are the strong immunoglobulin promoter, the EF1 alpha promoter, the murine CMV promoter, the Rous Sarcoma Virus promoter, the SV40 early/late promoters and the beta actin promoter, albeit those of skill in the art can appreciate that any promoter capable of effecting expression in the intended host can be used in accordance with the methods of the present invention. The promoter may comprise a regulatable sequence such as the Tet operator sequence. Sequences such as these that offer the potential for regulation of transcription and expression are useful in instances where repression of gene transcription is sought. The adenoviral gene expression cassette may comprise a transcription termination sequence; specific embodiments of which are the bovine growth hormone termination/polyadenylation signal (bGHpA) or the short synthetic polyA signal (SPA) of 50 nucleotides in length defined as follows: AATAAAAGATCTTTATTTTCATTAGATCTGTGTGTT-GGTTTTTTGTGTG (SEQ ID NO:2). A leader or signal peptide may also be incorporated into the transgene. In specific embodiments, the leader is derived from the tissue-specific plasminogen activator protein, tPA.

Heterologous nucleic acids of interest are genes (or their functional counterparts) which encode immunogenic and/or therapeutic proteins. Preferred therapeutic proteins are those which elicit some measurable therapeutic benefit in the individual host upon administration. Preferred immunogenic proteins are any proteins which are capable of eliciting an immune response in an individual. Applicants have exemplified the delivery of a representative immunogenic protein (HIV gag) in the present specification in non-human primates (rhesus macaques), albeit any gene encoding a therapeutic or immunogenic protein can be used in accordance with the methods disclosed herein. The adenovirus serotype 34 vectors were found to induce significant levels of gag-specific T cells; Figure 5. Moreover, the results indicated that immunization with the disclosed vectors was able to elicit both HIV-specific CD4+ and CD8+ T cells; Figure 6.

An aspect of the present invention, therefore, relates to adenovirus serotype 34-based vectors carrying an HIV transgene. In these embodiments, nucleic acid encoding any HIV antigen may be utilized (specific examples of which include gag, pol, nef, gp160, gp41, gp120, tat, and rev, including derivatives of the aforementioned genes). The embodiments exemplified herein employ nucleic acid encoding a codon-optimized p55 gag antigen; *see* Figure 7 (SEQ ID NO: 3). Codon-optimized HIV-1 env genes are disclosed in PCT International Applications

PCT/US97/02294 and PCT/US97/10517, published August 28, 1997 (WO 97/31115) and December 24, 1997, respectively. Codon-optimized HIV-1 pol genes are disclosed in U.S. Application Serial No. 09/745,221, filed December 21, 2000 and PCT International Application PCT/US00/34724, also filed December 21, 2000. Codon-optimized HIV-1 nef genes are disclosed in U.S. Application Serial No. 09/738,782, filed December 15, 2000 and PCT International Application PCT/US00/34162, also filed December 15, 2000.

In this specific embodiment of a recombinant, replication-defective Ad34 vector comprising an HIV-1 gene, the gene may be derived from HIV-1 strain CAM-1; Myers et al, eds. "Human Retroviruses and AIDS: 1995, IIA3-IIA19, which is hereby incorporated by reference. This gene closely resembles the consensus amino acid sequence for the clade B (North American/European) sequence. HIV gene sequence(s) may be based on various clades of HIV-1; specific examples of which are Clades B and C. Sequences for genes of many HIV strains are publicly available from GenBank and primary, field isolates of HIV are available from the National Institute of Allergy and Infectious Diseases (NIAID) which has contracted with Quality Biological (Gaithersburg, MD) to make these strains available. Strains are also available from the World Health Organization (WHO), Geneva Switzerland. It is well within the purview of the skilled artisan to choose an appropriate nucleotide sequence which encodes a specific HIV antigen, or immunologically relevant portion or modification thereof. "Immunologically relevant" as defined herein means (1) with regard to a viral antigen, that the protein is capable, upon administration, of eliciting a measurable immune response within an individual sufficient to retard the propagation and/or spread of the virus and/or to reduce the viral load present within the individual; or (2) with regards to a nucleotide sequence, that the sequence is capable of encoding for a protein capable of the above.

The present invention encompasses methods for (1) effectuating a therapeutic response in an individual and (2) generating an immune response (including a cellular-mediated immune response) comprising administering to an individual a recombinant adenovirus serotype 34 vector in accordance with the present invention. One aspect of the present invention are methods for generating an enhanced immune response against one or more antigens (bacterial, viral (*e.g.,* HIV), or other (*e.g.,* cancer)) which comprise the administration of a recombinant adenovirus serotype 34 vehicle expressing the antigen of interest. Administration of recombinant Ad34 vectors in this manner provides for improved cellular-mediated immune responses, particularly where there is pre-existing immunity in a given host to the more well-represented adenovirus serotypes (*e.g.,* Ad2 and Ad5). An effect of the improved vaccine administration methods should be a lower transmission rate to (or occurrence rate in) previously

uninfected individuals (*i.e.,* prophylactic applications) and/or a reduction in the levels of virus/bacteria/foreign agent within an infected individual (*i.e.,* therapeutic applications). As relates to HIV indications, an effect of the improved vaccine administration methods should be a lower transmission rate to previously uninfected individuals (*i.e.,* prophylactic applications) and/or a reduction in the levels of viral loads within an infected individual (*i.e.,* therapeutic applications) so as to prolong the asymptomatic phase of HIV infection. Administration, intracellular delivery and expression of the recombinant Ad34 vectors elicits a host CTL and Th response.

Accordingly, the present invention relates to methodology regarding administration of the recombinant Ad34 viral vectors (or immunogenic compositions thereof, herein termed vaccines) to provide effective immunoprophylaxis, to prevent establishment of an infection following exposure to the viral (for instance, HIV), bacterial or other agent, or as a post-infection therapeutic vaccine to mitigate infection to result in the establishment of a lower virus/bacteria/other load with beneficial long term consequences.

The recombinant adenovirus serotype 34 vectors of the present invention may be administered alone, or as part of a prime/boost administration regimen. A priming dose(s) of at least one antigen (*e.g.,* an HIV antigen) is first delivered with a recombinant adenoviral vector. This dose effectively primes the immune response so that, upon subsequent identification of the antigen(s) in the circulating immune system, the immune response is capable of immediately recognizing and responding to the antigen(s) within the host. The priming dose(s) is then followed with a boosting dose comprising a recombinant adenoviral vector containing at least one gene encoding the antigen. A mixed modality prime and boost inoculation scheme will result in an enhanced immune response, particularly where there is pre-existing anti-vector immunity. Prime-boost administrations typically involve priming the subject (by viral vector, plasmid, protein, *etc.*) at least one time, allowing a predetermined length of time to pass, and then boosting (by viral vector, plasmid, protein, *etc.*). Multiple primings, typically 1-4, are usually employed, although more may be used. The length of time between priming and boost may typically vary from about four months to a year, albeit other time frames may be used as one of ordinary skill in the art will appreciate.

In addition to a single protein or antigen of interest being delivered by the recombinant, replication-defective adenovirus serotype 34 vectors of the present invention, two or more proteins or antigens can be delivered either via separate vehicles or delivered *via* the same vehicle. Multiple genes/functional equivalents may be ligated into a proper shuttle plasmid for generation of a pre-adenoviral plasmid comprising multiple open reading frames. Open

reading frames for the multiple genes/functional equivalents can be operatively linked to distinct promoters and transcription termination sequences. In other embodiments, the open reading frames may be operatively linked to a single promoter, with the open reading frames operatively linked by an internal ribosome entry sequence (IRES; as disclosed in WO 95/24485), or suitable alternative allowing for transcription of the multiple open reading frames to run off of a single promoter. In certain embodiments, the open reading frames may be fused together by stepwise PCR or suitable alternative methodology for fusing together two open reading frames. Due consideration must be given, however, to the effective packaging limitations of the viral vehicle. Adenovirus type 5, for instance, has been shown to exhibit an upper cloning capacity limit of approximately 105% of the wildtype Ad5 sequence.

Prime-boost regimens can employ different adenoviral serotypes. One example of such a protocol would be a priming dose(s) comprising a recombinant adenoviral vector of a first serotype followed by a boosting dose comprising a recombinant adenoviral vector of a second and different serotype; *see,* for instance, Example 6 and Figures 12 and 13. Therein, a cohort of monkeys was given two doses of an Ad34-based HIV gag vector at weeks 0 and 4, and boosted at week 24 with an Ad35-based HIV gag vector. Administration of the Ad35-based vector resulted in about a 3-fold enhancement in T cell responses when compared to the levels at the time of the booster. In an alternative embodiment, the priming dose can comprise a mixture of separate adenoviral vehicles each comprising a gene encoding for a different protein/antigen. In such a case, the boosting dose would also comprise a mixture of vectors each comprising a gene encoding for a separate protein/antigen, provided that the boosting dose(s) administers recombinant viral vectors comprising genetic material encoding for the same or similar set of antigens that were delivered in the priming dose(s). These multiple gene/vector administration modalities can further be combined. It is further within the scope of the present invention to embark on combined modality regimes which include multiple but distinct components from a specific antigen.

Compositions, including vaccine compositions, comprising the adenoviral vectors of the present invention are an important aspect of the present invention. These compositions can be administered to mammalian hosts, preferably human hosts, in either a prophylactic or therapeutic setting. Potential hosts/vaccinees include but are not limited to primates and especially humans and non-human primates, and include any non-human mammal of commercial or domestic veterinary importance. Compositions comprising recombinant adenoviral serotype 34 vectors may be administered alone or in combination with other viral- or non-viral-based DNA/protein vaccines. They also may be administered as part of a broader treatment regimen.

The present invention encompasses those situations as well where the disclosed recombinant adenoviral serotype 34 vectors are administered in conjunction with other therapies; for example, HAART therapy (in the case of a recombinant HIV vector).

Compositions comprising the recombinant viral vectors may contain physiologically acceptable components, such as buffer, normal saline or phosphate buffered saline, sucrose, other salts and polysorbate. In certain embodiments, the formulation has: 2.5-10 mM TRIS buffer, preferably about 5 mM TRIS buffer; 25-100 mM NaCl, preferably about 75 mM NaCl; 2.5-10% sucrose, preferably about 5% sucrose; 0.01 -2 mM $MgCl_2$; and 0.001%-0.01% polysorbate 80 (plant derived). The pH should range from about 7.0-9.0, preferably about 8.0. One skilled in the art will appreciate that other conventional vaccine excipients may also be used in the formulation. In specific embodiments, the formulation contains 5mM TRIS, 75 mM NaCl, 5% sucrose, 1mM $MgCl_2$, 0.005% polysorbate 80 at pH 8.0. This has a pH and divalent cation composition which is near the optimum for Ad5 and Ad6 stability and minimizes the potential for adsorption of virus to a glass surface. It does not cause tissue irritation upon intramuscular injection. It is preferably frozen until use.

The amount of viral particles in the vaccine composition to be introduced into a vaccine recipient will depend on the strength of the transcriptional and translational promoters used and on the immunogenicity of the expressed gene product. In general, an immunologically or prophylactically effective dose of $1x10^7$ to $1x10^{12}$ particles and preferably about $1x10^{10}$ to $1x10^{11}$ particles is administered directly into muscle tissue. Subcutaneous injection, intradermal introduction, impression through the skin, and other modes of administration such as intraperitoneal, intravenous, or inhalation delivery are also contemplated. Parenteral administration, such as intravenous, intramuscular, subcutaneous or other means of administration of interleukin-12 protein, concurrently with or subsequent to parenteral introduction of the vaccine compositions of this invention is also advantageous.

The following non-limiting Examples are presented to better illustrate the workings of the invention.

Example 1

Construction of pAd34ΔE1ΔE4Ad5Orf6

To generate an E1- Ad34 based vector that can propagate in existing group C/Ad5 E1 complementing cell lines (293, PER.C6), Ad5 Orf6 was inserted in place of the native E4 region. To construct the Ad34 pre-Adenovirus plasmid, advantage was taken of the sequence

homology between Ad34 and Ad35. Cotransformation of BJ 5183 bacteria with purified wild-type Ad34 viral DNA and the appropriately constructed Ad35 ITR cassette resulted in the circularization of the viral genome by homologous recombination. The construction of the pre-Ad plasmid based on Ad34, is outlined below:

To construct pAd34ΔE1ΔE4Ad5Orf6 (An Ad34 pre-Ad plasmid containing an E1 deletion and an E4 deletion substituted with Ad5 Orf6), we utilized an Ad35 ITR cassette. We anticipated that sequence homology between Ad34 and Ad35 would allow homologous recombination to occur. The Ad35 ITR cassette was constructed containing sequences from the right (bp 31599 to 31913 and bp 34419 to 34793) and left (bp 4 to 456 and bp 3403 to 3886) end of the Ad35 genome (*see* Figures 11A-1 to 11A-10) separated by plasmid sequences containing a bacterial origin of replication and an ampicillin resistance gene. The four segments were generated by PCR and cloned sequentially into pNEB193, generating pNEBAd35-4. Next the Ad5 Orf6 open reading frame was generated by PCR and cloned between Ad35 bp 31913 and 34419 generating pNEBAd35-4Ad5Orf6 (the ITR cassette). PNEB193 is a commonly used commercially available cloning plasmid (New England Biolabs cat# N3051S) containing a bacterial origin of replication, ampicillin resistance gene and a multiple cloning site into which the PCR products were introduced. The ITR cassette contains a deletion of E1 sequences from Ad35 bp 457 to 3402 with a unique *Swa* I restriction site located in the deletion and an E4 deletion from Ad35 bp 31914 to 34418 into which Ad5 Orf6 was introduced in an E4 parallel orientation. In this construct Ad5Orf6 expression is driven by the Ad35 E4 promoter. The Ad35 sequences (bp 31599 to 31913 and bp 3403 to 3886) in the ITR cassette provided regions of homology with the purified Ad34 viral DNA in which bacterial recombination could occur following cotransformation into BJ 5183 bacteria (Figure 1). The ITR cassette was also designed to contain unique restriction enzyme sites (*Pme*I) located at the end of the viral ITR's so that digestion would release the recombinant Ad34 genome from the plasmid sequences. Potential clones were screened by restriction analysis and one clone was selected as pAd34ΔE1ΔE4Ad5Orf6.

Example 2

Rescue of pAd34ΔE1ΔE4Ad5Orf6 into Virus

In order to determine if pre-adenovirus plasmid pAd34ΔE1ΔE4Ad5Orf6, could be rescued into virus and propagated in a group C E1 complementing cell line, the plasmid was digested with *Pme* I and transfected into T-25 flasks of PER.C6 cells using the calcium phosphate co-precipitation technique (Cell Phect Transfection Kit, Amersham Pharmacia

Biotech Inc). *Pme*I digestion releases the viral genome from plasmid sequences allowing viral replication to occur after cell entry. Viral cytopathic effect (CPE), indicating that virus replication and amplification was occurring was observed following transfection. When CPE was complete, approximately 7-10 days post transfection, the infected cells and media were harvested, freeze/thawed three times and the cell debris pelleted by centrifugation. Approximately 1 ml of the cell lysate was used to infect a T-225 flask of PER.C6 cells at 80-90% confluence. Once CPE was reached, infected cells and media were harvested, freeze/thawed three times and the cell debris pelleted by centrifugation. Clarified cell lysates were then used to infect 2-layer NUNC cell factories of PER.C6 cells. Following complete CPE, the virus was purified by ultracentrifugation on CsCl density gradients. In order to verify the genetic structure of the rescued viruses, viral DNA was extracted using pronase treatment followed by phenol chloroform extraction and ethanol precipitation. Viral DNA was then digested with *Hin*dIII and treated with Klenow fragment to end-label the restriction fragments with P33-dATP. The end-labeled restriction fragments were then size-fractionated by gel electrophoresis and visualized by autoradiography. The digestion products were compared with the digestion products of the corresponding pre-Adenovirus plasmid (that had been digested with *Pme*1/*Hind*III prior to labeling) from which they were derived. The expected sizes were observed, indicating that the viruses had been successfully rescued.

Example 3

Insertion of an Expression Cassette into pAd34ΔE1ΔE4Ad5Orf6

In order to introduce a gag or SEAP expression cassette (*see* Figures 8 and 9, respectively) into the E1 region of pAd34ΔE1ΔE4Ad5Orf6, bacterial recombination was again used. A gag expression cassette consisting of the following: 1) the immediate early gene promoter from human cytomegalovirus, 2) the coding sequence of the human immunodeficiency virus type 1 (HIV-1) gag (strain CAM-1; 1526 bp) gene, and 3) the bovine growth hormone polyadenylation signal sequence, was cloned into the E1 deletion in Ad35 shuttle plasmid, pNEBAd35-2 (a precursor to the Ad35 ITR cassettes described above), generating pNEBAd35CMVgagBGHpA. pNEBAd35-2 contains Ad35 sequences from the left end of the genome (bp 4 to 456 and bp 3403 to 3886) with a unique *Swa*I site between bp 456 and 3403 at the position of the deletion. The gag expression cassette was obtained from a previously constructed shuttle plasmid by *Eco*RI digestion. Following the digestion the desired fragment was gel purified, treated with Klenow to obtain blunt ends and cloned into the *Swa*I site in pNEBAd35-2. This cloning step resulted in the gag expression cassette being inserted into the

E1 deletion between bp 456 and 3403 in the E1 parallel orientation. The shuttle vector containing the gag transgene was digested to generate a DNA fragment consisting of the gag expression cassette flanked by Ad35 bp 4 to 456 and bp 3403 to 3886 and the fragment was purified after electrophoresis on an agarose gel. Cotransformation of BJ 5183 bacteria with the shuttle vector fragment and pAd34ΔE1ΔE4Ad5Orf6, linearized in the E1 region by digestion with *Swa* I, resulted in the generation of the Ad34 gag-containing pre-Adenovirus plasmid pAd34ΔE1gagΔE4Ad5Orf6 by homologous recombination. Potential clones were screened by restriction analysis.

A similar strategy was used to generate Ad34 pre-Ad plasmids containing a SEAP expression cassette. In this case a SEAP expression cassette consisting of: 1) the immediate early gene promoter from human cytomegalovirus, 2) the coding sequence of the human placental SEAP gene, and 3) the bovine growth hormone polyadenylation signal sequence was cloned into the E1 deletion in Ad35 shuttle plasmid, pNEBAd35-2, generating pNEBAd35CMVSEAPBGHpA. The SEAP expression cassette was obtained from a previously constructed shuttle plasmid by *Eco*RI digestion. Following the digestion the desired fragment was gel purified, treated with Klenow to obtain blunt ends and cloned into the *Swa*I site in pNEBAd35-2. The transgene was then recombined into the pAd34ΔE1ΔE4Ad5Orf6, generating pAd34ΔE1SEAPΔE4Ad5Orf6 as described above for the gag transgene.

All pre-Ad plasmids were rescued into virus and expanded to prepare CsCl purified stocks as described above.

Example 4

Construction of pMRKAd34ΔE1ΔE4Ad5Orf6

To construct an Ad34 pre-Ad plasmid that was composed entirely of Ad34 sequences, an Ad34 ITR cassette was generated. The Ad34 ITR cassette was constructed containing sequences from the right (bp 31584 to 31895 and bp 34409 to 34772) and left (bp 4 to 456 and bp 3402 to 3885) end of the Ad34 genome (*see* Figures 3A-1 to 3A-9) separated by plasmid sequences containing a bacterial origin of replication and an ampicillin resistance gene. These four segments were generated by PCR and cloned sequentially into pNEB193, generating pNEBAd34-4. Next the Ad5 Orf6 open reading frame was generated by PCR and cloned between Ad34 bp 31895 and 34409 generating pNEBAd34-4Ad5Orf6 (the ITR cassette). PNEB193 is a commonly used commercially available cloning plasmid (New England Biolabs cat# N3051S) containing a bacterial origin of replication, ampicillin resistance gene and a multiple cloning site into which the PCR products were introduced. The ITR cassette contains a

deletion of E1 sequences from Ad34 bp 457 to 3401 with a unique *Swa* I restriction site located in the deletion and an E4 deletion from Ad34 bp 31896 to 34408 into which Ad5 Orf6 was introduced in an E4 parallel orientation. In this construct Ad5Orf6 expression is driven by the Ad34 E4 promoter. The Ad34 sequences (bp 31584 to 31895 and bp 3402 to 3885) in the ITR cassette provided regions of homology with the purified Ad34 viral DNA in which bacterial recombination could occur following cotransformation into BJ 5183 bacteria (Figure 2). The ITR cassette was also designed to contain unique restriction enzyme sites (PmeI) located at the end of the viral ITR's so that digestion would release the recombinant Ad34 genome from the plasmid sequences. Potential clones were screened by restriction analysis and one clone was selected as pMRKAd34ΔE1ΔE4Ad5Orf6.

Example 5

In Vivo Studies

A. Immunization

Cohorts of 3 rhesus macaques were given single intramuscular injections of one of the two vectors: (1) 10^11 vp MRKAd5-SEAP (in MRKAd vector backbone of Figures 10A-1 to 10A-45 disclosed in PCT/US01/28861, published March 21, 2002); and (2) 10^11 vp Ad34ΔE1SEAPΔE4Ad5Orf6. Rhesus macaques were between 3-10 kg in weight. In all cases, the total dose of each vaccine was suspended in 1 mL of buffer. The macaques were anesthetized (ketamine/xylazine) and the vaccines were delivered i.m. in 0.5-mL aliquots into both deltoid muscles using tuberculin syringes (Becton-Dickinson, Franklin Lakes, NJ). Peripheral blood mononuclear cells (PBMC) were prepared from blood samples collected at several time points during the immunization regimen. All animal care and treatment were in accordance with standards approved by the Institutional Animal Care and Use Committee according to the principles set forth in the *Guide for Care and Use of Laboratory Animals*, Institute of Laboratory Animal Resources, National Research Council.

B. SEAP Assay

Serum samples were analyzed for circulating human secreted alkaline phosphatase (SEAP) levels using TROPIX phospha-light chemiluminescent kit (Applied Biosystems Inc). Duplicate 5 μL aliquots of each serum were mixed with 45 μL of kit-supplied dilution buffer in a 96-well white DYNEX plate. Serially diluted solutions of a human placental alkaline phosphatase (Catalog no. M5905, Sigma, St. Louis, MO) in 10% naïve monkey serum served to provide the standard curve. Endogenous SEAP activity in the samples was inactivated by heating the well for 30 minutes at 65 °C. Enzymatic SEAP activities in the samples were

determined following the procedures described in the kit. Chemiluminescence readings (in relative light units) were recorded using DYNEX luminometer. RLU readings were converted to ng/mL SEAP using a log-log regression analyses.

C. ELISPOT Assay

The IFN-γ ELISPOT assays for rhesus macaques were conducted following a previously described protocol (Allen *et al.*, 2001 *J. Virol.* 75(2):738-749), with some modifications. For antigen-specific stimulation, a peptide pool was prepared from 20-aa peptides that encompass the entire HIV-1 gag sequence with 10-aa overlaps (Synpep Corp., Dublin, CA). To each well, 50 μL of 2-4 x 10^5 peripheral blood mononuclear cells (PBMCs) were added; the cells were counted using Beckman Coulter Z2 particle analyzer with a lower size cut-off set at 80 femtoliters ("fL"). Either 50 μL of media or the gag peptide pool at 8 μg/mL concentration per peptide were added to the PBMC. The samples were incubated at 37°C, 5% CO_2 for 20-24 hrs. Spots were developed accordingly and the plates were processed using custom-built imager and automatic counting subroutine based on the ImagePro platform (Silver Spring, MD); the counts were normalized to 10^6 cell input.

D. Intracellular Cytokine Staining (ICS)

To 1 ml of 2 x 10^6 PBMC/mL in complete RPMI media (in 17x100mm round bottom polypropylene tubes (Sarstedt, Newton, NC)), anti-hCD28 (clone L293, Becton-Dickinson) and anti-hCD49d (clone L25, Becton-Dickinson) monoclonal antibodies were added to a final concentration of 1 μg/mL. For gag-specific stimulation, 10 μL of the peptide pool (at 0.4 mg/mL per peptide) were added. The tubes were incubated at 37 °C for 1 hr., after which 20 μL of 5 mg/mL of brefeldin A (Sigma) were added. The cells were incubated for 16 hr at 37 °C, 5% CO_2, 90% humidity. 4 mL cold PBS/2%FBS were added to each tube and the cells were pelleted for 10 min at 1200 rpm. The cells were re-suspended in PBS/2%FBS and stained (30 min, 4 °C) for surface markers using several fluorescent-tagged mAbs: 20 μL per tube anti-hCD3-APC, clone FN-18 (Biosource); 20 μL anti-hCD8-PerCP, clone SK1 (Becton Dickinson); and 20 μL anti-hCD4-PE, clone SK3 (Becton Dickinson). Sample handling from this stage was conducted in the dark. The cells were washed and incubated in 750 μL 1xFACS Perm buffer (Becton Dickinson) for 10 min at room temperature. The cells were pelleted and re-suspended in PBS/2%FBS and 0.1 μg of FITC-anti-hIFN-γ, clone MD-1 (Biosource) was added. After 30 min incubation, the cells were washed and re-suspended in PBS. Samples were analyzed using all four color channels of the Becton Dickinson FACSCalibur instrument. To analyze the data, the low side- and forward-scatter lymphocyte population was initially gated; a common fluorescence

cut-off for cytokine-positive events was used for both $CD4^+$ and $CD8^+$ populations, and for both mock and gag-peptide reaction tubes of a sample.

E. Results

Expression: Serum samples prior to and after the injection were analyzed for circulating SEAP activities and the results are shown in Figure 4. Results indicate that the peak levels of SEAP protein produced by the alternative adenovirus serotype were lower than but were within 3-fold of that of MRKAd5 at the same high dose level of 10^11 vp (Figure 4). The levels of SEAP in the serum dropped dramatically after day 10 and were close to background as early as day 15. These observations strongly indicate that the Ad34-based vector is efficient in expressing a transgene following intramuscular administration in a primate.

Immunogenicity: Vaccine-induced T cell responses against HIV-1 gag were quantified using IFN-gamma ELISPOT assay against a pool of 20-aa peptides that encompassed the entire protein sequence. The results are shown in Figure 5; they are expressed as the number of spot-forming cells (SFC) per million peripheral blood mononuclear cells (PBMCs) that responded to the peptide pool or the mock (no peptide) control.

Immunization with gag-expressing Ad34 vector induced detectable levels of circulating gag-specific T cells immediately after a single dose of the vector. The responses improved following a second dose given at wk 4. Overall, the responses to the Ad34-based vector were slightly lower than those induced by the same dose of MRKAd5-gag. The results strongly indicate the Ad34-based vector can prime effectively for HIV-specific T cell responses.

IFN-γ ICS analyses of the PBMC from the Ad34-immunized animals revealed that the vector can induce detectable levels of both $CD4^+$ and $CD8^+$ HIV-specific T cells (Figure 6).

Example 6

Heterologous Immunization

Cohorts of 3 monkeys were immunized (at wks 0, 4) with 10^11 vp Ad34ΔE1gagΔE4Ad5Orf6 followed by a booster at week 24 with 10^10 vp Ad35ΔE1gagΔE4Ad5Orf6. Vaccine-induced T cell responses against HIV-1 gag were quantified using IFN-gamma ELISPOT assay against a pool of 20-aa peptides that encompassed the entire protein sequence. The results are shown in Figure 12; they are expressed as the number of spot-forming cells (SFC) per million peripheral blood mononuclear cells (PBMCs) that responded to the peptide pool or the mock (no peptide) control.

Immunization with gag-expressing Ad34 vector induced detectable levels of circulating gag-specific T cells that decreased to between 94-139 SFC/10^6 PBMC at the time of the boost. Heterologous immunization with an Ad35-based HIV vector resulted in as much as a 3-fold increase in T cell responses.

IFN-γ ICS analyses of the PBMCs from the Ad34 primed/Ad35 boosted animals at week 28 revealed that the vector can induce detectable levels of both $CD4^+$ and $CD8^+$ HIV-specific T cells (Figure 13).

WHAT IS CLAIMED IS:

1. A recombinant adenoviral vector of serotype 34 which is at least partially deleted in E1 and devoid of E1 activity.

2. A population of cells comprising the recombinant adenoviral vector of claim 1.

3. A method for producing recombinant, replication-defective adenovirus particles comprising:

(a) transfecting a recombinant adenoviral vector of claim 1 into a population of cells; and

(b) harvesting the resultant recombinant, replication-defective adenovirus.

4. Purified recombinant, replication-defective adenovirus particles harvested in accordance with the method of claim 3.

5. A composition comprising purified recombinant adenovirus particles in accordance with claim 4.

6. A composition in accordance with claim 5 which comprises a physiologically acceptable carrier.

7. A recombinant adenoviral vector of serotype 34 which is at least partially deleted in E1 and devoid of E1 activity which comprises heterologous nucleic acid.

8. A population of cells comprising the recombinant adenoviral vector of claim 7.

9. A method for producing recombinant, replication-defective adenovirus particles comprising:

(a) transfecting a recombinant adenoviral vector of claim 7 into a population of cells; and

(b) harvesting the resultant recombinant, replication-defective adenovirus.

10. A recombinant vector in accordance with claim 7 wherein the vector comprises a gene expression cassette comprising:

(a) a nucleic acid encoding a protein;

(b) a heterologous promoter operatively linked to the nucleic acid encoding the protein; and

(c) a transcription termination sequence.

11. A recombinant vector in accordance with claim 10 wherein the gene expression cassette is inserted into the E1 region.

12. A recombinant vector in accordance with claim 7 wherein the heterologous nucleic acid comprises codons optimized for expression in a human host.

13. A recombinant vector in accordance with claim 7 which comprises heterologous nucleic acid in the E1 deletion.

14. A recombinant vector in accordance with claim 7 which is at least partially deleted in E3.

15. Purified recombinant, replication-defective adenovirus particles harvested in accordance with the method of claim 9.

16. A composition comprising purified recombinant adenovirus particles in accordance with claim 9.

17. A composition in accordance with claim 16 which comprises a physiologically acceptable carrier.

18. A method for effecting the delivery and expression of heterologous nucleic acid comprising administering the composition of claim 16 prior or subsequent to administration of the heterologous nucleic acid with the same or different vector.

19. A method in accordance with claim 18 wherein the composition is preceded or followed by administration of heterologous nucleic acid with an adenovirus of a different serotype.

20. A composition in accordance with claim 16 wherein the heterologous nucleic acid encodes an HIV antigen.

21. A method for generating a cellular-mediated immune response against HIV in an individual comprising administering to the individual a composition of claim 20.

22. A composition in accordance with claim 21 wherein the HIV antigen is HIV-1 gag or immunologically relevant modification thereof.

23. A composition in accordance with claim 21 wherein the HIV antigen is HIV-1 nef or immunologically relevant modification thereof.

24. A composition in accordance with claim 21 wherein the HIV antigen is HIV-1 pol or immunologically relevant modification thereof.

25. A recombinant adenoviral vector of serotype 34 which is at least partially deleted in E1 and devoid of E1 activity which comprises an HIV-1 gene.

26. A population of cells comprising the recombinant adenoviral vector of claim 25.

27. A method for producing recombinant, replication-defective adenovirus particles comprising:

(a) transfecting a recombinant adenoviral vector of claim 25 into a population of cells; and

(b) harvesting the resultant recombinant, replication-defective adenovirus.

28. Purified recombinant, replication-defective adenovirus particles harvested in accordance with the method of claim 27.

29. A composition comprising purified recombinant adenovirus particles in accordance with claim 28.

30. A composition in accordance with claim 29 which comprises a physiologically acceptable carrier.

31. A method for effecting the delivery and expression of the HIV-1 gene comprising administering the composition of claim 30 prior or subsequent to administration of the HIV-1 gene with the same or different vector.

32. A method in accordance with claim 31 wherein the composition is preceded or followed by administration of the HIV-1 gene with an adenovirus of a different serotype.

33. A method for generating a cellular-mediated immune response against HIV in an individual comprising administering to the individual a composition of claim 29.

34. A composition in accordance with claim 29 wherein the HIV antigen is HIV-1 gag or immunologically relevant modification thereof.

35. A composition in accordance with claim 29 wherein the HIV antigen is HIV-1 nef or immunologically relevant modification thereof.

36. A composition in accordance with claim 29 wherein the HIV antigen is HIV-1 pol or immunologically relevant modification thereof.

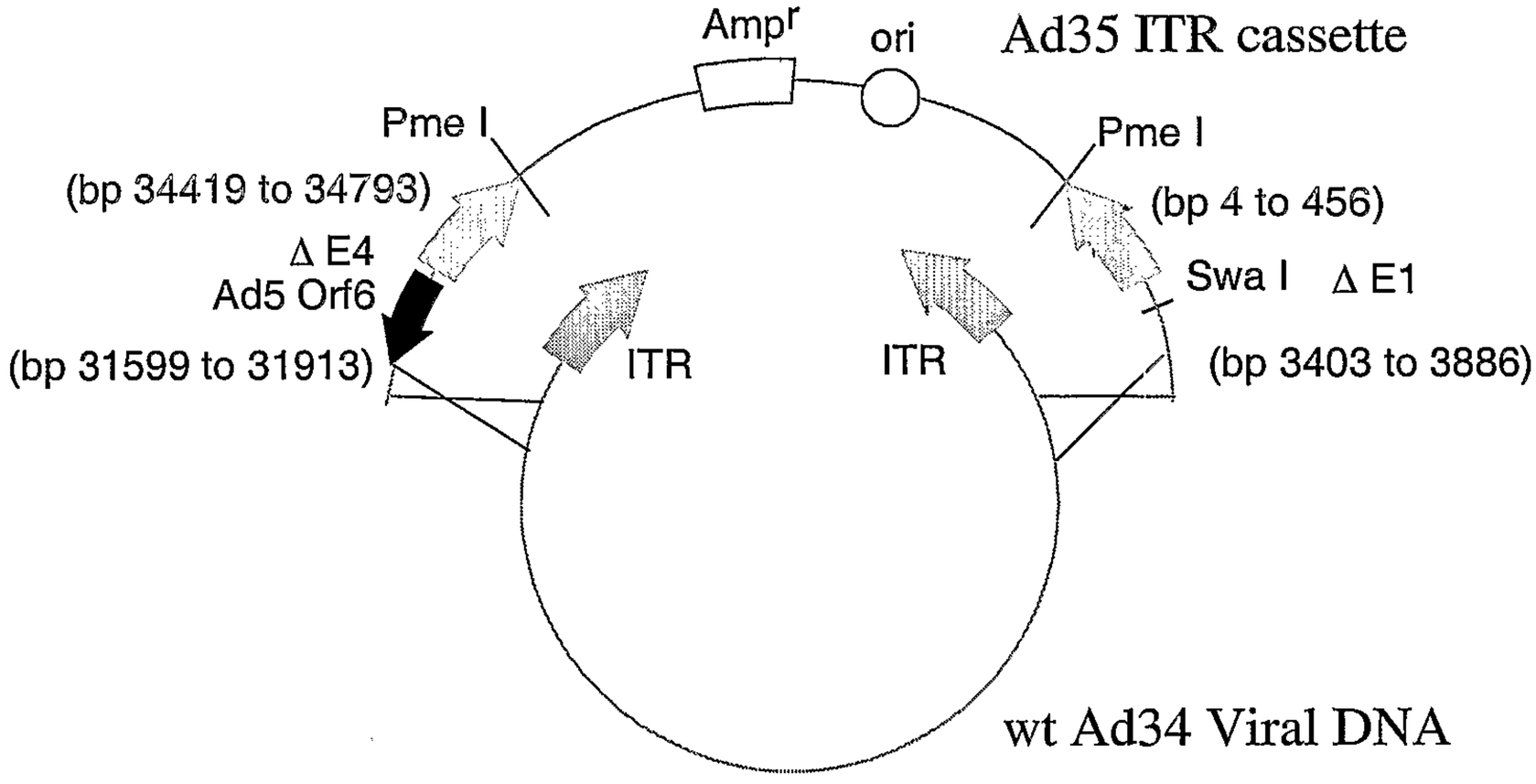
Ampr
ori
Ad35 ITR cassette
Pme I
(bp 34419 to 34793)
Δ E4
Ad5 Orf6
(bp 31599 to 31913)
ITR
ITR
Pme I
(bp 4 to 456)
Swa I
Δ E1
(bp 3403 to 3886)
wt Ad34 Viral DNA

FIG. 1

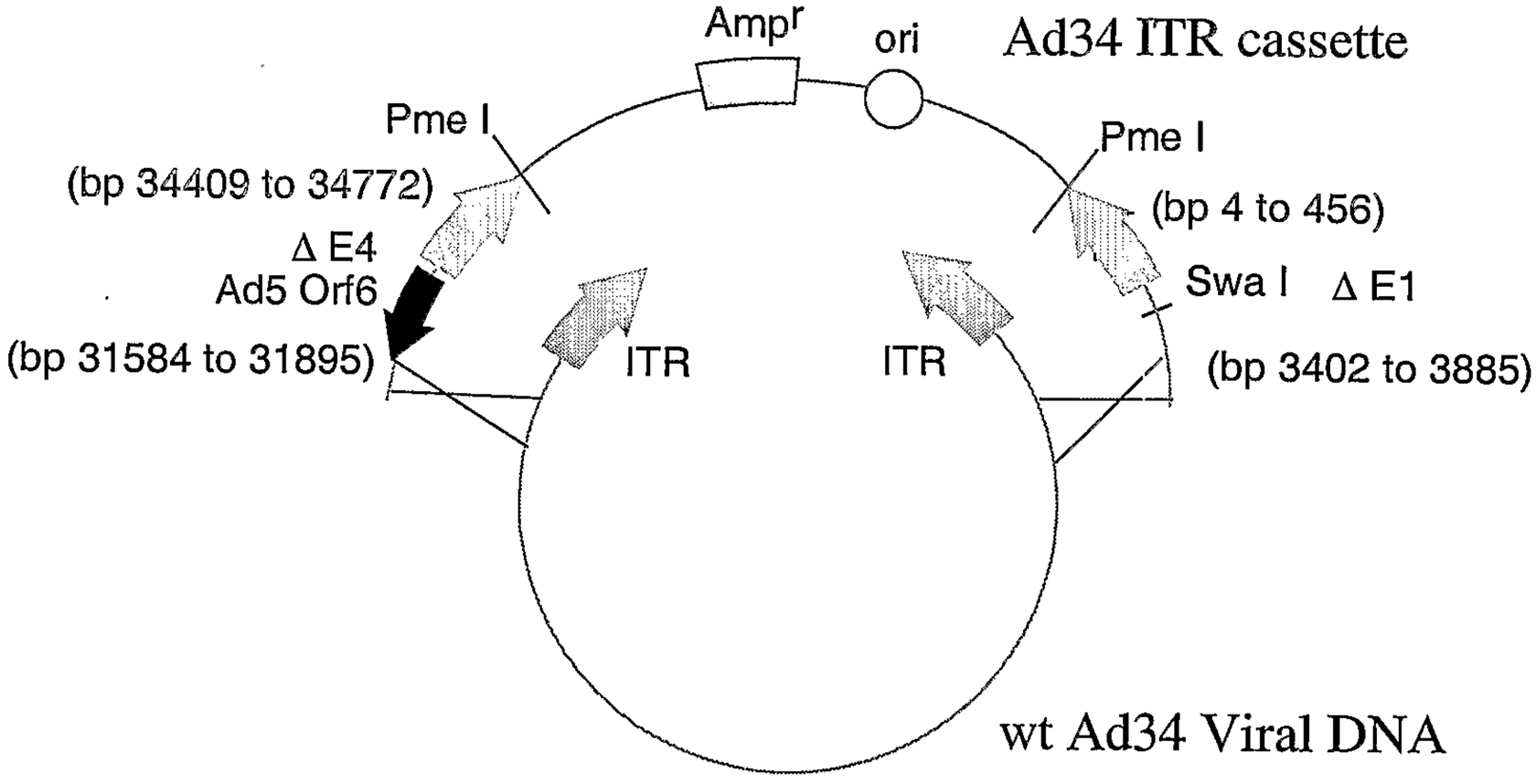
Ampr
ori
Ad34 ITR cassette
Pme I
(bp 34409 to 34772)
Δ E4
Ad5 Orf6
(bp 31584 to 31895)
ITR
ITR
Pme I
(bp 4 to 456)
Swa I
Δ E1
(bp 3402 to 3885)
wt Ad34 Viral DNA

FIG. 2

```
   1 catcatcaat aatatacctt atagatggaa tggtgccaat atgtaaatga ggtgatttta
  61 aaaattgtgg ggtgtgtggt gattggctgt ggggttaacg gctaaacggg gcggcgcggc
 121 cgtgggaaaa tgacgttttg tgggggtgga gttttttgc aagttgtcgc gggaaatgtg
 181 acgcataaaa aggcttttt tctcacggaa ctactgactt ttcccacggt atttaacagg
 241 aaatgaggta gttttgaccg gatgcaagtg aaaattgctg atttgcgcgc gaaaactgaa
 301 tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg
 361 ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt
 421 ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctacggtatt
 481 tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc
 541 tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat
 601 aatttctgct gagactggaa atgaaatact ggagcttgtg gtgcacgccc tgatgggaga
 661 cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt
 721 agaggtagag ggatcggagg attctaatga ggaagctgtg aatggctttt ttaccgattc
 781 tatgctttta gctgctaatg aaggattaga attagatccg cctttggaca ctttcgatac
 841 tccaggggtg attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgggttccgt
 901 ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga
 961 aaaggagcag tctatgcaga ctgcagcggg tgagggagtg aaggctgcca gtgttggttt
1021 tcagttggat tgcccggagc ttcctggaca tggctgtaag tcttgtgaat ttcacaggaa
1081 aaatactgga gtaaaggaac tgttatgttc gctttgttat atgagagcgc actgccactt
1141 tatttacagt aagtgtgttt aagttaaaat ttaaaggaat atgctgtttt tcacatgtat
1201 attgagtggg agttttgtgc ttcttattat aggtcctgtg tctgatgctg atgagtcacc
1261 atctcctgat tctactacct cacctcctga gattcaagca cctgttcctg tggacgtgcg
1321 caagcccatt cctgtgaagc ttaagcctgg gaaacgtcca gcagtggaaa aacttgagga
1381 cttgttacag ggtggggacg gacctttgga cttgagtaca cggaaacggc caagacaata
1441 agtgttccat atccgtgttt acttaaggtg acgtcaatat ttgtgtgaga gtgcaatgta
1501 ataaaaatat gttaactgtt cactggtttt tattgctttt tgggcgggga ctcaggtata
1561 taagtagaag cagacctgta tggttagctc ataggagctg gctttcatcc atggaggttt
1621 gggccatttt ggaagacctt agaaagacta ggcaactgtt agaggacgct tcggacggag
1681 tctccggttt ttggagattc tggttcgcta gtgaattagc tagggtagtt tttaggataa
1741 aacaggacta taaagaagaa tttgaaaagt tgttggtaga ttgcccagga ctttttgaag
1801 ctcttaattt gggccatcaa gttcacttta aagaaaaagt tttatcagtt ttagactttt
1861 caaccccagg tagaactgcc gctgctgtgg cttttcttac ttttatatta gataaatgga
1921 tcccgcagac tcatttcagc aggggatacg ttttggattt cgtagccaca gcattgtgga
1981 gaacatggaa ggttcgcaag atgaggacaa tcttaggtta ctggccagtg cagcctttgg
2041 gtgtagcggg aatcctgagg catccaccgg tcatgccagc ggttctggag gaggaacagc
2101 aagaggacaa cccgagagcc ggcctggacc ctccagtgga ggaggcggag tagctgactt
2161 gtctcctgaa ctgcaacggg tgcttactgg atctacgtcc actggacggg ataggggcgt
2221 taagagggag agggcatcta gtggtactga tgctagatct gagttggctt taagtttaat
2281 gagtcgcaga cgtcctgaaa ccatttggtg gcatgaggtc cagaaagagg gaagggatga
2341 agtttctgta ttgcaggaga aatattcact ggaacaggtg aaaacatgtt ggttggagcc
2401 tgaggatgat tgggaggtgg ccattaaaaa ttatgccaag atagctttga ggcctgataa
2461 acagtataag attactagac ggattaatat ccggaatgct tgttacatat ctggaaatgg
2521 ggctgaggtg gtaatagata ctcaagacaa ggcagttatt agatgctgca tgatggatat
2581 gtggcctgga gtagtcggta tggaagcagt aacttttgta aatgttaagt ttaggggaga
2641 tggttataat ggaatagtgt ttatggccaa taccaaactt atattgcatg gttgtagctt
2701 ttttggtttc aacaatacct gtgtagatgc ctggggacag gttagtgtac ggggatgtag
2761 tttctatgcg tgttggattg ccacagctgg cagaaccaag agtcaattgt ctctgaagaa
2821 atgcatattc caaagatgta acctgggcat tctgaatgaa ggcgaagcaa gggtccgcca
2881 ctgcgcttct acagatactg gatgttttat tttaattaag ggcaatgcca gcgtaaagca
2941 taacatgatt tgcggtgctt ccgatgagag gccttatcaa atgctcactt gtgccggtgg
3001 gcattgtaat atgctggcta ctgtgcatat tgtttcccat caacgcaaaa aatggcctgt
3061 ttttgatcac aatgtgttga ccaagtgtac catgcatgca ggtgggcgta gaggaatgtt
3121 tatgccttac cagtgtaaca tgaatcatgt gaaagtgttg ttggaaccag atgccttttc
3181 cagaatgagc ctaacaggaa tctttgacat gaacatgcaa atctggaaga tcctgaggta
3241 tgatgatacg agatcgaggg tgcgcgcatg cgaatgcgga ggcaagcatg ccaggttcca
3301 gccggtgtgt gtagatgtga ctgaagatct gagaccggat catttggtta ttgcccgcac
3361 tggagcagag ttcggatcca gtggagaaga aactgactaa ggtgagtatt gggaaaactt
3421 ggggtggggt tttcagatgg acagattgag taaaaatttg ttttttctgt ctttcagctg
3481 tcatgagtgg aaacgcttct tttaaggggg gagtcttcag cccttatctg acagggcgtc
3541 tcccatcctg ggcaggagtt cgtcagaatg ttatgggatc tactgtggat ggaagacccg
3601 tccaacccgc caattcttca acgctgacct atgctacttt aagttcttca cctttggacg
3661 cagctgcagc cgccgccgcc gcctctgttg ccgctaacac tgtgcttgga atgggttact
3721 atggaagtat cgtggctaat tccacttcct ctaataaccc ttctaccctg actcaggaca
3781 agttacttgt ccttttggcc cagctggagg ctttgaccca acgtctgggt gaactttatc
3841 agcaggtggc cgagttgcga gtacaaactg agtctgctgt cggcacggca aagtctaaat
```

FIG. 3A-1

3901 aaaaaaaaat tccacaatca atgaataaat aaacgagctt gttgttgatt taaaatcaag
3961 tgtttttatt tcatttttcg cgcacggtat gccctagacc accgatctcg atcattgaga
4021 acacggtgga ttttttccag aatcctatag aggtgggatt gaatgtttag atacatgggc
4081 attaggccat ctttggggtg gagatagctc cattgaaggg attcatgctc cggggtagtg
4141 ttgtaaatca cccagtcata acaaggtcgc agtgcatggt gttgcacaat atcttttaga
4201 agtaggctga ttgccacaga taagcccttg gtgtaggtgt ttacaaaccg gttgagctgg
4261 gaggggtgca ttcggggtga aattatgtgc attttggatt ggatttttaa gttggcaata
4321 ttgccgccaa gatctcgtct tgggttcatg ttatgaagga ccaccaagac ggtgtatccg
4381 gtacatttag gaaatttatc gtgtagcttg gatggaaaag cgtggaaaaa tttggagaca
4441 cccttgtgtc ctccgagatt ttccatgcac tcatccatga taatagcaat ggggccgtgg
4501 gcagcagcgc gggcaaacac gttccgtggg tctgacacat catagttatg ttcctgagtt
4561 aaatcatcat aagccatttt aatgaatttg gggcggagag tacccgattg gggtatgaat
4621 gttccttcgg gccccggagc atagttcccc tcacagattt gcatttccca agctttcagt
4681 tccgatggtg gaatcatgtc cacctggggg gctatgaaga acaccgtttc tggggcgggg
4741 gtgattagtt gggatgatag caagtttctg agcaattgag atttgccaca tccggtgggg
4801 ccataaatga ttccgattac aggttgcagg tggtagttta gggaacggca actgccgtct
4861 tctcgaagca agggggccac ctcgttcatc atttcccttа catgcatatt ttcccgcacc
4921 aaatccatta ggaggcgctc tcctcctagt gatagaagtt cttgtagtga ggaaaagttt
4981 ttcagcggtt ttagaccgtc agccatgggc attttggaga gagtttgctg caaaagttct
5041 agtctgttcc acagttcagt gatgtgttct atggcatctc gatccagcag acctcctcgt
5101 ttcgcgggtt tggacggctc ctggagtagg gtatgagacg atgggcgtcc agcgctgcca
5161 gggttcggtc cttccagggt ctcagtgttc gagtcagggt tgtttccgtc acagtgaagg
5221 ggtgtgcgcc tgcttgggcg cttgccaggg tgcgcttcag actcattctg ctggtggaga
5281 acttctgtcg cttggcgccc tgtatgtcgg ccaagtagca gtttaccatg agttcgtagt
5341 tgagcgcctc ggctgcgtgg cctttggcgc ggagcttacc tttggaagtt ttcttgcata
5401 ccgggcagta taggcatttc agcgcataca gcttgggcgc aaggaaaatg gattctgggg
5461 agtatgcatc tgcgccgcag gaggcgcaaa cagtttcaca ttccaccagc caggttaaat
5521 ccggttcatt ggggtcaaaa acaagttttc cgccatattt tttgatgcgt ttcttacctt
5581 tggtctccat gagttcgtgt cctcgttgag tgacaaacag gctgtccgta tccccgtaga
5641 ctgattttac aggcctcttc tccagtggag tgcctcggtc ttcttcgtac aggaactctg
5701 accactctga tacaaaggcg cgcgtccagg ccagcacaaa ggaggctatg tgggaggggt
5761 agcgatcgtt gtcaaccagg gggtccacct tttccaaagt atgcaaacac atgtcaccct
5821 cttcaacatc caggaatgtg attggcttgt aggtgtattt cacgtgacct ggggtccccg
5881 ctgggggggt ataaaagggg gcggttcttt gctcttcctc actgtcttcc ggatcgctgt
5941 ccaggaacgt cagctgttgg ggtaggtatt ccctctcgaa ggcgggcatg acctctgcac
6001 tcaggttgtc agtttctaag aacgaggagg atttgatatt gacagtgccg gttgagatgc
6061 ctttcatgag gttttcgtcc atttggtcag aaaacacaat ttttttattg tcaagtttgg
6121 tggcaaatga tccatacagg gcgttggata aaagtttggc aatggatcgc atggtttggt
6181 tcttttcctt gtccgcgcgc tctttggcag cgatgttgag ttggacatac tcgcgtgcta
6241 ggcacttcca ttcggggaag atagttgtca attcatctgg cacgattctc acttgccacc
6301 ctcgattatg caaggtaatt aaatccacac tggtggccac ctcgcctcga aggggttcgt
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6421 gttcatcggg agggtctgca tccatggtaa agattcccgg aagtaaatcc ttatcaaaat
6481 agctgatggg agtggggtca tctaaggcca tttgccattc tcgagctgcc agtgcacgct
6541 catatgggtt aaggggactg ccccagggca tgggatgggt gagtgcagag gcatacatgc
6601 cacagatgtc atagacgtag atgggatcct caaagatgcc tatataggtt ggatagcatc
6661 gccccccctct gatacttgct cgcacatagt catatagttc atgtgatggc gctagcaacc
6721 ccggacccaa gttggtgcga ttgggttttt ctgttctgta gacaatctgg cgaaagatgg
6781 cgtgagaatt ggaagagatg gtgggtcttt gaaaaatgtt gaaatgggca tgaggtagac
6841 ctacagagtc tctgacaaag tgggcataag attcttgaag cttggttacc agttcggcgg
6901 tgacaagtac gtctagggcg cagtagtcaa gtgtttcttg aatgatgtca taacctggtt
6961 ggtttttctt ttcccacagt tcgcggttga gaaggtattc ttcgcgatcc ttccagtact
7021 cttctagcgg aaacccgtct ttgtctgcac ggtaagatcc tagcatgtag aactgattaa
7081 ctgccttgta agggcagcag cccttctcta cgggtagaga gtatgcttga gcagcttttc
7141 gcagcgaagc gtgagtaagg gcgaaggtgt ctctgaccat gactttgaga aattggtatt
7201 tgaagtccat gtcgtcacag gctccctgtt cccagagttg gaagtctacc cgtttcttgt
7261 aggcggggtt gggcaaagcg aaagtaacat cgttgaagag aatcttaccg gctctgggca
7321 taaaattgcg agtgatgcgg aaaggctgtg gtacttccgc tcgattgttg atcacctggg
7381 cagctaggac gatctcgtcg aaaccgttga tgttgtgtcc tacgatgtat aattctatga
7441 aacgcggcgt gcctttgacg tgaggtagct tattgagctc atcaaaggtt aggtctgtag
7501 ggtcagataa ggcgtagtgt tcgagagccc attcgtgcag gtgaggattt gcatgtagga
7561 atgatgacca aagatccacc gccagtgctg tttgtaactg gtcccgatac tgacgaaaat
7621 gctggccaat tgccattttt tctggagtga cacagtagaa ggttctgggg tcttgttgcc
7681 atcgatccca ctttagttta atggctagat cgtgggccat gttgacgaga cgctcttctc
7741 ctgagagttt catgaccagc atgaaaggaa ctagttgttt gccaaaggac cccatccagg

FIG. 3A-2

```
7801 tgtaagtttc cacatcgtag gtcaggaaga gtctttctgt gcgaggatga gagccgatcg
7861 ggaagaactg gatttcctgc caccagttgg aggattggct gttgatgtga tggaagtaga
7921 agtttctgcg gcgcgccgag cattcgtgtt tgtgcttgta cagacggccg cagtagtcgc
7981 agcgttgcac gggttgtatc tcgtgaatga gctgtacctg gcttcccttg acgagaaatt
8041 tcagtgggaa gccgaggcct ggcgattgta tctcgtgctc ttctatattc gctgtatcgg
8101 cctgttcatc ttctgtttcg gtggtggtca tgctgacgag cccccgcggg aggcaagtcc
8161 agacctcggc gcgggagggg cggagctgaa ggaccagagc gcgcaggctg gagctgtcca
8221 gagtcctgag acgctgcgga ctcaggttag taggtaggga cagaagatta acttgcatga
8281 tcttttccag ggcgtgcggg aggttcagat ggtacttgat ttccacaggt tcgtttgtag
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8461 cgcgccgggc ggaagcggtt gttccggacc cggaggcatg gctggtagtg gcacgtcggc
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8581 tcgattgacg tcttgtatct gacgtctctg ggtgaaagct accggccccg tgagcttgaa
8641 cctgaaagag agttcaacag aatcaatttc ggtatcgtta acggcagctt gtctcagtat
8701 ttcttgtacg tcaccagagt tgtcctggta ggcgatctcc gccatgaact gctcgatttc
8761 ttcctcctga agatctccgc gacccgctct ctcgacggtg gccgcgaggt cattggagat
8821 acggcccatg agttgggaga atgcagtcat gcccgcctcg ttccagacgc ggctgtaaac
8881 cacggccccc tcggagtctc ttgcgcgcat caccacctga gcgaggttaa gctccacgtg
8941 tctggtgaag accgcatagt tgcataggcg ctgaaaaagg tagttgagtg tggtggcaat
9001 gtgttcggcg acgaagaaat acatgatcca tcgtctcagc ggcatttcgc tgacatcgcc
9061 cagagcttcc aagcgctcca tggcctcgta gaagtccacg gcaaaattaa aaaactggga
9121 gtttcgcgcg gacacggtca attcctcctc gagaagacgg atgagttcgg ctatggtggc
9181 ccgtacttcg cgttcgaagg ctcccgggat ctcttcttcc tcttctatct cttcttccac
9241 taacatctct tcttcgtctt caggcggggg cggagggggc acacggcgac gtcgacggcg
9301 cacgggcaaa cggtcgatga atcgttcaat gacctctccg cggcggcggc gcatggtttc
9361 agtgacggcg cggccgttct cgcgcggtcg cagagtaaaa acaccgccgc gcatctcctt
9421 aaagtggtga ctgggaggtt ctccgtttgg gagggagagg gcgctgatta tacattttat
9481 taattggccc gtagggactg cgcgcagaga tctgatcgtg tcaagatcca cgggatctga
9541 aaacctttcg acgaaagcgt ctaaccagtc acagtcacaa ggtaggctga gtacggcttc
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9661 aggtgagacg atgctgctgg tgatgaaatt aaagtaggca gttctaagac ggcggatggt
9721 ggcgaggagc accaggtctt tgggtccggc ttgctggata cgcaggcgat tggccattcc
9781 ccaagcatta tcctgacatc tagcaagatc tttgtagtag tcttgcatga gccgttctac
9841 gggcacttct tcctcacccg ttctgccatg catacgtgtg agtccaaacc cgcgcattgg
9901 ttgtaccagt gccaagtcag ctacgactct ttcggcgagg atggcttgct gtacttgggt
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10021 gtaagcacag ttggccatga ctgaccagtt aactgtctgg tgaccagggc gcacgagctc
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10141 cagatactgg taacctataa gaaaatgcgg cggtggttgg cggtagagag gccatcgttc
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10441 ctccgtagcc tggaggaacg tgaacgggtt gggtcgcggt gtaccccggt tcgagacttg
10501 tactcgagcc ggccggagcc gcggctaacg tggtattggc actcccgtct cgacccagcc
10561 tacaaaaatc caggatacgg aatcgagtcg ttttgctggt tgccgaatgg cagggaagtg
10621 agtcctattt tttttttttg ccgctcagat gcatcccgtg ctgcgacaga tgcgtcccca
10681 acaacagccc ccctcgcagc agcagcaacc acaaaaggct gtccctgcaa ctactgcaac
10741 tgccgctgtg agcggtgcgg gacagcccgc ctatgatctg gacttggaag agggcgaagg
10801 actggcacgt ctaggtgcgc cttcgcccga gcggcatccg cgagttcaac tgaaaaaaga
10861 ttctcgcgag gcgtatgtgc cccaacagaa cctatttaga gacagaagcg gcgaggagcc
10921 ggaggagatg cgagcttccc gctttaacgc gggtcgtgag ctgcgtcacg gtttggacag
10981 aagacgagtg ttgcgggacg aggatttcga agttgatgaa gtgacaggga tcagtcctgc
11041 cagggcacac gtggctgcag ccaaccttgt atcggcttac gaacagacag taaaggaaga
11101 gcgtaatttc caaaagtctt ttaataatca tgtgcgaacc ctcattgccc gcgaagaagt
11161 caccttggt ttgatgcatt tgtgggattt gatggaagct atcattcaga accctactag
11221 caaacctctg accgcacagc tgtttctggt ggtgcaacac agcagagaca atgaggcttt
11281 cagagaggcg ctgctcaaca tcaccgaacc cgaggggaga tggttgtatg atcttatcaa
11341 cattctacag agtatcatag tgcaggagcg gagcctgggc ctggccgaga aggtggctgc
11401 catcaattac tcggttttga gcttgggaaa gtattacgct cgcaagatct acaagactcc
11461 atacgttccc atagacaagg aggtgaagat agatgggttc tacatgcgca tgacgctgaa
11521 ggtgttgacc ctgagcgatg atcttggggt gtaccgcaat gacagaatgc atcgcgcggt
11581 gagcgccagc aggaggcgcg agttaagcga cagggaactg atgcacagtt tgcaaagagc
11641 tctaactgga gctggaaccg agggtgagaa ttactttgat atgggagctg acttgcagtg
```

FIG. 3A-3

11701 gcagcctagt cgcagggctc tgaacgccgc gacggcagga tgtgagcttc cttacataga
11761 agaggcggat gaaggcgagg aggaagaggg cgagtacttg gaagactgat ggcacaaccc
11821 gtgtttttg ctagatggaa cagcaagcac cggatcccgc aatgcgggcg gcgctgcaga
11881 gccagccgtc cggcattaac tcctcggacg attggaccca ggccatgcaa cgtatcatgg
11941 cgttgacgac tcgcaacccc gaagccttta gacagcaacc ccaggccaac cgtctatcgg
12001 ccatcatgga agctgtagtg ccttcccgct ctaatcccac tcatgagaag gtcctggcca
12061 tcgtgaacgc gttggtggag aacaaagcta ttcgtccaga tgaggccgga ctggtataca
12121 acgctctctt agaacgcgtg gctcgctaca acagtagcaa tgtgcaaacc aatttggacc
12181 gtatgataac agatgtacgc gaagccgtgt ctcagcgcga aaggttccag cgcgatgcca
12241 acctgggttc gctggtggcg ttaaatgctt tcttgagtac tcagcctgct aatgtgccgc
12301 gtggtcaaca ggattatact aacttttaa gtgctttgag actgatggta tcagaagtac
12361 ctcagagcga agtatatcag tccggtcctg attacttctt tcagactagc agacagggct
12421 tgcagacggt aaatctgagc caagctttta aaaaccttaa aggtttgtgg ggagtgcatg
12481 ccccggtagg agaaagagca accgtgtcta gcttgttaac tccgaactcc cgcctattat
12541 tactgttggt agctcctttc accgacagcg gtagcatcga ccgtaattcc tatttgggtt
12601 acctactaaa cctgtatcgc gaagccatag ggcaaagtca ggtggacgag cagacctatc
12661 aagaaattac ccaagtcagt cgcgctttgg gacaggaaga cactggcagt ttggaagcca
12721 ctctgaactt cttgcttacc aatcggtctc aaaagatccc tcctcaatat gctcttactg
12781 cggaggagga gaggatcctt agatatgtgc agcagagcgt gggattgttt ctgatgcaag
12841 agggggcaac tccgactgca gcactggaca tgacagcgcg aaatatggag cccagcatgt
12901 atgccagtaa ccgacctttc attaacaaac tgctggacta cttgcacaga gctgccgcta
12961 tgaactctga ttatttcacc aatgccatct taaacccgca ctggctgccc ccacctggtt
13021 tctacacggg cgaatatgac atgcccgacc ctaatgacgg atttctgtgg gacgacgtgg
13081 acagcgatgt tttttcacct ctttctgatc atcgcacgtg gaaaaaggaa ggcggcgata
13141 gaatgcattc ttctgcatcg ctgtccgggg tcattggtgc taccgcggct gagcccgagt
13201 ctgcaagtcc ttttcctagt ctacccttt ctctacacag tgtacgtagc agcgaagtgg
13261 gtagaataag tcgcccgagt ttaatgggcg aagaggagta cctaaacgat tccttgctca
13321 gaccggcaag agaaaaaaat ttcccaaaca atggaataga aagtttggtg gataaaatga
13381 gtagatggaa gacttatgct caggatcaca gagacgagcc tgggatcatg gggactacaa
13441 gtagagcgag ccgtagacgc cagcgccatg acagacagag gggtcttgtg tgggacgatg
13501 aggattcggc cgatgatagc agcgtattgg acttgggtgg gagaggaagg ggcaacccgt
13561 ttgctcattt gcgccctcgc ttgggtggta tgttgtaaaa aaaaataaaa aagaaaaaac
13621 tcaccaaggc catggcgacg agcgtacgtt cgttcttctt tattatctgt gtctagtata
13681 atgaggcgag tcgtgctagg cggagcggtg gtgtatccgg agggtcctcc tccttcgtac
13741 gagagcgtga tgcagcagca gcaggcgacg gcggtgatgc aatccccact ggaggctccc
13801 tttgtgcctc cgcgatacct ggcacctacg gagggcagaa acagcattcg ttactcggaa
13861 ctggcacctc agtacgatac caccaggttg tatctggtgg acaacaagtc ggcggacatt
13921 gcttctctga actatcagaa tgaccacagc aacttcttga ccacggtggt gcaaaacaat
13981 gactttaccc ctacggaagc cagcacccag accattaact ttgatgaacg atcgcggtgg
14041 ggcggtcagc taaaaaccat catgcatact aacatgccca acgtgaacga gtatatgttt
14101 agtaacaagt tcaaagcgcg tgtgatggtg tccagaaaac ctcctgaggg tgttagagta
14161 gacgataatt atgatcataa gcaagatatt ctaaaatacg agtggttcga gtttactttg
14221 ccagaaggca acttttcggt cactatgact atcgacttga tgaacaatgc catcatagac
14281 aattacttga aagtgggcag acagaatgga gtgttggaaa gtgacattgg tgttaagttc
14341 gacactagga acttcaagtt gggatgggat ccagaaacta agttgatcat gcctggggtt
14401 tacacctatg aggccttcca tcctgacatc gtattgctgc ctggctgcgg agtggacttt
14461 accgaaagcc gtctgagcaa ccttcttggc attagaaaga aacacccatt ccaagagggt
14521 tttaagatct tgtatgagga tttagaagga ggaaatattc cagccctttt ggatgtagat
14581 gcttatgaga acagcaagaa agatcaaaaa gccaaaatag aagctgctgc agaagctaaa
14641 gcaaacatag ttgccaacga tccggtaagg gtggctaacg ctagtgaaat caggggagac
14701 agttttgccg caacatccgt tccgactaaa gaatcattat tggatgatgt gtctcaaaac
14761 atagagttaa aactcactat taagcctgtg gaaaaagatg gcaaaaacag aagttacaat
14821 gtgttggaag ataaaatcaa cacggcctat cgcagttggt acctttcgta caattatggc
14881 gaccccgaaa aaggagtgcg ttcctggaca ttgctcacca cctcagatgt cacctgcgga
14941 gcggagcagg tctactggtc gcttccagac atgatgcagg atcctgtcac tttccgctcc
15001 actagacaag tcagtaacta ccctgtggtg ggtgcagagc ttatgcccgt cttttcaaag
15061 agcttctaca acgaacaagc tgtgtactcc cagcagctcc gccagtccac ctcgcttacg
15121 cacgtcttca accgctttcc tgagaaccag attttaatcc gtccgccggc gcccacaatt
15181 accaccgtca gtgaaaacgt tcctgctctc acagatcacg ggaccctgcc gttgcgcagc
15241 agtatccggg gagtccaacg tgtgaccgtt actgacgcca gacgccgcac ctgtccctac
15301 gtgtacaagg cactgggcat agtcgcaccg cgcgtccttt caagccgcac tttctaaaaa
15361 aaaaaaaaaa atgtccgttc ttatctcgcc cagtaataac accggttggg gtctgcgcgc
15421 tcccagcaag atgtacggag gcgcacgcaa acgttctacc caacatcccg tgcgtgttcg
15481 cgggcatttt cgcgctccat ggggtgccct caagggccgc actcgcgttc gaaccaccgt
15541 cgatgatgta atcgatcagg tggttgccga cgcccgtaat tatactccta ctgcgcctac

FIG. 3A-4

15601 atctactgtg gacgcagtta ttgacagtgt agtggctgac gctcgcaact atgctcgacg
15661 taagagccgg cgaaggcgca ttgccagacg tcaccgagct accactgcca tgcgagcagc
15721 aagagctctg ctacgaagag ctagacgcgt ggggcgaaga gccatgctta gggcggccag
15781 acgtgcagct tcgggcgcca gcgccggcag gtcccgcagg caagcagccg ctgtcgcagc
15841 ggcgactatt gccgacatgg cccaatcgcg aagaggcaat gtatactggg tgcgtgacgc
15901 tgccaccggt caacgtgtac ccgtgcgcac ccgtcccccc cgcacttaga agatactgag
15961 cagtctccga tgttgtgtcc cagcggcgag gatgtccaag cgcaaataca aggaagaaat
16021 gctgcaggtt atcgcacctg aagtctacgg ccaaccgttg aaggatgaaa aaaaaccccg
16081 caaaatcaag cgggtaaaaa aggacaaaaa agaagaggaa gatggcgatg atgggctggc
16141 ggagtttgtg cgcgagtttg ccccacggcg acgcgtgcaa tggcgtgggc gcaaagttcg
16201 acatgtgttg agacctggaa cttcggtggt ctttacaccc ggcgagcgtt caagcgctac
16261 ttttaagcgt tcctatgatg aggtgtacgg ggatgatgat attcttgagc aggcagctga
16321 ccgattaggc gagtttgctt atggcaagcg tagtagaata aatcccaagg atgaaacagt
16381 gtccataccc ttggatcatg gaaatcccac ccctagtctt aaaccggtca ctttgcagca
16441 agtgttaccc gtaactccgc gaacaggtgt taaacgcgaa ggtgaagatt tgtatcccac
16501 tatgcaactg atggtgccca aacgccagaa gttggaggac gttttggaga aagtaaaagt
16561 ggatccagat attcaacctg aggttaaagt gagacccatt aagcaggtag cgcctggtct
16621 gggagtacaa actgtagaca ttaaaattcc cactgaaagt atggaagtgc aaactgaacc
16681 cgcaaagcct actgccacct ccactgaagt gcaaacggac ccatggatgc ccatgcctat
16741 tacaactgac gccgtcggtc ccactcgaag atcccgacga aagtacggtc cagcaagtct
16801 gttgatgccc aactatgtcg tacacccatc tattattcct actcctggtt accgaggcac
16861 tcgctactat cgcagccgaa acagtacttc ccgccgtcgc cgcaagacac ctgcaaatcg
16921 cagtcgtcgc cgtagacgca caagcaaacc gattcccggc gccctggtgc ggcaagtgta
16981 ccgcaatggt agtgcggaac ctttgacact gccgcgtgcg cgttaccatc ctagtatcat
17041 cacttaatca atgttgccgc tgcctccttg cagatatggc cctcacttgt cgccttcgcg
17101 ttcccatcac tggttaccga ggaagaaact cgcgccgtag aagagggatg ttggggcgcg
17161 gaatgcgacg ctacaggcga cggcgtgcta tccgcaagca attgcggggt ggtttttgc
17221 cagccttaat tccaattatc gctgctgcga ttggcgcaat accaggcata gcttccgtgg
17281 cggttcaggc ctcgcaacga cattgacatt ggaaaaaaaa aaaacgtata aataaaaaat
17341 acaatggact ctgacactcc tggtactgtg actatgtttt cttagagatg gaagacatca
17401 atttttcatc cttggctccg cgacacggca cgaagccgta catgggcacc tggagcgaca
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17581 aggcgcttag aaataaactt aaagaccaga acttccaaca aaaagtagtc gatgggatag
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17881 cgatagcccc tatggccacc ggggtgatga aaccttctca gttgcatcga cccgtcacct
17941 tggatttgcc ccctcctcct gctgctactg ctgtacccgc ttctaagcct gtcgctgccc
18001 cgaaaccagt cgccgtagcc aggtcacgtc ccgggggcgc tcctcgtcca aatgcacact
18061 ggcaaaatac tctgaacagc atcgtgggtc taggcgtgca aagtgtaaaa cgccgtcgct
18121 gcttttaatt aaatatggag tagcgcttaa cttgcctatc tgtgtatatg tgtcattaca
18181 cgccgtcaca gcatcagagg aaaaaaggaa gaggtcgtgc gtcgacgctg agttactttc
18241 aagatggcca ccccatcgat gctgccccaa tgggcataca tgcacatcgc cggacaggat
18301 gcttcggagt acctgagtcc gggtctggtg cagttcgccc gcgccacaga cacctacttc
18361 aatctgggaa ataagtttag aaatcctacc gtagcgccga cccacgatgt gaccaccgat
18421 cgtagccagc ggctcatgtt gcgcttcgtg cccgttgacc gggaggacaa tacatactct
18481 tacaaagtgc ggtacaccct ggccgtgggc gacaacagag tgctggatat ggccagcacg
18541 ttctttgaca ttaggggcgt gttggacaga ggtcccagtt ttaaacccta ttctggtacg
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18721 gcaacataca cttttggtaa tgctccagta aaagccgagg ctgaaatcac aaaagacgga
18781 ttgccggtgg gcttggaagt ttcaactgaa ggtcctaaac caatctatgc tgataagctt
18841 tatcagccag aacctcaagt gggagacgaa acttggactg acctagacgg aaaaaccgaa
18901 gagtatggag ggagggttct taaacctgaa actaaaatga aaccctgcta cggatctttt
18961 gctaaaccta ctaatattaa aggaggtcag gcaaaggtaa aaccaaaaga agacgatggc
19021 actaacaaca tcgagtatga cattgacatg aacttctttg acttaagatc acaaagatca
19081 gaactcaaac ctaaaattgt aatgtatgca gaaaatgtgg acctggaatg tccagatact
19141 catgttgtgt acaaacctgg agtttcagat gctagttctg agaccaatct tggacaacag
19201 tctatgccca acagacccaa ctacattggc ttcagagata acttcatcgg acttatgtac
19261 tataacagta ctggcaacat gggggtactg gctggccaag cgtctcagtt gaatgcagtg
19321 gttgacttgc aggacagaaa cacagaactg tcttaccaac tcttgcttga ctctctgggc
19381 gacagaacca gatactttag catgtggaat caggctgtgg acagttatga tcctgatgta
19441 cgtgttattg aaaatcatgg tgtggaagat gaacttccca actattgttt tccgttggat

FIG. 3A-5

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19501 ggtgtcggtc cgcgaacaga tagttacaag gagattaagc caaatggaga ccaatctact
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19621 gaaattaacc ttcaagccaa tctatggcga agtttccttt attccaatgt ggctctatat
19681 ctcccagact cgtacaaata caccccgtcc aatgtcactc ttccagaaaa caaaaacacc
19741 tacgactaca tgaacgggcg ggtggtgccg ccatctctag tagacaccta tgtgaacatt
19801 ggtgccaggt ggtctctgga tgccatggac aatgtcaacc cattcaacca ccaccgtaac
19861 gctggcttgc gttaccgatc catgcttctg ggtaacggac gttatgtgcc tttccacata
19921 caagtgcctc aaaaattctt cgctgttaaa aacctgctgc ttctcccagg ctcctacact
19981 tatgagtgga actttaggaa ggatgtaaac atggttctac agagttccct cggtaacgac
20041 ctacgggtag atggcgccag catcagtttt acgagcatca acctctatgc tacttttttc
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20161 cagtcattca acgactacct atctgcagct aacatgctct accccattcc tgccaatgca
20221 accaatattc ccatttccat tccttctcgc aactgggcgg ctttcagagg ctggtcattt
20281 accagactga aaaccaaaga aactccctct ttggggtctg gatttgaccc ctacttcgtc
20341 tattctggtt ctattcccta cctggatggt accttctacc tgaaccacac ttttaagaag
20401 gtttccatca tgtttgactc ttcagtgagc tggcctggaa atgacaggtt actatctcct
20461 aacgaatttg aaataaagcg cactgtggat ggcgaaggct acaacgtagc ccaatgcaac
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20581 ttctacattc cagaaggata caaagatcgc atgtattcat ttttcagaaa cttccagccc
20641 atgagcaggc aggtggttga tgaggtcaat tacaaagact tcaaggccgt cgccataccc
20701 taccaacaca acaactctgg ctttgtgggt tacatggctc cgaccatgcg tcaaggtcaa
20761 ccctatcccg ctaactatcc ctatccactc attggaacaa ctgccgtaaa tagtgttacg
20821 cagaaaaagt tcttgtgtga cagaaccatg tggcgcatac cgttctcaag caacttcatg
20881 tctatgggag cccttacaga cttgggacag aacatgctct atgccaactc agctcatgct
20941 ctggacatga cctttgaggt ggatcccatg gatgagccca ccctgcttta tcttctcttc
21001 gaagttttcg acgtggtcag agtgcatcag ccacaccgcg gcatcatcga ggcagtctac
21061 ctgcgtacac cgttctcggc cggtaacgct accacgtaag aagcttcttg cttcttgcaa
21121 acagcagctg caaccatggc ctgcggatcc caaaacggct ccagcgagca agagctcaga
21181 gccattgtcc aagacctggg ttgcggacca tatttttgg gaacctttga taagcgcttc
21241 ccggggttca tggcccccga taagctcgcc tgtgccattg taaatacggc cggacgtgag
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22081 ggattgcagc actgaaacac catcagcgac ggatgtctta cgcttgccag cacggtggga
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22381 gacctgctcg aaaactggtt agctgcgcag ccggcatcat tcacacagca gcgggcgtca
22441 ttgttggcta tttgcaccac acttctgccc cagcggtttt gggtgatttt ggttcgctcg
22501 ggattctcct tcaaggctcg ttgtccgttc tcgctggcca catccatctc gataatctgc
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22621 ccatgaggcc acaacgcaca gcctgtacat tcccaattat ggtgggcgat ctgagaaaaa
22681 gaatgtatca ttccctgcag aaatcttccc atcatcgtgc tcagtgtctt gtgactagtg
22741 aaagttaact ggatgcctcg gtgctcctcg ttcacgtact ggtgacagat gcgcttgtat
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22921 ctaatcggat tcttaacagt gcaggcagca gctcctttag ccagagggtc atctttggcg
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23221 tcggtagaag aacctgaccc cacacggcga caggtgtttc tcttcggggg cagaggtgga
23281 ggcgattgcg aagggctgcg gtccgacctg gaaggcggat gactggcaga acccttccg
23341 cgttcggggg tgtgctccct gtggcggtcg cttaactgat ttccttcgcg gctggccatt
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FIG. 3A-6

23401 gtgttctcct aggcagagaa acaacagaca tggaaactca gccattgctg tcaacatcgc
23461 cacgagtgcc atcacatctc gtcctcagcg acgaggaaaa ggagcagagc ttaagcattc
23521 caccgcccag tcctgccacc acctctaccc tagaagataa ggaggtcgac gcatctcatg
23581 acatgcagaa taaaaaagcg aaagagtctg agccagacat cgaacaagac ccgggctatg
23641 tgacaccggt ggaacacgag gaagagttga aacgctttct agagagagag gatgaaaact
23701 gcccaaaaca gcaagcggat aactatcacc aagatgctgg aaatagggat cagaacaccg
23761 actacctcat agggcttgac ggggaagacg cgctccttaa acatctagca agacagtcac
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24661 tttcctacat gggtattctg catgagaatc gcctaggaca aagcgtgctg cacagcaccc
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26221 agccaacgag ccagcgcaaa cccgagagtt aagaaatcgg atctttccaa ccctgtatgc
26281 catcttccag cagagtcggg gccaagagca ggaactgaaa ataaaaaacc gatctctgcg
26341 ttcgctcacc agaagttgtt tgtatcacaa gagcgaagat caacttcagc gcactctcga
26401 ggacgccgag gctctcttca acaagtactg cgcgctgact cttaaagagt aggcagcgac
26461 cgcgcttatt caaaaaaggc gggaattaca tcatcctcga catgagtaaa gaaattccca
26521 cgccttacat gtggagttat cagccccaaa tgggattggc ggcaggcgcc tcccaggact
26581 actccacccg catgaattgg ctcagcgccg ggccttctat gatttctcga gttaatgata
26641 tacgcgccta ccgaaaccaa atacttttgg aacagtcagc tcttaccacc acgccccgcc
26701 aacaccttaa tcccagaaat tggcccgccg ccctagtgta ccaggaaagt cccgctccca
26761 ccactgtatt acttcctcga gacgcccagg ccgaagtcca aatgactaat gcaggtgcgc
26821 agttagcggg cggctccacc ctatgtcgtc acaggcctcg gcataatata aaacgcctga
26881 tgatcagagg ccgaggtatc cagctcaacg acgagtcggt gagctctccg cttggtctac
26941 gaccagacgg aatctttcag attgccggct gcgggagatc ttccttcacc cctcgtcagg
27001 ctgttctgac tttggaaagt tcgtcttcgc aaccccgctc gggcggaatc gggaccgttc
27061 aatttgtgga ggagtttact ccctctgtct acttcaaccc cttctccgga tctcctgggc
27121 actacccgga cgagttcata ccgaacttcg acgcgattag cgagtcagtg gacggctacg
27181 attgatgtct ggtgacgcgg ctgagctatc tcggctgcga catctagacc actgccgccg
27241 ctttcgctgc tttgcccggg aactcattga gttcatctac ttcgaactcc ccaaggatca

FIG. 3A-7

27301 ccctcaaggt ccggcccacg gagtgcggat tactatcgaa ggcaaaatac actctcgcct
27361 gcaacgaatt ttctcccagc ggcccgtgct gatcgagcga gaccagggaa acaccacggt
27421 ttccatctac tgcatttgta atcaccccgg attgcatgaa agcctttgct gtcttatgtg
27481 tactgagttt aataaaaact gaattaagac tctcctacgg actgccgctt cttcaacccg
27541 gattttacaa ccagaagaac gaaacttttc ctgtcgtcca ggactctgtt aacttcacct
27601 ttcctactca caaactagaa gctcaacgac tacaccgctt ttccagaagc attttcccta
27661 ctaatactac tttcaaaacc ggaggtgagc tccaaggtct tcctacagaa aacccttggg
27721 tggaagcggg ccttgtagtg ctaggaattc ttgcgggtgg gcttgtgatt attctttgct
27781 acctatacac accttgcttc actttcctag tggtgttgtg gtattggttt aaaaaatggg
27841 gcccatacta gtcttgcttg ttttactttc gcttttggaa ccgggttctg ccaattacga
27901 tccatgtcta gacttcgacc cagaaaactg cacacttact tttgcacccg acacaagccg
27961 catctgtgga gttcttatta agtgcggatg ggaatgcagg tccgttgaaa ttacacacaa
28021 taacaaaacc tggaacaata ccttatccac cacatgggag ccaggagttc ccgagtggta
28081 cactgtctct gtccgaggtc ctgacggttc catccgcatt agtaacaaca ctttcatttt
28141 ttctgaaatg tgcgatctgg ccatgttcat gagcaaacag tattctctat ggcctcctag
28201 caaggacaac atcgtaacgt tctccattgc ttattgcttg tgcgcttgcc ttcttactgc
28261 tttactgtgc gtatgcatac acctgcttgt aaccactcgc atcaaaaacg ccaataacaa
28321 agaaaaaatg ccttaacctc tttctgttta cagacatggc ttctcttaca tctctcatat
28381 ttgtcagcat tgtcactgcc gctcacggac aaacagtcgt ctctatccct ctaggacata
28441 attacactct cataggaccc ccaatcactt cagaggtcat ctggaccaaa ctgggaagcg
28501 ttgattactt tgatataatc tgcaacaaaa caaaaccaat aatagtaact tgcaacatac
28561 aaaatcttac attgattaat gttagcaaag tttacagcgg ttactattat ggttatgaca
28621 gatacagtag tcaatataga aattacttgg ttcgtgttac ccagttaaaa accacgaaaa
28681 tgccaaatat ggcaaagatt cgatccgatg acaattctct agaaacttct acatctccca
28741 ccacacccga cgaaaaaaac atcccagatt caatgattgc aattgttgca gcggtggcag
28801 tggtgatggc actaataata atatgcatgc ttttatatgc ttgtcgctac aaaaagtttc
28861 atcctaaaaa acaagatctc ctactaaggc ttaacattta atttcttttt atacagccat
28921 ggtttccact accacattcc ttatgcttac tagtcttgca actctgactt ctgctcgctc
28981 acacctcact gtaactatag gctcaaactg cacactaaaa ggacctcaag gtggtcatgt
29041 cttttggtgg agaatatatg acaatggatg gtttacaaaa ccatgtgacc aacctggtag
29101 atttttctgc aacggcagag acctaaccat tatcaacgtg acagcaaatg acaaaggctt
29161 ctattatgga accgactata aaagtagttt agattataac attattgtac tgccatctac
29221 cactccagca ccccgcacaa ctactttctc tagcagcagt gtcgctaaca atacaatttc
29281 caatccaacc tttgccgcgc ttttaaaacg cactgtgaat aattctacaa cttcacatac
29341 aacaatttcc acttcaacaa tcagcattat cgctgcagtg acaattggaa tatctattct
29401 tgtttttacc ataacctact acgcctgctg ctatagaaaa gacaaacata aaggtgatcc
29461 attacttaga tttgatattt aatttgttct ttttttttt atttacagta tggtgaacac
29521 caatcatggt acctagaaat ttcttcttca ccatactcat ttgtgcattt aatgtttgcg
29581 ctactttcac agcagtagcc acagcaaccc cagactgtat aggagcattt gcttcctatg
29641 cacttttgc ttttgttact tgcatctgcg tatgtagcat agtctgcctg gttattaatt
29701 ttttccaact tctagactgg atccttgtgc gaattgccta cctgcgccac catcccgaat
29761 accgcaacca aaatatcgcg gcacttctta gactcatcta aaaccatgca ggctatacta
29821 ccaatatttt tgcttctatt gcttccctac gctgtctcaa ccccagctgc ctatagtact
29881 ccaccagaac accttagaaa atgcaaattc caacaaccgt ggtcatttct tgcttgctat
29941 cgagaaaaat cagaaattcc cccaaattta ataatgattg ctggaataat taatataatc
30001 tgttgcacca taatttcatt tttgatatac cccctatttg attttggctg gaatgctccc
30061 aatgcacatg atcatccaca agacccagag gaacacattc ccctacaaaa catgcaacat
30121 ccaatagcgc taatagatta cgaaagtgaa ccacaacccc cactactccc tgctattagt
30181 tacttcaacc taaccggcgg agatgactga aacactcacc acctccaatt ccgccgagga
30241 tctgctcgat atggacggcc gcgtctcaga acagcgactt gcccaactac gcatccgcca
30301 gcagcaggaa cgcgcggcca aagagctcag agatgtcatc caaattcacc aatgcaaaaa
30361 aggcatattc tgtttggtaa aacaagccaa gatatcctac gagatcaccg ctactgacca
30421 tcgcctctct tacgaacttg gcccccaacg acaaaaattt acctgcatgg tgggaatcaa
30481 ccccatagtt atcacccagc aaagtggaga tactaagggt tgcattcact gctcctgcga
30541 ttccatcgag tgcacctaca ccctgctgaa gaccctatgc ggcctaagag acctgctacc
30601 aatgaattaa aaaatgatta ataaaaaatc acttacttga aatcagcaat aaggtctctg
30661 ttgaaatttt ctcccagcag cacctcactt ccctcttccc aactctggta ttctaaaccc
30721 cgttcagcgg catactttct ccatacttta aaggggatgt caaattttag ctcctctcct
30781 gtacccacaa tcttcatgtc tttcttccca gatgaccaag agagtccggc tcagtgactc
30841 cttcaaccct gtctacccct atgaagatga aagcacctcc caacacccct ttataaaccc
30901 agggtttatt tccccaaatg gcttcacaca aagcccagac ggagttctta ctttaaaatg
30961 tttaacccca ctaacaacca caggcggatc tctacagcta aaagtgggag ggggacttac
31021 agtggatgac actgatggta ccttacaaga aaacatacgt gctacagcac ccattactaa
31081 aaataatcac tctgtagaac tatccattgg aaatggatta gaaactcaaa acaataaact
31141 atgtgccaaa ttgggaaatg ggttaaaatt taacaacggt gacatttgta taaaggatag

FIG. 3A-8

31201 tattaacacc ttatggactg gaataaaccc tccacctaac tgtcaaattg tggaaaacac
31261 taatacaaat gatggcaaac ttactttagt attagtaaaa aacggagggc ttgttaatgg
31321 ctacgtgtct ctagttggtg tatcagacac tgtgaaccaa atgttcacac aaaagacagc
31381 aaacatccaa ttaagattat attttgactc ttctggaaat ctattaactg atgaatcaga
31441 cttaaaaatt ccacttaaaa ataaatcttc tacagcgacc agtgaaactg tagccagcag
31501 caaagccttt atgccaagta ctacagctta tcccttcaac accactacta gggatagtga
31561 aaactacatt catggaatat gttactacat gactagttat gatagaagtc tatttccctt
31621 gaacatttct ataatgctaa acagccgtat gatttcttcc aatgttgcct atgccataca
31681 atttgaatgg aatctaaatg caagtgaatc tccagaaagc aacatagcta cgctgaccac
31741 atcccccttt ttcttttctt acattacaga agacgacaac taaaataaag tttaagtgtt
31801 tttatttaaa atcacaaaat tcgagtagtt attttgcctc caccttccca tttgacagaa
31861 tacaccaatc tctccccacg cacagcttta aacatttgga taccattaga gatagacatt
31921 gttttagatt ccacattcca aacagtttca gagcgagcca atctggggtc agtgatagat
31981 aaaaatccat cgcgatagtc ttttaaagcg ctttcacagt ccaactgctg cggatgcgaa
32041 tccggagtct ggatcacggt catctggaag aagaacgatg ggaatcataa tccgaaaacg
32101 gtatcggacg attgtgtctc atcaaaccca caagcagccg ctgtctgcgt cgctccgtgc
32161 aactgctgtt tatgggatca gggtccacag tgtcctgaag catgatttta atagcccttа
32221 acatcaactt tctggtgcga tgcgcgcagc aacgcattct gatttcactc aaatctttgc
32281 agtaggtaca acacattatt acaatattgt ttaataaacc ataattaaaa gcgctccagc
32341 caaaactcat atctgatata atcgcccctg catgaccatc ataccaaagt ttaatataaa
32401 ttaaatgacg ttcccctcaaa aacacactac ccacatacat gatctctttt ggcatgtgca
32461 tattaacaat ctgtctgtac catggacaac gttggttaat catgcaaccc aatataacct
32521 tccggaacca cactgccaac accgctcccc cagccatgca ttgaagtgaa ccctgctgat
32581 tacaatgaca atgaagaacc caattctctc gaccgtgaat cacttgagaa tgaaaaatat
32641 ctatagtggc acaacataga cataaatgca tgcatcttct cataattttt aactcctcag
32701 gatttagaaa catatcccag ggaataggaa gctcttgcag aacagtaaag ctggcagaac
32761 aaggaagacc acgaacacaa cttacactat gcatagtcat agtatcacaa tctggcaaca
32821 gcgggtggtc ttcagtcata gaagctcggg tttcattttc ctcacaacgt ggtaactggg
32881 ctctggtgta agggtgatgt ctggcgcatg atgtcgagcg tgcgcgcaac cttgtcataa
32941 tggagttgct tcctgacatt ctcgtatttt gtatagcaaa acgcggccct ggcagaacac
33001 actcttcttc gccttctatc ctgccgctta gcgtgttccg tgtgatagtt caagtacagc
33061 cacactctta agttggtcaa aagaatgctg gcttcagttg taatcaaaac tccatcgcat
33121 ctaattgttc tgaggaaatc atccacggta gcatatgcaa atcccaacca agcaatgcaa
33181 ctggattgcg tttcaagcag gagaggagag ggaagagacg gaagaaccat gttaattttt
33241 attccaaacg atctcgcagt acttcaaatt gtagatcgcg cagatggcat ctctcgcccc
33301 cactgtgttg gtgaaaaagc acagctaaat caaaagaaat gcgattttca aggtgctcaa
33361 cggtggcttc caacaaagcc tccacgcgca catccaagaa caaaagaata ccaaaagaag
33421 gagcattttc taactcctca atcatcatat tacattcctg caccattccc agataatttt
33481 cagctttcca gccttgaatt attcgtgtca gttcttgtgg taaatccaat ccacacatta
33541 caaacaggtc ccggagggcg ccctccacca ccattcttaa acacaccctc ataatgacaa
33601 aatatcttgc tcctgtgtca cctgtagcga attgagaatg gcaacatcaa ttgacatgcc
33661 cttggctcta agttcttctt taagttctag ttgtaaaaac tctctcatat tatcaccaaa
33721 ctgcttagcc agaagccccc cgggaacaag agcaggggac gctacagtgc agtacaagcg
33781 cagacctccc caattggctc cagcaaaaac aagattggaa taagcatatt gggaaccgcc
33841 agtaatatca tcgaagttgc tggaaatata atcaggcaga gtttcttgta aaaattgaat
33901 aaaagaaaaa tttgccaaaa aaacattcaa aacctctggg atgcaaatgc aataggttac
33961 cgcgctgcgc tccaacattg ttagttttga attagtctgc aaaaataaaa aaaaaaacaa
34021 gcgtcatatc atagtagcct gacgaacagg tggataaatc agtctttcca tcacaagaca
34081 agccacaggg tctccagctc gaccctcgta aaacctgtca tggtgattaa acaacagcac
34141 cgaaagttcc tcgcggtgac cagcatgaat aattcttgat gaagcataca atccagacat
34201 gttagcatca gttaacgaga aaaaacagcc aacatagcct ttgggtataa ttatgcttaa
34261 tcgtaagtat agcaaagcca cccctcgcgg atacaaagta aaaggcacag gagaataaaa
34321 aatataatta tttctctgct gctgttcagg caacgtcgcc cccggtccct ctaaatacac
34381 atacaaagcc tcatcagcca tggcttacca gacaaagtac agcgggcacg cacaagctct
34441 aaagtcactc tccaacctct ccacaatata tatacacaag ccctaaactg acgtaatggg
34501 agtaaagtgt aaaaaatccc gccaaaccca acacacaccc cgaaactgcg tcaccaggga
34561 aaagtacagt ttcacttccg caatcccaac aagcgtcact tcctctttct cacggtacgt
34621 cacatcccat taacttgcaa cgtcattttc ccacggccgc gccgccccgt ttagccgtta
34681 accccacagc caatcaccac acaccccaca atttttaaaa tcacctcatt tacatattgg
34741 caccattcca tctataaggt atattattga tgatg

FIG. 3A-9

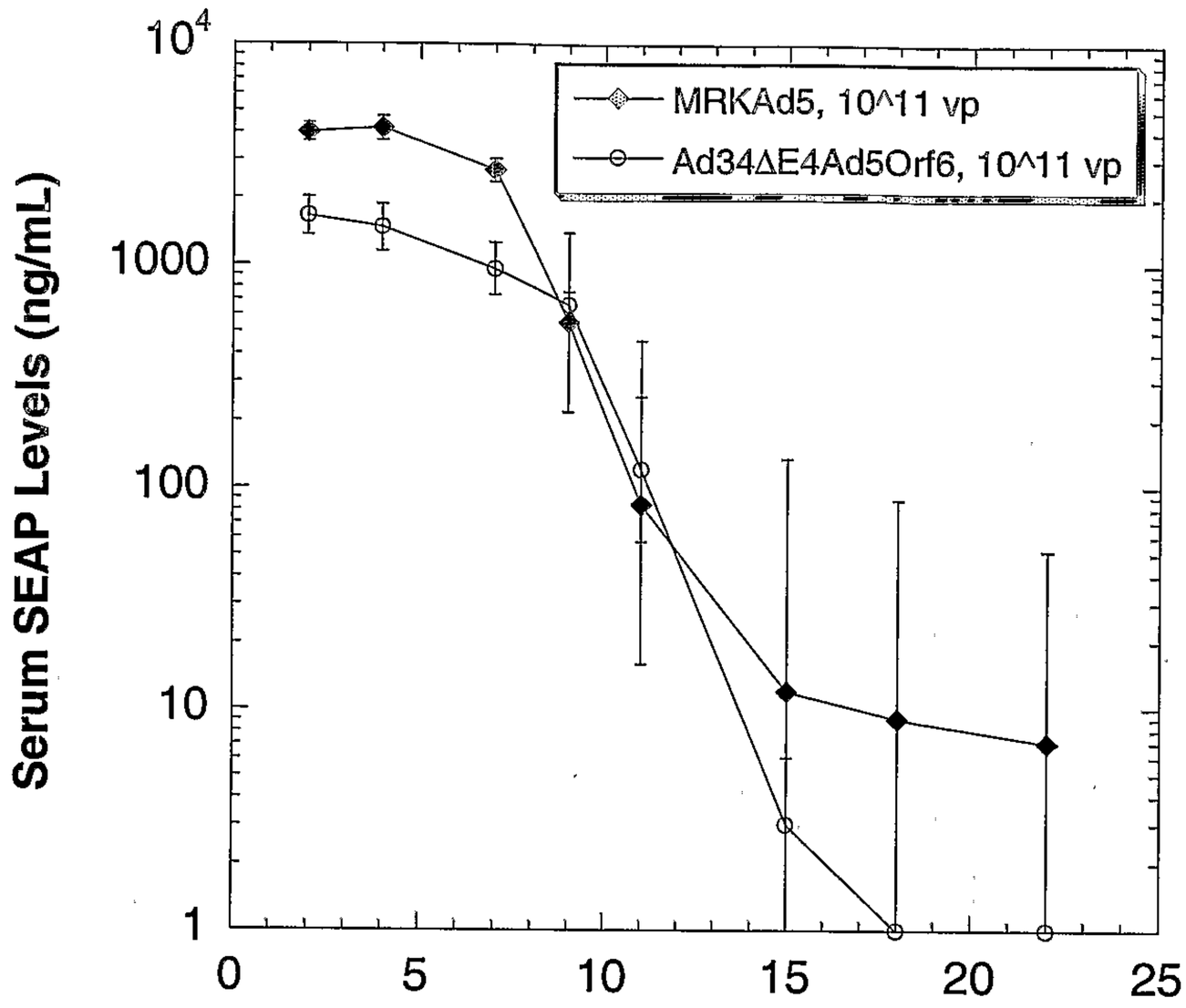
MRKAd5, 10^11 vp
Ad34ΔE4Ad5Orf6, 10^11 vp
Serum SEAP Levels (ng/mL)
10^4
1000
100
10
1
0
5
10
15
20
25

FIG. 4

Vaccine Wk 0, 4, 24	Monkey ID	Pre		Wk 4		Wk 8		Wk 24		Wk 28		Wk 36	
		Mock	Gag[a]	Mock	Gag	Mock	Gag	Mock	Gag	Mock	Gag	Mock	Gag
MRKAd5gag, 10^11 vp	00C018	1	5	13	1025	0	824	8	756	0	474	0	383
MRKAd5gag, 10^11 vp	00C034	0	4	5	219	5	404	3	445	3	339	0	216
MRKAd5gag, 10^11 vp	00C058	4	4	3	1086	0	440	4	1439	0	2338	0	940
Ad34ΔE1gagΔE4Ad5Orf6, 10^11 vp	00D038	6	8	5	111	1	301	0	224	1	536	0	233
Ad34ΔE1gagΔE4Ad5Orf6, 10^11 vp	00D042	6	30	4	89	4	264	1	73	0	181	0	69
Ad34ΔE1gagΔE4Ad5Orf6, 10^11 vp	00D066	3	18	1	118	1	816	0	429	0	439	0	273

FIG. 5

Vaccine	Monk ID	IFN-γ$^+$CD4$^+$CD3$^+$ per 10^6 Lymphocytes		IFN-γ$^+$CD8$^+$CD3$^+$ per 10^6 Lymphocytes	
		Mock	Gag[a]	Mock	Gag[a]
Ad34ΔE1gagΔE4Ad5Orf6	00D038	22	154	130	450
	00D042	32	118	96	171
	00D066	12	238	150	442

FIG. 6

Sequence of the open reading frame for FL-gag (human codon optimized)

atgggtgctagggcttctgtgctgtctggtggtgagctggacaagtgggagaagatcaggctgaggcctggtggc
aagaagaagtacaagctaaagcacattgtgtgggcctccagggagctggagaggtttgctgtgaaccctggcctg
ctggagacctctgaggggtgcaggcagatcctgggccagctccagccctccctgcaaacaggctctgaggagctg
aggtccctgtacaacacagtggctaccctgtactgtgtgcaccagaagattgatgtgaaggacaccaaggaggcc
ctggagaagattgaggaggagcagaacaagtccaagaagaaggcccagcaggctgctgctggcacaggcaactcc
agccaggtgtcccagaactaccccattgtgcagaacctccagggccagatggtgcaccaggccatctccccccgg
accctgaatgcctgggtgaaggtggtggaggagaaggccttctcccctgaggtgatccccatgttctctgccctg
tctgagggtgccacccccccaggacctgaacaccatgctgaacacagtgggggggccatcaggctgccatgcagatg
ctgaaggagaccatcaatgaggaggctgctgagtgggacaggctgcatcctgtgcacgctggccccattgccccc
ggccagatgagggagcccaggggctctgacattgctggcaccacctccaccctccaggagcagattggctggatg
accaacaaccccccccatccctgtgggggaaatctacaagaggtggatcatcctgggcctgaacaagattgtgagg
atgtactcccccacctccatcctggacatcaggcagggccccaaggagcccttcagggactatgtggacaggttc
tacaagaccctgagggctgagcaggcctcccaggaggtgaagaactggatgacagagaccctgctggtgcagaat
gccaaccctgactgcaagaccatcctgaaggccctgggccctgctgccaccctggaggagatgatgacagcctgc
caggggtgggggggccctggtcacaaggccagggtgctggctgaggccatgtcccaggtgaccaactccgccacc
atcatgatgcagaggggcaacttcaggaaccagaggaagacagtgaagtgcttcaactgtggcaaggtgggccac
attgccaagaactgtagggcccccaggaagaagggctgctggaagtgtggcaaggagggccaccagatgaaggac
tgcaatgagaggcaggccaacttcctgggcaaaatctggccctcccacaagggcaggcctggcaacttcctccag
tccaggcctgagcccacagcccctcccgaggagtccttcaggtttggggaggagaagaccacccccagccagaag
caggagcccattgacaaggagctgtacccccctggcctccctgaggtccctgtttggcaacgacccctcctcccag
taaaataaagcccgggcagat

FIG. 7

```
   1 ccattgcata cgttgtatcc atatcataat atgtacattt atattggctc atgtccaaca
  61 ttaccgccat gttgacattg attattgact agttattaat agtaatcaat tacggggtca
 121 ttagttcata gcccatatat ggagttccgc gttacataac ttacggtaaa tggcccgcct
 181 ggctgaccgc ccaacgaccc ccgcccattg acgtcaataa tgacgtatgt tcccatagta
 241 acgccaatag ggactttcca ttgacgtcaa tgggtggagt atttacggta aactgcccac
 301 ttggcagtac atcaagtgta tcatatgcca agtacgcccc ctattgacgt caatgacggt
 361 aaatggcccg cctggcatta tgcccagtac atgaccttat gggactttcc tacttggcag
 421 tacatctacg tattagtcat cgctattacc atggtgatgc ggttttggca gtacatcaat
 481 gggcgtggat agcggtttga ctcacgggga tttccaagtc tccaccccat tgacgtcaat
 541 gggagtttgt tttggcacca aaatcaacgg gactttccaa aatgtcgtaa caactccgcc
 601 ccattgacgc aaatgggcgg taggcgtgta cggtgggagg tctatataag cagagctcgt
 661 ttagtgaacc gtcagatcgc ctggagacgc catccacgct gttttgacct ccatagaaga
 721 caccgggacc gatccagcct ccgcggccgg gaacggtgca ttggaacgcg gattccccgt
 781 gccaagagtg agatctaccA TGGGTGCTAG GGCTTCTGTG CTGTCTGGTG GTGAGCTGGA
 841 CAAGTGGGAG AAGATCAGGC TGAGGCCTGG TGGCAAGAAG AAGTACAAGC TAAAGCACAT
 901 TGTGTGGGCC TCCAGGGAGC TGGAGAGGTT TGCTGTGAAC CCTGGCCTGC TGGAGACCTC
 961 TGAGGGGTGC AGGCAGATCC TGGGCCAGCT CCAGCCCTCC CTGCAAACAG GCTCTGAGGA
1021 GCTGAGGTCC CTGTACAACA CAGTGGCTAC CCTGTACTGT GTGCACCAGA AGATTGATGT
1081 GAAGGACACC AAGGAGGCCC TGGAGAAGAT TGAGGAGGAG CAGAACAAGT CCAAGAAGAA
1141 GGCCCAGCAG GCTGCTGCTG GCACAGGCAA CTCCAGCCAG GTGTCCCAGA ACTACCCCAT
1201 TGTGCAGAAC CTCCAGGGCC AGATGGTGCA CCAGGCCATC TCCCCCCGGA CCCTGAATGC
1261 CTGGGTGAAG GTGGTGGAGG AGAAGGCCTT CTCCCCTGAG GTGATCCCCA TGTTCTCTGC
1321 CCTGTCTGAG GGTGCCACCC CCCAGGACCT GAACACCATG CTGAACACAG TGGGGGGCCA
1381 TCAGGCTGCC ATGCAGATGC TGAAGGAGAC CATCAATGAG GAGGCTGCTG AGTGGGACAG
1441 GCTGCATCCT GTGCACGCTG GCCCCATTGC CCCCGGCCAG ATGAGGGAGC CCAGGGGCTC
1501 TGACATTGCT GGCACCACCT CCACCCTCCA GGAGCAGATT GGCTGGATGA CCAACAACCC
1561 CCCCATCCCT GTGGGGGAAA TCTACAAGAG GTGGATCATC CTGGGCCTGA ACAAGATTGT
1621 GAGGATGTAC TCCCCCACCT CCATCCTGGA CATCAGGCAG GGCCCCAAGG AGCCCTTCAG
1681 GGACTATGTG GACAGGTTCT ACAAGACCCT GAGGGCTGAG CAGGCCTCCC AGGAGGTGAA
1741 GAACTGGATG ACAGAGACCC TGCTGGTGCA GAATGCCAAC CCTGACTGCA AGACCATCCT
1801 GAAGGCCCTG GGCCCTGCTG CCACCCTGGA GGAGATGATG ACAGCCTGCC AGGGGGTGGG
1861 GGGCCCTGGT CACAAGGCCA GGGTGCTGGC TGAGGCCATG TCCCAGGTGA CCAACTCCGC
1921 CACCATCATG ATGCAGAGGG GCAACTTCAG GAACCAGAGG AAGACAGTGA AGTGCTTCAA
1981 CTGTGGCAAG GTGGGCCACA TTGCCAAGAA CTGTAGGGCC CCCAGGAAGA AGGGCTGCTG
2041 GAAGTGTGGC AAGGAGGGCC ACCAGATGAA GGACTGCAAT GAGAGGCAGG CCAACTTCCT
2101 GGGCAAAATC TGGCCCTCCC ACAAGGGCAG GCCTGGCAAC TTCCTCCAGT CCAGGCCTGA
2161 GCCCACAGCC CCTCCCGAGG AGTCCTTCAG GTTTGGGGAG GAGAAGACCA CCCCCAGCCA
2221 GAAGCAGGAG CCCATTGACA AGGAGCTGTA CCCCCTGGCC TCCCTGAGGT CCCTGTTTGG
2281 CAACGACCCC TCCTCCCAGT AAaataaagc ccgggcagat ctgatctgct gtgccttcta
2341 gttgccagcc atctgttgtt tgcccctccc ccgtgccttc cttgaccctg gaaggtgcca
2401 ctcccactgt cctttcctaa taaaatgagg aaattgcatc gcattgtctg agtaggtgtc
2461 attctattct gggggggtggg gtggggcagc acagcaaggg ggaggattgg gaagacaata
2521 gcaggcatgc tggggatgcg gtgggctcta
```

SEQ ID NO: 2

FIG. 8

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   1 ccattgcata cgttgtatcc atatcataat atgtacattt atattggctc atgtccaaca
  61 ttaccgccat gttgacattg attattgact agttattaat agtaatcaat tacggggtca
 121 ttagttcata gcccatatat ggagttccgc gttacataac ttacggtaaa tggcccgcct
 181 ggctgaccgc ccaacgaccc ccgcccattg acgtcaataa tgacgtatgt tcccatagta
 241 acgccaatag ggactttcca ttgacgtcaa tgggtggagt atttacggta aactgcccac
 301 ttggcagtac atcaagtgta tcatatgcca agtacgcccc ctattgacgt caatgacggt
 361 aaatggcccg cctggcatta tgcccagtac atgaccttat gggactttcc tacttggcag
 421 tacatctacg tattagtcat cgctattacc atggtgatgc ggttttggca gtacatcaat
 481 gggcgtggat agcggtttga ctcacgggga tttccaagtc tccaccccat tgacgtcaat
 541 gggagtttgt tttggcacca aaatcaacgg gactttccaa aatgtcgtaa caactccgcc
 601 ccattgacgc aaatgggcgg taggcgtgta cggtgggagg tctatataag cagagctcgt
 661 ttagtgaacc gtcagatcgc ctggagacgc catccacgct gttttgacct ccatagaaga
 721 caccgggacc gatccagcct ccgcggccgg gaacggtgca ttggaacgcg gattccccgt
 781 gccaagagtg agatctaagt aagcttcctg cATGCTGCTG CTGCTGCTGC TGCTGGGCCT
 841 GAGGCTACAG CTCTCCCTGG GCATCATCCC AGTTGAGGAG GAGAACCCGG ACTTCTGGAA
 901 CCGCGAGGCA GCCGAGGCCC TGGGTGCCGC CAAGAAGCTG CAGCCTGCAC AGACAGCCGC
 961 CAAGAACCTC ATCATCTTCC TGGGCGATGG GATGGGGGTG TCTACGGTGA CAGCTGCCAG
1021 GATCCTAAAA GGGCAGAAGA AGGACAAACT GGGGCCTGAG ATACCCCTGG CCATGGACCG
1081 CTTCCCATAT GTGGCTCTGT CCAAGACATA CAATGTAGAC AAACATGTGC CAGACAGTGG
1141 AGCCACAGCC ACGGCCTACC TGTGCGGGGT CAAGGGCAAC TTCCAGACCA TTGGCTTGAG
1201 TGCAGCCGCC CGCTTTAACC AGTGCAACAC GACACGCGGC AACGAGGTCA TCTCCGTGAT
1261 GAATCGGGCC AAGAAAGCAG GGAAGTCAGT GGGAGTGGTA ACCACCACAC GAGTGCAGCA
1321 CGCCTCGCCA GCCGGCACCT ACGCCCACAC GGTGAACCGC AACTGGTACT CGGACGCCGA
1381 CGTGCCTGCC TCCGCCCGCC AGGAGGGGTG CCAGGACATC GCTACGCAGC TCATCTCCAA
1441 CATGGACATT GACGTGATCC TAGGTGGAGG CCGAAAGTAC ATGTTTCGCA TGGGAACCCC
1501 AGACCCTGAG TACCCAGATG ACTACAGCCA AGGTGGGACC AGGCTGGACG GGAAGAATCT
1561 GGTGCAGGAA TGGCTGGCGA AGCGCCAGGG TGCCCGGTAT GTGTGGAACC GCACTGAGCT
1621 CATGCAGGCT TCCCTGGACC CGTCTGTGAC CCATCTCATG GGTCTCTTTG AGCCTGGAGA
1681 CATGAAATAC GAGATCCACC GAGACTCCAC ACTGGACCCC TCCCTGATGG AGATGACAGA
1741 GGCTGCCCTG CGCCTGCTGA GCAGGAACCC CCGCGGCTTC TTCCTCTTCG TGGAGGGTGG
1801 TCGCATCGAC CATGGTCATC ATGAAAGCAG GGCTTACCGG GCACTGACTG AGACGATCAT
1861 GTTCGACGAC GCCATTGAGA GGGCGGGCCA GCTCACCAGC GAGGAGGACA CGCTGAGCCT
1921 CGTCACTGCC GACCACTCCC ACGTCTTCTC CTTCGGAGGC TACCCCCTGC GAGGGAGCTC
1981 CATCTTCGGG CTGGCCCCTG GCAAGGCCCG GGACAGGAAG GCCTACACGG TCCTCCTATA
2041 CGGAAACGGT CCAGGCTATG TGCTCAAGGA CGGCGCCCGG CCGGATGTTA CCGAGAGCGA
2101 GAGCGGGAGC CCCGAGTATC GGCAGCAGTC AGCAGTGCCC CTGGACGAAG AGACCCACGC
2161 AGGCGAGGAC GTGGCGGTGT TCGCGCGCGG CCCGCAGGCG CACCTGGTTC ACGGCGTGCA
2221 GGAGCAGACC TTCATAGCGC ACGTCATGGC CTTCGCCGCC TGCCTGGAGC CCTACACCGC
2281 CTGCGACCTG GCGCCCCCCG CCGGCACCAC CGACGCCGCG CACCCGGGTT AAcccgtggt
2341 ccccgcgttg cttcctctgc tggccgggac atcaggtggc ccccgctgaa ttggaatcga
2401 tcagaattca gtcgacgata tctgatcacg atctgatctg ctgtgccttc tagttgccag
2461 ccatctgttg tttgcccctc ccccgtgcct tccttgaccc tggaaggtgc cactcccact
2521 gtcctttcct aataaaatga ggaaattgca tcgcattgtc tgagtaggtg tcattctatt
2581 ctgggggggtg gggtggggca gcacagcaag ggggaggatt gggaagacaa tagcaggcat
2641 gctggggatg cggtgggctc ta
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FIG. 9

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1    TTCTTAATTA ACATCATCAA TAATATACCT TATTTTGGAT TGAAGCCAAT
     AAGAATTAAT TGTAGTAGTT ATTATATGGA ATAAAACCTA ACTTCGGTTA

51   ATGATAATGA GGGGGTGGAG TTTGTGACGT GGCGCGGGGC GTGGGAACGG
     TACTATTACT CCCCCACCTC AAACACTGCA CCGCGCCCCG CACCCTTGCC

101  GGCGGGTGAC GTAGTAGTGT GGCGGAAGTG TGATGTTGCA AGTGTGGCGG
     CCGCCCACTG CATCATCACA CCGCCTTCAC ACTACAACGT TCACACCGCC

151  AACACATGTA AGCGACGGAT GTGGCAAAAG TGACGTTTTT GGTGTGCGCC
     TTGTGTACAT TCGCTGCCTA CACCGTTTTC ACTGCAAAAA CCACACGCGG

201  GGTGTACACA GGAAGTGACA ATTTTCGCGC GGTTTTAGGC GGATGTTGTA
     CCACATGTGT CCTTCACTGT TAAAAGCGCG CCAAAATCCG CCTACAACAT

251  GTAAATTTGG GCGTAACCGA GTAAGATTTG GCCATTTTCG CGGGAAAACT
     CATTTAAACC CGCATTGGCT CATTCTAAAC CGGTAAAAGC GCCCTTTTGA

301  GAATAAGAGG AAGTGAAATC TGAATAATTT TGTGTTACTC ATAGCGCGTA
     CTTATTCTCC TTCACTTTAG ACTTATTAAA ACACAATGAG TATCGCGCAT

351  ATATTTGTCT AGGGCCGCGG GGACTTTGAC CGTTTACGTG GAGACTCGCC
     TATAAACAGA TCCCGGCGCC CCTGAAACTG GCAAATGCAC CTCTGAGCGG

401  CAGGTGTTTT TCTCAGGTGT TTTCCGCGTT CCGGGTCAAA GTTGGCGTTT
     GTCCACAAAA AGAGTCCACA AAAGGCGCAA GGCCCAGTTT CAACCGCAAA

451  TATTATTATA GGCGGCCGCG ATCCATTGCA TACGTTGTAT CCATATCATA
     ATAATAATAT CCGCCGGCGC TAGGTAACGT ATGCAACATA GGTATAGTAT

501  ATATGTACAT TTATATTGGC TCATGTCCAA CATTACCGCC ATGTTGACAT
     TATACATGTA AATATAACCG AGTACAGGTT GTAATGGCGG TACAACTGTA

551  TGATTATTGA CTAGTTATTA ATAGTAATCA ATTACGGGGT CATTAGTTCA
     ACTAATAACT GATCAATAAT TATCATTAGT TAATGCCCCA GTAATCAAGT

601  TAGCCCATAT ATGGAGTTCC GCGTTACATA ACTTACGGTA AATGGCCCGC
     ATCGGGTATA TACCTCAAGG CGCAATGTAT TGAATGCCAT TTACCGGGCG

651  CTGGCTGACC GCCCAACGAC CCCCGCCCAT TGACGTCAAT AATGACGTAT
     GACCGACTGG CGGGTTGCTG GGGGCGGGTA ACTGCAGTTA TTACTGCATA

701  GTTCCCATAG TAACGCCAAT AGGGACTTTC CATTGACGTC AATGGGTGGA
     CAAGGGTATC ATTGCGGTTA TCCCTGAAAG GTAACTGCAG TTACCCACCT

751  GTATTTACGG TAAACTGCCC ACTTGGCAGT ACATCAAGTG TATCATATGC
     CATAAATGCC ATTTGACGGG TGAACCGTCA TGTAGTTCAC ATAGTATACG
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FIG. 10A-1
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801   CAAGTACGCC CCCTATTGAC GTCAATGACG GTAAATGGCC CGCCTGGCAT
      GTTCATGCGG GGGATAACTG CAGTTACTGC CATTTACCGG GCGGACCGTA

851   TATGCCCAGT ACATGACCTT ATGGGACTTT CCTACTTGGC AGTACATCTA
      ATACGGGTCA TGTACTGGAA TACCCTGAAA GGATGAACCG TCATGTAGAT

901   CGTATTAGTC ATCGCTATTA CCATGGTGAT GCGGTTTTGG CAGTACATCA
      GCATAATCAG TAGCGATAAT GGTACCACTA CGCCAAAACC GTCATGTAGT

951   ATGGGCGTGG ATAGCGGTTT GACTCACGGG GATTTCCAAG TCTCCACCCC
      TACCCGCACC TATCGCCAAA CTGAGTGCCC CTAAAGGTTC AGAGGTGGGG

1001  ATTGACGTCA ATGGGAGTTT GTTTTGGCAC CAAAATCAAC GGGACTTTCC
      TAACTGCAGT TACCCTCAAA CAAAACCGTG GTTTTAGTTG CCCTGAAAGG

1051  AAAATGTCGT AACAACTCCG CCCCATTGAC GCAAATGGGC GGTAGGCGTG
      TTTTACAGCA TTGTTGAGGC GGGGTAACTG CGTTTACCCG CCATCCGCAC

1101  TACGGTGGGA GGTCTATATA AGCAGAGCTC GTTTAGTGAA CCGTCAGATC
      ATGCCACCCT CCAGATATAT TCGTCTCGAG CAAATCACTT GGCAGTCTAG

1151  GCCTGGAGAC GCCATCCACG CTGTTTTGAC CTCCATAGAA GACACCGGGA
      CGGACCTCTG CGGTAGGTGC GACAAAACTG GAGGTATCTT CTGTGGCCCT

1201  CCGATCCAGC CTCCGCGGCC GGGAACGGTG CATTGGAACG CGGATTCCCC
      GGCTAGGTCG GAGGCGCCGG CCCTTGCCAC GTAACCTTGC GCCTAAGGGG

1251  GTGCCAAGAG TGAGATCTAC CATGGGTGCT AGGGCTTCTG TGCTGTCTGG
      CACGGTTCTC ACTCTAGATG GTACCCACGA TCCCGAAGAC ACGACAGACC

1301  TGGTGAGCTG GACAAGTGGG AGAAGATCAG GCTGAGGCCT GGTGGCAAGA
      ACCACTCGAC CTGTTCACCC TCTTCTAGTC CGACTCCGGA CCACCGTTCT

1351  AGAAGTACAA GCTAAAGCAC ATTGTGTGGG CCTCCAGGGA GCTGGAGAGG
      TCTTCATGTT CGATTTCGTG TAACACACCC GGAGGTCCCT CGACCTCTCC

1401  TTTGCTGTGA ACCCTGGCCT GCTGGAGACC TCTGAGGGGT GCAGGCAGAT
      AAACGACACT TGGGACCGGA CGACCTCTGG AGACTCCCCA CGTCCGTCTA

1451  CCTGGGCCAG CTCCAGCCCT CCCTGCAAAC AGGCTCTGAG GAGCTGAGGT
      GGACCCGGTC GAGGTCGGGA GGGACGTTTG TCCGAGACTC CTCGACTCCA

1501  CCCTGTACAA CACAGTGGCT ACCCTGTACT GTGTGCACCA GAAGATTGAT
      GGGACATGTT GTGTCACCGA TGGGACATGA CACACGTGGT CTTCTAACTA

1551  GTGAAGGACA CCAAGGAGGC CCTGGAGAAG ATTGAGGAGG AGCAGAACAA
      CACTTCCTGT GGTTCCTCCG GGACCTCTTC TAACTCCTCC TCGTCTTGTT
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FIG. 10A-2

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1601  GTCCAAGAAG AAGGCCCAGC AGGCTGCTGC TGGCACAGGC AACTCCAGCC
      CAGGTTCTTC TTCCGGGTCG TCCGACGACG ACCGTGTCCG TTGAGGTCGG

1651  AGGTGTCCCA GAACTACCCC ATTGTGCAGA ACCTCCAGGG CCAGATGGTG
      TCCACAGGGT CTTGATGGGG TAACACGTCT TGGAGGTCCC GGTCTACCAC

1701  CACCAGGCCA TCTCCCCCCG GACCCTGAAT GCCTGGGTGA AGGTGGTGGA
      GTGGTCCGGT AGAGGGGGGC CTGGGACTTA CGGACCCACT TCCACCACCT

1751  GGAGAAGGCC TTCTCCCCTG AGGTGATCCC CATGTTCTCT GCCCTGTCTG
      CCTCTTCCGG AAGAGGGGAC TCCACTAGGG GTACAAGAGA CGGGACAGAC

1801  AGGGTGCCAC CCCCCAGGAC CTGAACACCA TGCTGAACAC AGTGGGGGGC
      TCCCACGGTG GGGGGTCCTG GACTTGTGGT ACGACTTGTG TCACCCCCCG

1851  CATCAGGCTG CCATGCAGAT GCTGAAGGAG ACCATCAATG AGGAGGCTGC
      GTAGTCCGAC GGTACGTCTA CGACTTCCTC TGGTAGTTAC TCCTCCGACG

1901  TGAGTGGGAC AGGCTGCATC CTGTGCACGC TGGCCCCATT GCCCCCGGCC
      ACTCACCCTG TCCGACGTAG GACACGTGCG ACCGGGGTAA CGGGGGCCGG

1951  AGATGAGGGA GCCCAGGGGC TCTGACATTG CTGGCACCAC CTCCACCCTC
      TCTACTCCCT CGGGTCCCCG AGACTGTAAC GACCGTGGTG GAGGTGGGAG

2001  CAGGAGCAGA TTGGCTGGAT GACCAACAAC CCCCCCATCC CTGTGGGGGA
      GTCCTCGTCT AACCGACCTA CTGGTTGTTG GGGGGGTAGG GACACCCCCT

2051  AATCTACAAG AGGTGGATCA TCCTGGGCCT GAACAAGATT GTGAGGATGT
      TTAGATGTTC TCCACCTAGT AGGACCCGGA CTTGTTCTAA CACTCCTACA

2101  ACTCCCCCAC CTCCATCCTG GACATCAGGC AGGGCCCCAA GGAGCCCTTC
      TGAGGGGGTG GAGGTAGGAC CTGTAGTCCG TCCCGGGGTT CCTCGGGAAG

2151  AGGGACTATG TGGACAGGTT CTACAAGACC CTGAGGGCTG AGCAGGCCTC
      TCCCTGATAC ACCTGTCCAA GATGTTCTGG GACTCCCGAC TCGTCCGGAG

2201  CCAGGAGGTG AAGAACTGGA TGACAGAGAC CCTGCTGGTG CAGAATGCCA
      GGTCCTCCAC TTCTTGACCT ACTGTCTCTG GGACGACCAC GTCTTACGGT

2251  ACCCTGACTG CAAGACCATC CTGAAGGCCC TGGGCCCTGC TGCCACCCTG
      TGGGACTGAC GTTCTGGTAG GACTTCCGGG ACCCGGGACG ACGGTGGGAC

2301  GAGGAGATGA TGACAGCCTG CCAGGGGGTG GGGGCCCCTG GTCACAAGGC
      CTCCTCTACT ACTGTCGGAC GGTCCCCCAC CCCCCGGGAC CAGTGTTCCG

2351  CAGGGTGCTG GCTGAGGCCA TGTCCCAGGT GACCAACTCC GCCACCATCA
      GTCCCACGAC CGACTCCGGT ACAGGGTCCA CTGGTTGAGG CGGTGGTAGT
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FIG. 10A-3

```
2401   TGATGCAGAG GGGCAACTTC AGGAACCAGA GGAAGACAGT GAAGTGCTTC
       ACTACGTCTC CCCGTTGAAG TCCTTGGTCT CCTTCTGTCA CTTCACGAAG

2451   AACTGTGGCA AGGTGGGCCA CATTGCCAAG AACTGTAGGG CCCCCAGGAA
       TTGACACCGT TCCACCCGGT GTAACGGTTC TTGACATCCC GGGGGTCCTT

2501   GAAGGCTGC TGGAAGTGTG GCAAGGAGGG CCACCAGATG AAGGACTGCA
       CTTCCCGACG ACCTTCACAC CGTTCCTCCC GGTGGTCTAC TTCCTGACGT

2551   ATGAGAGGCA GGCCAACTTC CTGGGCAAAA TCTGGCCCTC CCACAAGGGC
       TACTCTCCGT CCGGTTGAAG GACCCGTTTT AGACCGGGAG GGTGTTCCCG

2601   AGGCCTGGCA ACTTCCTCCA GTCCAGGCCT GAGCCCACAG CCCCTCCCGA
       TCCGGACCGT TGAAGGAGGT CAGGTCCGGA CTCGGGTGTC GGGGAGGGCT

2651   GGAGTCCTTC AGGTTTGGGG AGGAGAAGAC CACCCCCAGC CAGAAGCAGG
       CCTCAGGAAG TCCAAACCCC TCCTCTTCTG GTGGGGGTCG GTCTTCGTCC

2701   AGCCCATTGA CAAGGAGCTG TACCCCCTGG CCTCCCTGAG GTCCCTGTTT
       TCGGGTAACT GTTCCTCGAC ATGGGGGACC GGAGGGACTC CAGGGACAAA

2751   GGCAACGACC CCTCCTCCCA GTAAAATAAA GCCCGGGCAG ATCTGCTGTG
       CCGTTGCTGG GGAGGAGGGT CATTTTATTT CGGGCCCGTC TAGACGACAC

2801   CCTTCTAGTT GCCAGCCATC TGTTGTTTGC CCCTCCCCCG TGCCTTCCTT
       GGAAGATCAA CGGTCGGTAG ACAACAAACG GGGAGGGGGC ACGGAAGGAA

2851   GACCCTGGAA GGTGCCACTC CCACTGTCCT TTCCTAATAA AATGAGGAAA
       CTGGGACCTT CCACGGTGAG GGTGACAGGA AAGGATTATT TTACTCCTTT

2901   TTGCATCGCA TTGTCTGAGT AGGTGTCATT CTATTCTGGG GGGTGGGGTG
       AACGTAGCGT AACAGACTCA TCCACAGTAA GATAAGACCC CCCACCCCAC

2951   GGGCAGGACA GCAAGGGGGA GGATTGGGAA GACAATAGCA GGCATGCTGG
       CCCGTCCTGT CGTTCCCCCT CCTAACCCTT CTGTTATCGT CCGTACGACC

3001   GGATGCGGTG GGCTCTATGG CCGATCGGCG CGCCGTACTG AAATGTGTGG
       CCTACGCCAC CCGAGATACC GGCTAGCCGC GCGGCATGAC TTTACACACC

3051   GCGTGGCTTA AGGGTGGGAA AGAATATATA AGGTGGGGGT CTTATGTAGT
       CGCACCGAAT TCCCACCCTT TCTTATATAT TCCACCCCCA GAATACATCA

3101   TTTGTATCTG TTTTGCAGCA GCCGCCGCCG CCATGAGCAC CAACTCGTTT
       AAACATAGAC AAAACGTCGT CGGCGGCGGC GGTACTCGTG GTTGAGCAAA

3151   GATGGAAGCA TTGTGAGCTC ATATTTGACA ACGCGCATGC CCCCATGGGC
       CTACCTTCGT AACACTCGAG TATAAACTGT TGCGCGTACG GGGGTACCCG
```

FIG. 10A-4

```
3201  CGGGGTGCGT CAGAATGTGA TGGGCTCCAG CATTGATGGT CGCCCCGTCC
      GCCCCACGCA GTCTTACACT ACCCGAGGTC GTAACTACCA GCGGGGCAGG

3251  TGCCCGCAAA CTCTACTACC TTGACCTACG AGACCGTGTC TGGAACGCCG
      ACGGGCGTTT GAGATGATGG AACTGGATGC TCTGGCACAG ACCTTGCGGC

3301  TTGGAGACTG CAGCCTCCGC CGCCGCTTCA GCCGCTGCAG CCACCGCCCG
      AACCTCTGAC GTCGGAGGCG GCGGCGAAGT CGGCGACGTC GGTGGCGGGC

3351  CGGGATTGTG ACTGACTTTG CTTTCCTGAG CCCGCTTGCA AACAGTGCAG
      GCCCTAACAC TGACTGAAAC GAAAGGACTC GGGCGAACGT TTGTCACGTC

3401  CTTCCCGTTC ATCCGCCCGC GATGACAAGT TGACGGCTCT TTTGGCACAA
      GAAGGGCAAG TAGGCGGGCG CTACTGTTCA ACTGCCGAGA AAACCGTGTT

3451  TTGGATTCTT TGACCCGGGA ACTTAATGTC GTTTCTCAGC AGCTGTTGGA
      AACCTAAGAA ACTGGGCCCT TGAATTACAG CAAAGAGTCG TCGACAACCT

3501  TCTGCGCCAG CAGGTTTCTG CCCTGAAGGC TTCCTCCCCT CCCAATGCGG
      AGACGCGGTC GTCCAAAGAC GGGACTTCCG AAGGAGGGGA GGGTTACGCC

3551  TTTAAAACAT AAATAAAAAA CCAGACTCTG TTTGGATTTG GATCAAGCAA
      AAATTTTGTA TTTATTTTTT GGTCTGAGAC AAACCTAAAC CTAGTTCGTT

3601  GTGTCTTGCT GTCTTTATTT AGGGGTTTTG CGCGCGCGGT AGGCCCGGGA
      CACAGAACGA CAGAAATAAA TCCCCAAAAC GCGCGCGCCA TCCGGGCCCT

3651  CCAGCGGTCT CGGTCGTTGA GGGTCCTGTG TATTTTTTCC AGGACGTGGT
      GGTCGCCAGA GCCAGCAACT CCCAGGACAC ATAAAAAAGG TCCTGCACCA

3701  AAAGGTGACT CTGGATGTTC AGATACATGG GCATAAGCCC GTCTCTGGGG
      TTTCCACTGA GACCTACAAG TCTATGTACC CGTATTCGGG CAGAGACCCC

3751  TGGAGGTAGC ACCACTGCAG AGCTTCATGC TGCGGGGTGG TGTTGTAGAT
      ACCTCCATCG TGGTGACGTC TCGAAGTACG ACGCCCCACC ACAACATCTA

3801  GATCCAGTCG TAGCAGGAGC GCTGGGCGTG GTGCCTAAAA ATGTCTTTCA
      CTAGGTCAGC ATCGTCCTCG CGACCCGCAC CACGGATTTT TACAGAAAGT

3851  GTAGCAAGCT GATTGCCAGG GGCAGGCCCT TGGTGTAAGT GTTTACAAAG
      CATCGTTCGA CTAACGGTCC CCGTCCGGGA ACCACATTCA CAAATGTTTC

3901  CGGTTAAGCT GGGATGGGTG CATACGTGGG GATATGAGAT GCATCTTGGA
      GCCAATTCGA CCCTACCCAC GTATGCACCC CTATACTCTA CGTAGAACCT

3951  CTGTATTTTT AGGTTGGCTA TGTTCCCAGC CATATCCCTC CGGGGATTCA
      GACATAAAAA TCCAACCGAT ACAAGGGTCG GTATAGGGAG GCCCCTAAGT
```

FIG. 10A-5

```
4001  TGTTGTGCAG AACCACCAGC ACAGTGTATC CGGTGCACTT GGGAAATTTG
      ACAACACGTC TTGGTGGTCG TGTCACATAG GCCACGTGAA CCCTTTAAAC

4051  TCATGTAGCT TAGAAGGAAA TGCGTGGAAG AACTTGGAGA CGCCCTTGTG
      AGTACATCGA ATCTTCCTTT ACGCACCTTC TTGAACCTCT GCGGGAACAC

4101  ACCTCCAAGA TTTTCCATGC ATTCGTCCAT AATGATGGCA ATGGGCCCAC
      TGGAGGTTCT AAAAGGTACG TAAGCAGGTA TTACTACCGT TACCCGGGTG

4151  GGGCGGCGGC CTGGGCGAAG ATATTTCTGG GATCACTAAC GTCATAGTTG
      CCCGCCGCCG GACCCGCTTC TATAAAGACC CTAGTGATTG CAGTATCAAC

4201  TGTTCCAGGA TGAGATCGTC ATAGGCCATT TTTACAAAGC GCGGGCGGAG
      ACAAGGTCCT ACTCTAGCAG TATCCGGTAA AAATGTTTCG CGCCCGCCTC

4251  GGTGCCAGAC TGCGGTATAA TGGTTCCATC CGGCCCAGGG GCGTAGTTAC
      CCACGGTCTG ACGCCATATT ACCAAGGTAG GCCGGGTCCC CGCATCAATG

4301  CCTCACAGAT TTGCATTTCC CACGCTTTGA GTTCAGATGG GGGGATCATG
      GGAGTGTCTA AACGTAAAGG GTGCGAAACT CAAGTCTACC CCCCTAGTAC

4351  TCTACCTGCG GGGCGATGAA GAAAACGGTT TCCGGGGTAG GGGAGATCAG
      AGATGGACGC CCCGCTACTT CTTTTGCCAA AGGCCCCATC CCCTCTAGTC

4401  CTGGGAAGAA AGCAGGTTCC TGAGCAGCTG CGACTTACCG CAGCCGGTGG
      GACCCTTCTT TCGTCCAAGG ACTCGTCGAC GCTGAATGGC GTCGGCCACC

4451  GCCCGTAAAT CACACCTATT ACCGGCTGCA ACTGGTAGTT AAGAGAGCTG
      CGGGCATTTA GTGTGGATAA TGGCCGACGT TGACCATCAA TTCTCTCGAC

4501  CAGCTGCCGT CATCCCTGAG CAGGGGGGCC ACTTCGTTAA GCATGTCCCT
      GTCGACGGCA GTAGGGACTC GTCCCCCCGG TGAAGCAATT CGTACAGGGA

4551  GACTCGCATG TTTTCCCTGA CCAAATCCGC CAGAAGGCGC TCGCCGCCCA
      CTGAGCGTAC AAAAGGGACT GGTTTAGGCG GTCTTCCGCG AGCGGCGGGT

4601  GCGATAGCAG TTCTTGCAAG GAAGCAAAGT TTTTCAACGG TTTGAGACCG
      CGCTATCGTC AAGAACGTTC CTTCGTTTCA AAAAGTTGCC AAACTCTGGC

4651  TCCGCCGTAG GCATGCTTTT GAGCGTTTGA CCAAGCAGTT CCAGGCGGTC
      AGGCGGCATC CGTACGAAAA CTCGCAAACT GGTTCGTCAA GGTCCGCCAG

4701  CCACAGCTCG GTCACCTGCT CTACGGCATC TCGATCCAGC ATATCTCCTC
      GGTGTCGAGC CAGTGGACGA GATGCCGTAG AGCTAGGTCG TATAGAGGAG

4751  GTTTCGCGGG TTGGGGCGGC TTTCGCTGTA CGGCAGTAGT CGGTGCTCGT
      CAAAGCGCCC AACCCCGCCG AAAGCGACAT GCCGTCATCA GCCACGAGCA
```

FIG. 10A-6

```
4801  CCAGACGGGC CAGGGTCATG TCTTTCCACG GGCGCAGGGT CCTCGTCAGC
      GGTCTGCCCG GTCCCAGTAC AGAAAGGTGC CCGCGTCCCA GGAGCAGTCG

4851  GTAGTCTGGG TCACGGTGAA GGGGTGCGCT CCGGGCTGCG CGCTGGCCAG
      CATCAGACCC AGTGCCACTT CCCCACGCGA GGCCCGACGC GCGACCGGTC

4901  GGTGCGCTTG AGGCTGGTCC TGCTGGTGCT GAAGCGCTGC CGGTCTTCGC
      CCACGCGAAC TCCGACCAGG ACGACCACGA CTTCGCGACG GCCAGAAGCG

4951  CCTGCGCGTC GGCCAGGTAG CATTTGACCA TGGTGTCATA GTCCAGCCCC
      GGACGCGCAG CCGGTCCATC GTAAACTGGT ACCACAGTAT CAGGTCGGGG

5001  TCCGCGGCGT GGCCCTTGGC GCGCAGCTTG CCCTTGGAGG AGGCGCCGCA
      AGGCGCCGCA CCGGGAACCG CGCGTCGAAC GGGAACCTCC TCCGCGGCGT

5051  CGAGGGGCAG TGCAGACTTT TGAGGGCGTA GAGCTTGGGC GCGAGAAATA
      GCTCCCCGTC ACGTCTGAAA ACTCCCGCAT CTCGAACCCG CGCTCTTTAT

5101  CCGATTCCGG GGAGTAGGCA TCCGCGCCGC AGGCCCCGCA GACGGTCTCG
      GGCTAAGGCC CCTCATCCGT AGGCGCGGCG TCCGGGGCGT CTGCCAGAGC

5151  CATTCCACGA GCCAGGTGAG CTCTGGCCGT TCGGGGTCAA AAACCAGGTT
      GTAAGGTGCT CGGTCCACTC GAGACCGGCA AGCCCCAGTT TTTGGTCCAA

5201  TCCCCCATGC TTTTTGATGC GTTTCTTACC TCTGGTTTCC ATGAGCCGGT
      AGGGGGTACG AAAAACTACG CAAAGAATGG AGACCAAAGG TACTCGGCCA

5251  GTCCACGCTC GGTGACGAAA AGGCTGTCCG TGTCCCCGTA TACAGACTTG
      CAGGTGCGAG CCACTGCTTT TCCGACAGGC ACAGGGGCAT ATGTCTGAAC

5301  AGAGGCCTGT CCTCGAGCGG TGTTCCGCGG TCCTCCTCGT ATAGAAACTC
      TCTCCGGACA GGAGCTCGCC ACAAGGCGCC AGGAGGAGCA TATCTTTGAG

5351  GGACCACTCT GAGACAAAGG CTCGCGTCCA GGCCAGCACG AAGGAGGCTA
      CCTGGTGAGA CTCTGTTTCC GAGCGCAGGT CCGGTCGTGC TTCCTCCGAT

5401  AGTGGGAGGG GTAGCGGTCG TTGTCCACTA GGGGGTCCAC TCGCTCCAGG
      TCACCCTCCC CATCGCCAGC AACAGGTGAT CCCCCAGGTG AGCGAGGTCC

5451  GTGTGAAGAC ACATGTCGCC CTCTTCGGCA TCAAGGAAGG TGATTGGTTT
      CACACTTCTG TGTACAGCGG GAGAAGCCGT AGTTCCTTCC ACTAACCAAA

5501  GTAGGTGTAG GCCACGTGAC CGGGTGTTCC TGAAGGGGGG CTATAAAAGG
      CATCCACATC CGGTGCACTG GCCCACAAGG ACTTCCCCCC GATATTTTCC

5551  GGGTGGGGGC GCGTTCGTCC TCACTCTCTT CCGCATCGCT GTCTGCGAGG
      CCCACCCCCG CGCAAGCAGG AGTGAGAGAA GGCGTAGCGA CAGACGCTCC
```

FIG. 10A-7

```
5601   GCCAGCTGTT GGGGTGAGTA CTCCCTCTGA AAAGCGGGCA TGACTTCTGC
       CGGTCGACAA CCCCACTCAT GAGGGAGACT TTTCGCCCGT ACTGAAGACG

5651   GCTAAGATTG TCAGTTTCCA AAAACGAGGA GGATTTGATA TTCACCTGGC
       CGATTCTAAC AGTCAAAGGT TTTTGCTCCT CCTAAACTAT AAGTGGACCG

5701   CCGCGGTGAT GCCTTTGAGG GTGGCCGCAT CCATCTGGTC AGAAAAGACA
       GGCGCCACTA CGGAAACTCC CACCGGCGTA GGTAGACCAG TCTTTTCTGT

5751   ATCTTTTTGT TGTCAAGCTT GGTGGCAAAC GACCCGTAGA GGGCGTTGGA
       TAGAAAAACA ACAGTTCGAA CCACCGTTTG CTGGGCATCT CCCGCAACCT

5801   CAGCAACTTG GCGATGGAGC GCAGGGTTTG GTTTTTGTCG CGATCGGCGC
       GTCGTTGAAC CGCTACCTCG CGTCCCAAAC CAAAAACAGC GCTAGCCGCG

5851   GCTCCTTGGC CGCGATGTTT AGCTGCACGT ATTCGCGCGC AACGCACCGC
       CGAGGAACCG GCGCTACAAA TCGACGTGCA TAAGCGCGCG TTGCGTGGCG

5901   CATTCGGGAA AGACGGTGGT GCGCTCGTCG GGCACCAGGT GCACGCGCCA
       GTAAGCCCTT TCTGCCACCA CGCGAGCAGC CCGTGGTCCA CGTGCGCGGT

5951   ACCGCGGTTG TGCAGGGTGA CAAGGTCAAC GCTGGTGGCT ACCTCTCCGC
       TGGCGCCAAC ACGTCCCACT GTTCCAGTTG CGACCACCGA TGGAGAGGCG

6001   GTAGGCGCTC GTTGGTCCAG CAGAGGCGGC CGCCCTTGCG CGAGCAGAAT
       CATCCGCGAG CAACCAGGTC GTCTCCGCCG GCGGGAACGC GCTCGTCTTA

6051   GGCGGTAGGG GGTCTAGCTG CGTCTCGTCC GGGGGGTCTG CGTCCACGGT
       CCGCCATCCC CCAGATCGAC GCAGAGCAGG CCCCCCAGAC GCAGGTGCCA

6101   AAAGACCCCG GGCAGCAGGC GCGCGTCGAA GTAGTCTATC TTGCATCCTT
       TTTCTGGGGC CCGTCGTCCG CGCGCAGCTT CATCAGATAG AACGTAGGAA

6151   GCAAGTCTAG CGCCTGCTGC CATGCGCGGG CGGCAAGCGC GCGCTCGTAT
       CGTTCAGATC GCGGACGACG GTACGCGCCC GCCGTTCGCG CGCGAGCATA

6201   GGGTTGAGTG GGGGACCCCA TGGCATGGGG TGGGTGAGCG CGGAGGCGTA
       CCCAACTCAC CCCCTGGGGT ACCGTACCCC ACCCACTCGC GCCTCCGCAT

6251   CATGCCGCAA ATGTCGTAAA CGTAGAGGGG CTCTCTGAGT ATTCCAAGAT
       GTACGGCGTT TACAGCATTT GCATCTCCCC GAGAGACTCA TAAGGTTCTA

6301   ATGTAGGGTA GCATCTTCCA CCGCGGATGC TGGCGCGCAC GTAATCGTAT
       TACATCCCAT CGTAGAAGGT GGCGCCTACG ACCGCGCGTG CATTAGCATA

6351   AGTTCGTGCG AGGGAGCGAG GAGGTCGGGA CCGAGGTTGC TACGGGCGGG
       TCAAGCACGC TCCCTCGCTC CTCCAGCCCT GGCTCCAACG ATGCCCGCCC
```

FIG. 10A-8

```
6401   CTGCTCTGCT CGGAAGACTA TCTGCCTGAA GATGGCATGT GAGTTGGATG
       GACGAGACGA GCCTTCTGAT AGACGGACTT CTACCGTACA CTCAACCTAC

6451   ATATGGTTGG ACGCTGGAAG ACGTTGAAGC TGGCGTCTGT GAGACCTACC
       TATACCAACC TGCGACCTTC TGCAACTTCG ACCGCAGACA CTCTGGATGG

6501   GCGTCACGCA CGAAGGAGGC GTAGGAGTCG CGCAGCTTGT TGACCAGCTC
       CGCAGTGCGT GCTTCCTCCG CATCCTCAGC GCGTCGAACA ACTGGTCGAG

6551   GGCGGTGACC TGCACGTCTA GGGCGCAGTA GTCCAGGGTT TCCTTGATGA
       CCGCCACTGG ACGTGCAGAT CCCGCGTCAT CAGGTCCCAA AGGAACTACT

6601   TGTCATACTT ATCCTGTCCC TTTTTTTTCC ACAGCTCGCG GTTGAGGACA
       ACAGTATGAA TAGGACAGGG AAAAAAAAGG TGTCGAGCGC CAACTCCTGT

6651   AACTCTTCGC GGTCTTTCCA GTACTCTTGG ATCGGAAACC CGTCGGCCTC
       TTGAGAAGCG CCAGAAAGGT CATGAGAACC TAGCCTTTGG GCAGCCGGAG

6701   CGAACGGTAA GAGCCTAGCA TGTAGAACTG GTTGACGGCC TGGTAGGCGC
       GCTTGCCATT CTCGGATCGT ACATCTTGAC CAACTGCCGG ACCATCCGCG

6751   AGCATCCCTT TTCTACGGGT AGCGCGTATG CCTGCGCGGC CTTCCGGAGC
       TCGTAGGGAA AAGATGCCCA TCGCGCATAC GGACGCGCCG GAAGGCCTCG

6801   GAGGTGTGGG TGAGCGCAAA GGTGTCCCTG ACCATGACTT TGAGGTACTG
       CTCCACACCC ACTCGCGTTT CCACAGGGAC TGGTACTGAA ACTCCATGAC

6851   GTATTTGAAG TCAGTGTCGT CGCATCCGCC CTGCTCCCAG AGCAAAAAGT
       CATAAACTTC AGTCACAGCA GCGTAGGCGG GACGAGGGTC TCGTTTTTCA

6901   CCGTGCGCTT TTTGGAACGC GGATTTGGCA GGGCGAAGGT GACATCGTTG
       GGCACGCGAA AAACCTTGCG CCTAAACCGT CCCGCTTCCA CTGTAGCAAC

6951   AAGAGTATCT TTCCCGCGCG AGGCATAAAG TTGCGTGTGA TGCGGAAGGG
       TTCTCATAGA AAGGGCGCGC TCCGTATTTC AACGCACACT ACGCCTTCCC

7001   TCCCGGCACC TCGGAACGGT TGTTAATTAC CTGGGCGGCG AGCACGATCT
       AGGGCCGTGG AGCCTTGCCA ACAATTAATG GACCCGCCGC TCGTGCTAGA

7051   CGTCAAAGCC GTTGATGTTG TGGCCCACAA TGTAAAGTTC CAAGAAGCGC
       GCAGTTTCGG CAACTACAAC ACCGGGTGTT ACATTTCAAG GTTCTTCGCG

7101   GGGATGCCCT TGATGGAAGG CAATTTTTTA AGTTCCTCGT AGGTGAGCTC
       CCCTACGGGA ACTACCTTCC GTTAAAAAAT TCAAGGAGCA TCCACTCGAG

7151   TTCAGGGGAG CTGAGCCCGT GCTCTGAAAG GGCCCAGTCT GCAAGATGAG
       AAGTCCCCTC GACTCGGGCA CGAGACTTTC CCGGGTCAGA CGTTCTACTC
```

FIG. 10A-9

```
7201   GGTTGGAAGC GACGAATGAG CTCCACAGGT CACGGGCCAT TAGCATTTGC
       CCAACCTTCG CTGCTTACTC GAGGTGTCCA GTGCCCGGTA ATCGTAAACG

7251   AGGTGGTCGC GAAAGGTCCT AAACTGGCGA CCTATGGCCA TTTTTTCTGG
       TCCACCAGCG CTTTCCAGGA TTTGACCGCT GGATACCGGT AAAAAAGACC

7301   GGTGATGCAG TAGAAGGTAA GCGGGTCTTG TTCCCAGCGG TCCCATCCAA
       CCACTACGTC ATCTTCCATT CGCCCAGAAC AAGGGTCGCC AGGGTAGGTT

7351   GGTTCGCGGC TAGGTCTCGC GCGGCAGTCA CTAGAGGCTC ATCTCCGCCG
       CCAAGCGCCG ATCCAGAGCG CGCCGTCAGT GATCTCCGAG TAGAGGCGGC

7401   AACTTCATGA CCAGCATGAA GGGCACGAGC TGCTTCCCAA AGGCCCCCAT
       TTGAAGTACT GGTCGTACTT CCCGTGCTCG ACGAAGGGTT TCCGGGGGTA

7451   CCAAGTATAG GTCTCTACAT CGTAGGTGAC AAAGAGACGC TCGGTGCGAG
       GGTTCATATC CAGAGATGTA GCATCCACTG TTTCTCTGCG AGCCACGCTC

7501   GATGCGAGCC GATCGGGAAG AACTGGATCT CCCGCCACCA ATTGGAGGAG
       CTACGCTCGG CTAGCCCTTC TTGACCTAGA GGGCGGTGGT TAACCTCCTC

7551   TGGCTATTGA TGTGGTGAAA GTAGAAGTCC CTGCGACGGG CCGAACACTC
       ACCGATAACT ACACCACTTT CATCTTCAGG GACGCTGCCC GGCTTGTGAG

7601   GTGCTGGCTT TTGTAAAAAC GTGCGCAGTA CTGGCAGCGG TGCACGGGCT
       CACGACCGAA AACATTTTTG CACGCGTCAT GACCGTCGCC ACGTGCCCGA

7651   GTACATCCTG CACGAGGTTG ACCTGACGAC CGCGCACAAG GAAGCAGAGT
       CATGTAGGAC GTGCTCCAAC TGGACTGCTG GCGCGTGTTC CTTCGTCTCA

7701   GGGAATTTGA GCCCCTCGCC TGGCGGGTTT GGCTGGTGGT CTTCTACTTC
       CCCTTAAACT CGGGGAGCGG ACCGCCCAAA CCGACCACCA GAAGATGAAG

7751   GGCTGCTTGT CCTTGACCGT CTGGCTGCTC GAGGGGAGTT ACGGTGGATC
       CCGACGAACA GGAACTGGCA GACCGACGAG CTCCCCTCAA TGCCACCTAG

7801   GGACCACCAC GCCGCGCGAG CCCAAAGTCC AGATGTCCGC GCGCGGCGGT
       CCTGGTGGTG CGGCGCGCTC GGGTTTCAGG TCTACAGGCG CGCGCCGCCA

7851   CGGAGCTTGA TGACAACATC GCGCAGATGG GAGCTGTCCA TGGTCTGGAG
       GCCTCGAACT ACTGTTGTAG CGCGTCTACC CTCGACAGGT ACCAGACCTC

7901   CTCCCGCGGC GTCAGGTCAG GCGGGAGCTC CTGCAGGTTT ACCTCGCATA
       GAGGGCGCCG CAGTCCAGTC CGCCCTCGAG GACGTCCAAA TGGAGCGTAT

7951   GACGGGTCAG GGCGCGGGCT AGATCCAGGT GATACCTAAT TTCCAGGGGC
       CTGCCCAGTC CCGCGCCCGA TCTAGGTCCA CTATGGATTA AAGGTCCCCG
```

FIG. 10A-10

```
8001   TGGTTGGTGG CGGCGTCGAT GGCTTGCAAG AGGCCGCATC CCCGCGGCGC
       ACCAACCACC GCCGCAGCTA CCGAACGTTC TCCGGCGTAG GGGCGCCGCG

8051   GACTACGGTA CCGCGCGGCG GGCGGTGGGC CGCGGGGGTG TCCTTGGATG
       CTGATGCCAT GGCGCGCCGC CCGCCACCCG GCGCCCCCAC AGGAACCTAC

8101   ATGCATCTAA AAGCGGTGAC GCGGGCGAGC CCCCGGAGGT AGGGGGGGCT
       TACGTAGATT TTCGCCACTG CGCCCGCTCG GGGGCCTCCA TCCCCCCCGA

8151   CCGGACCCGC CGGGAGAGGG GGCAGGGGCA CGTCGGCGCC GCGCGCGGGC
       GGCCTGGGCG GCCCTCTCCC CCGTCCCCGT GCAGCCGCGG CGCGCGCCCG

8201   AGGAGCTGGT GCTGCGCGCG TAGGTTGCTG GCGAACGCGA CGACGCGGCG
       TCCTCGACCA CGACGCGCGC ATCCAACGAC CGCTTGCGCT GCTGCGCCGC

8251   GTTGATCTCC TGAATCTGGC GCCTCTGCGT GAAGACGACG GGCCCGGTGA
       CAACTAGAGG ACTTAGACCG CGGAGACGCA CTTCTGCTGC CCGGGCCACT

8301   GCTTGAACCT GAAAGAGAGT TCGACAGAAT CAATTTCGGT GTCGTTGACG
       CGAACTTGGA CTTTCTCTCA AGCTGTCTTA GTTAAAGCCA CAGCAACTGC

8351   GCGGCCTGGC GCAAAATCTC CTGCACGTCT CCTGAGTTGT CTTGATAGGC
       CGCCGGACCG CGTTTTAGAG GACGTGCAGA GGACTCAACA GAACTATCCG

8401   GATCTCGGCC ATGAACTGCT CGATCTCTTC CTCCTGGAGA TCTCCGCGTC
       CTAGAGCCGG TACTTGACGA GCTAGAGAAG GAGGACCTCT AGAGGCGCAG

8451   CGGCTCGCTC CACGGTGGCG GCGAGGTCGT TGGAAATGCG GGCCATGAGC
       GCCGAGCGAG GTGCCACCGC CGCTCCAGCA ACCTTTACGC CCGGTACTCG

8501   TGCGAGAAGG CGTTGAGGCC TCCCTCGTTC CAGACGCGGC TGTAGACCAC
       ACGCTCTTCC GCAACTCCGG AGGGAGCAAG GTCTGCGCCG ACATCTGGTG

8551   GCCCCCTTCG GCATCGCGGG CGCGCATGAC CACCTGCGCG AGATTGAGCT
       CGGGGGGAAGC CGTAGCGCCC GCGCGTACTG GTGGACGCGC TCTAACTCGA

8601   CCACGTGCCG GGCGAAGACG GCGTAGTTTC GCAGGCGCTG AAAGAGGTAG
       GGTGCACGGC CCGCTTCTGC CGCATCAAAG CGTCCGCGAC TTTCTCCATC

8651   TTGAGGGTGG TGGCGGTGTG TTCTGCCACG AAGAAGTACA TAACCCAGCG
       AACTCCCACC ACCGCCACAC AAGACGGTGC TTCTTCATGT ATTGGGTCGC

8701   TCGCAACGTG GATTCGTTGA TATCCCCCAA GGCCTCAAGG CGCTCCATGG
       AGCGTTGCAC CTAAGCAACT ATAGGGGGTT CCGGAGTTCC GCGAGGTACC

8751   CCTCGTAGAA GTCCACGGCG AAGTTGAAAA ACTGGGAGTT GCGCGCCGAC
       GGAGCATCTT CAGGTGCCGC TTCAACTTTT TGACCCTCAA CGCGCGGCTG
```

FIG. 10A-11

```
8801   ACGGTTAACT CCTCCTCCAG AAGACGGATG AGCTCGGCGA CAGTGTCGCG
       TGCCAATTGA GGAGGAGGTC TTCTGCCTAC TCGAGCCGCT GTCACAGCGC

8851   CACCTCGCGC TCAAAGGCTA CAGGGGCCTC TTCTTCTTCT TCAATCTCCT
       GTGGAGCGCG AGTTTCCGAT GTCCCCGGAG AAGAAGAAGA AGTTAGAGGA

8901   CTTCCATAAG GGCCTCCCCT TCTTCTTCTT CTGGCGGCGG TGGGGGAGGG
       GAAGGTATTC CCGGAGGGGA AGAAGAAGAA GACCGCCGCC ACCCCCTCCC

8951   GGGACACGGC GGCGACGACG GCGCACCGGG AGGCGGTCGA CAAAGCGCTC
       CCCTGTGCCG CCGCTGCTGC CGCGTGGCCC TCCGCCAGCT GTTTCGCGAG

9001   GATCATCTCC CCGCGGCGAC GGCGCATGGT CTCGGTGACG GCGCGGCCGT
       CTAGTAGAGG GGCGCCGCTG CCGCGTACCA GAGCCACTGC CGCGCCGGCA

9051   TCTCGCGGGG GCGCAGTTGG AAGACGCCGC CCGTCATGTC CCGGTTATGG
       AGAGCGCCCC CGCGTCAACC TTCTGCGGCG GGCAGTACAG GGCCAATACC

9101   GTTGGCGGGG GGCTGCCATG CGGCAGGGAT ACGGCGCTAA CGATGCATCT
       CAACCGCCCC CCGACGGTAC GCCGTCCCTA TGCCGCGATT GCTACGTAGA

9151   CAACAATTGT TGTGTAGGTA CTCCGCCGCC GAGGGACCTG AGCGAGTCCG
       GTTGTTAACA ACACATCCAT GAGGCGGCGG CTCCCTGGAC TCGCTCAGGC

9201   CATCGACCGG ATCGGAAAAC CTCTCGAGAA AGGCGTCTAA CCAGTCACAG
       GTAGCTGGCC TAGCCTTTTG GAGAGCTCTT TCCGCAGATT GGTCAGTGTC

9251   TCGCAAGGTA GGCTGAGCAC CGTGGCGGGC GGCAGCGGGC GGCGGTCGGG
       AGCGTTCCAT CCGACTCGTG GCACCGCCCG CCGTCGCCCG CCGCCAGCCC

9301   GTTGTTTCTG GCGGAGGTGC TGCTGATGAT GTAATTAAAG TAGGCGGTCT
       CAACAAAGAC CGCCTCCACG ACGACTACTA CATTAATTTC ATCCGCCAGA

9351   TGAGACGGCG GATGGTCGAC AGAAGCACCA TGTCCTTGGG TCCGGCCTGC
       ACTCTGCCGC CTACCAGCTG TCTTCGTGGT ACAGGAACCC AGGCCGGACG

9401   TGAATGCGCA GGCGGTCGGC CATGCCCCAG GCTTCGTTTT GACATCGGCG
       ACTTACGCGT CCGCCAGCCG GTACGGGGTC CGAAGCAAAA CTGTAGCCGC

9451   CAGGTCTTTG TAGTAGTCTT GCATGAGCCT TTCTACCGGC ACTTCTTCTT
       GTCCAGAAAC ATCATCAGAA CGTACTCGGA AAGATGGCCG TGAAGAAGAA

9501   CTCCTTCCTC TTGTCCTGCA TCTCTTGCAT CTATCGCTGC GGCGGCGGCG
       GAGGAAGGAG AACAGGACGT AGAGAACGTA GATAGCGACG CCGCCGCCGC

9551   GAGTTTGGCC GTAGGTGGCG CCCTCTTCCT CCCATGCGTG TGACCCCGAA
       CTCAAACCGG CATCCACCGC GGGAGAAGGA GGGTACGCAC ACTGGGGCTT
```

FIG. 10A-12

```
9601   GCCCCTCATC GGCTGAAGCA GGGCTAGGTC GGCGACAACG CGCTCGGCTA
       CGGGGAGTAG CCGACTTCGT CCCGATCCAG CCGCTGTTGC GCGAGCCGAT

9651   ATATGGCCTG CTGCACCTGC GTGAGGGTAG ACTGGAAGTC ATCCATGTCC
       TATACCGGAC GACGTGGACG CACTCCCATC TGACCTTCAG TAGGTACAGG

9701   ACAAAGCGGT GGTATGCGCC CGTGTTGATG GTGTAAGTGC AGTTGGCCAT
       TGTTTCGCCA CCATACGCGG GCACAACTAC CACATTCACG TCAACCGGTA

9751   AACGGACCAG TTAACGGTCT GGTGACCCGG CTGCGAGAGC TCGGTGTACC
       TTGCCTGGTC AATTGCCAGA CCACTGGGCC GACGCTCTCG AGCCACATGG

9801   TGAGACGCGA GTAAGCCCTC GAGTCAAATA CGTAGTCGTT GCAAGTCCGC
       ACTCTGCGCT CATTCGGGAG CTCAGTTTAT GCATCAGCAA CGTTCAGGCG

9851   ACCAGGTACT GGTATCCCAC CAAAAAGTGC GGCGGCGGCT GGCGGTAGAG
       TGGTCCATGA CCATAGGGTG GTTTTTCACG CCGCCGCCGA CCGCCATCTC

9901   GGGCCAGCGT AGGGTGGCCG GGGCTCCGGG GGCGAGATCT TCCAACATAA
       CCCGGTCGCA TCCCACCGGC CCCGAGGCCC CCGCTCTAGA AGGTTGTATT

9951   GGCGATGATA TCCGTAGATG TACCTGGACA TCCAGGTGAT GCCGGCGGCG
       CCGCTACTAT AGGCATCTAC ATGGACCTGT AGGTCCACTA CGGCCGCCGC

10001  GTGGTGGAGG CGCGCGGAAA GTCGCGGACG CGGTTCCAGA TGTTGCGCAG
       CACCACCTCC GCGCGCCTTT CAGCGCCTGC GCCAAGGTCT ACAACGCGTC

10051  CGGCAAAAAG TGCTCCATGG TCGGGACGCT CTGGCCGGTC AGGCGCGCGC
       GCCGTTTTTC ACGAGGTACC AGCCCTGCGA GACCGGCCAG TCCGCGCGCG

10101  AATCGTTGAC GCTCTAGACC GTGCAAAAGG AGAGCCTGTA AGCGGGCACT
       TTAGCAACTG CGAGATCTGG CACGTTTTCC TCTCGGACAT TCGCCCGTGA

10151  CTTCCGTGGT CTGGTGGATA AATTCGCAAG GGTATCATGG CGGACGACCG
       GAAGGCACCA GACCACCTAT TTAAGCGTTC CCATAGTACC GCCTGCTGGC

10201  GGGTTCGAGC CCCGTATCCG GCCGTCCGCC GTGATCCATG CGGTTACCGC
       CCCAAGCTCG GGGCATAGGC CGGCAGGCGG CACTAGGTAC GCCAATGGCG

10251  CCGCGTGTCG AACCCAGGTG TGCGACGTCA GACAACGGGG GAGTGCTCCT
       GGCGCACAGC TTGGGTCCAC ACGCTGCAGT CTGTTGCCCC CTCACGAGGA

10301  TTTGGCTTCC TTCCAGGCGC GGCGGCTGCT GCGCTAGCTT TTTTGGCCAC
       AAACCGAAGG AAGGTCCGCG CCGCCGACGA CGCGATCGAA AAAACCGGTG

10351  TGGCCGCGCG CAGCGTAAGC GGTTAGGCTG GAAAGCGAAA GCATTAAGTG
       ACCGGCGCGC GTCGCATTCG CCAATCCGAC CTTTCGCTTT CGTAATTCAC
```

FIG. 10A-13

```
10401   GCTCGCTCCC TGTAGCCGGA GGGTTATTTT CCAAGGGTTG AGTCGCGGGA
        CGAGCGAGGG ACATCGGCCT CCCAATAAAA GGTTCCCAAC TCAGCGCCCT

10451   CCCCCGGTTC GAGTCTCGGA CCGGCCGGAC TGCGGCGAAC GGGGGTTTGC
        GGGGGCCAAG CTCAGAGCCT GGCCGGCCTG ACGCCGCTTG CCCCCAAACG

10501   CTCCCCGTCA TGCAAGACCC CGCTTGCAAA TTCCTCCGGA AACAGGGACG
        GAGGGGCAGT ACGTTCTGGG GCGAACGTTT AAGGAGGCCT TTGTCCCTGC

10551   AGCCCCTTTT TTGCTTTTCC CAGATGCATC CGGTGCTGCG GCAGATGCGC
        TCGGGGAAAA AACGAAAAGG GTCTACGTAG GCCACGACGC CGTCTACGCG

10601   CCCCCTCCTC AGCAGCGGCA AGAGCAAGAG CAGCGGCAGA CATGCAGGGC
        GGGGGAGGAG TCGTCGCCGT TCTCGTTCTC GTCGCCGTCT GTACGTCCCG

10651   ACCCTCCCCT CCTCCTACCG CGTCAGGAGG GGCGACATCC GCGGTTGACG
        TGGGAGGGGA GGAGGATGGC GCAGTCCTCC CCGCTGTAGG CGCCAACTGC

10701   CGGCAGCAGA TGGTGATTAC GAACCCCCGC GGCGCCGGGC CCGGCACTAC
        GCCGTCGTCT ACCACTAATG CTTGGGGGCG CCGCGGCCCG GGCCGTGATG

10751   CTGGACTTGG AGGAGGGCGA GGGCCTGGCG CGGCTAGGAG CGCCCTCTCC
        GACCTGAACC TCCTCCCGCT CCCGGACCGC GCCGATCCTC GCGGGAGAGG

10801   TGAGCGGCAC CCAAGGGTGC AGCTGAAGCG TGATACGCGT GAGGCGTACG
        ACTCGCCGTG GGTTCCCACG TCGACTTCGC ACTATGCGCA CTCCGCATGC

10851   TGCCGCGGCA GAACCTGTTT CGCGACCGCG AGGGAGAGGA GCCCGAGGAG
        ACGGCGCCGT CTTGGACAAA GCGCTGGCGC TCCCTCTCCT CGGGCTCCTC

10901   ATGCGGGATC GAAAGTTCCA CGCAGGGCGC GAGCTGCGGC ATGGCCTGAA
        TACGCCCTAG CTTTCAAGGT GCGTCCCGCG CTCGACGCCG TACCGGACTT

10951   TCGCGAGCGG TTGCTGCGCG AGGAGGACTT TGAGCCCGAC GCGCGAACCG
        AGCGCTCGCC AACGACGCGC TCCTCCTGAA ACTCGGGCTG CGCGCTTGGC

11001   GGATTAGTCC CGCGCGCGCA CACGTGGCGG CCGCCGACCT GGTAACCGCA
        CCTAATCAGG GCGCGCGCGT GTGCACCGCC GGCGGCTGGA CCATTGGCGT

11051   TACGAGCAGA CGGTGAACCA GGAGATTAAC TTTCAAAAAA GCTTTAACAA
        ATGCTCGTCT GCCACTTGGT CCTCTAATTG AAAGTTTTTT CGAAATTGTT

11101   CCACGTGCGT ACGCTTGTGG CGCGCGAGGA GGTGGCTATA GGACTGATGC
        GGTGCACGCA TGCGAACACC GCGCGCTCCT CCACCGATAT CCTGACTACG

11151   ATCTGTGGGA CTTTGTAAGC GCGCTGGAGC AAAACCCAAA TAGCAAGCCG
        TAGACACCCT GAAACATTCG CGCGACCTCG TTTTGGGTTT ATCGTTCGGC
```

FIG. 10A-14

```
11201   CTCATGGCGC AGCTGTTCCT TATAGTGCAG CACAGCAGGG ACAACGAGGC
        GAGTACCGCG TCGACAAGGA ATATCACGTC GTGTCGTCCC TGTTGCTCCG

11251   ATTCAGGGAT GCGCTGCTAA ACATAGTAGA GCCCGAGGGC CGCTGGCTGC
        TAAGTCCCTA CGCGACGATT TGTATCATCT CGGGCTCCCG GCGACCGACG

11301   TCGATTTGAT AAACATCCTG CAGAGCATAG TGGTGCAGGA GCGCAGCTTG
        AGCTAAACTA TTTGTAGGAC GTCTCGTATC ACCACGTCCT CGCGTCGAAC

11351   AGCCTGGCTG ACAAGGTGGC CGCCATCAAC TATTCCATGC TTAGCCTGGG
        TCGGACCGAC TGTTCCACCG GCGGTAGTTG ATAAGGTACG AATCGGACCC

11401   CAAGTTTTAC GCCCGCAAGA TATACCATAC CCCTTACGTT CCCATAGACA
        GTTCAAAATG CGGGCGTTCT ATATGGTATG GGGAATGCAA GGGTATCTGT

11451   AGGAGGTAAA GATCGAGGGG TTCTACATGC GCATGGCGCT GAAGGTGCTT
        TCCTCCATTT CTAGCTCCCC AAGATGTACG CGTACCGCGA CTTCCACGAA

11501   ACCTTGAGCG ACGACCTGGG CGTTTATCGC AACGAGCGCA TCCACAAGGC
        TGGAACTCGC TGCTGGACCC GCAAATAGCG TTGCTCGCGT AGGTGTTCCG

11551   CGTGAGCGTG AGCCGGCGGC GCGAGCTCAG CGACCGCGAG CTGATGCACA
        GCACTCGCAC TCGGCCGCCG CGCTCGAGTC GCTGGCGCTC GACTACGTGT

11601   GCCTGCAAAG GGCCCTGGCT GGCACGGGCA GCGGCGATAG AGAGGCCGAG
        CGGACGTTTC CCGGGACCGA CCGTGCCCGT CGCCGCTATC TCTCCGGCTC

11651   TCCTACTTTG ACGCGGGCGC TGACCTGCGC TGGGCCCCAA GCCGACGCGC
        AGGATGAAAC TGCGCCCGCG ACTGGACGCG ACCCGGGGTT CGGCTGCGCG

11701   CCTGGAGGCA GCTGGGGCCG GACCTGGGCT GGCGGTGGCA CCCGCGCGCG
        GGACCTCCGT CGACCCCGGC CTGGACCCGA CCGCCACCGT GGGCGCGCGC

11751   CTGGCAACGT CGGCGGCGTG GAGGAATATG ACGAGGACGA TGAGTACGAG
        GACCGTTGCA GCCGCCGCAC CTCCTTATAC TGCTCCTGCT ACTCATGCTC

11801   CCAGAGGACG GCGAGTACTA AGCGGTGATG TTTCTGATCA GATGATGCAA
        GGTCTCCTGC CGCTCATGAT TCGCCACTAC AAAGACTAGT CTACTACGTT

11851   GACGCAACGG ACCCGGCGGT GCGGGCGGCG CTGCAGAGCC AGCCGTCCGG
        CTGCGTTGCC TGGGCCGCCA CGCCCGCCGC GACGTCTCGG TCGGCAGGCC

11901   CCTTAACTCC ACGGACGACT GGCGCCAGGT CATGGACCGC ATCATGTCGC
        GGAATTGAGG TGCCTGCTGA CCGCGGTCCA GTACCTGGCG TAGTACAGCG

11951   TGACTGCGCG CAATCCTGAC GCGTTCCGGC AGCAGCCGCA GGCCAACCGG
        ACTGACGCGC GTTAGGACTG CGCAAGGCCG TCGTCGGCGT CCGGTTGGCC
```

FIG. 10A-15

```
12001   CTCTCCGCAA TTCTGGAAGC GGTGGTCCCG GCGCGCGCAA ACCCCACGCA
        GAGAGGCGTT AAGACCTTCG CCACCAGGGC CGCGCGCGTT TGGGGTGCGT

12051   CGAGAAGGTG CTGGCGATCG TAAACGCGCT GGCCGAAAAC AGGGCCATCC
        GCTCTTCCAC GACCGCTAGC ATTTGCGCGA CCGGCTTTTG TCCCGGTAGG

12101   GGCCCGACGA GGCCGGCCTG GTCTACGACG CGCTGCTTCA GCGCGTGGCT
        CCGGGCTGCT CCGGCCGGAC CAGATGCTGC GCGACGAAGT CGCGCACCGA

12151   CGTTACAACA GCGGCAACGT GCAGACCAAC CTGGACCGGC TGGTGGGGGA
        GCAATGTTGT CGCCGTTGCA CGTCTGGTTG GACCTGGCCG ACCACCCCCT

12201   TGTGCGCGAG GCCGTGGCGC AGCGTGAGCG CGCGCAGCAG CAGGGCAACC
        ACACGCGCTC CGGCACCGCG TCGCACTCGC GCGCGTCGTC GTCCCGTTGG

12251   TGGGCTCCAT GGTTGCACTA AACGCCTTCC TGAGTACACA GCCCGCCAAC
        ACCCGAGGTA CCAACGTGAT TTGCGGAAGG ACTCATGTGT CGGGCGGTTG

12301   GTGCCGCGGG GACAGGAGGA CTACACCAAC TTTGTGAGCG CACTGCGGCT
        CACGGCGCCC CTGTCCTCCT GATGTGGTTG AAACACTCGC GTGACGCCGA

12351   AATGGTGACT GAGACACCGC AAAGTGAGGT GTACCAGTCT GGGCCAGACT
        TTACCACTGA CTCTGTGGCG TTTCACTCCA CATGGTCAGA CCCGGTCTGA

12401   ATTTTTTCCA GACCAGTAGA CAAGGCCTGC AGACCGTAAA CCTGAGCCAG
        TAAAAAAGGT CTGGTCATCT GTTCCGGACG TCTGGCATTT GGACTCGGTC

12451   GCTTTCAAAA ACTTGCAGGG GCTGTGGGGG GTGCGGGCTC CCACAGGCGA
        CGAAAGTTTT TGAACGTCCC CGACACCCCC CACGCCCGAG GGTGTCCGCT

12501   CCGCGCGACC GTGTCTAGCT TGCTGACGCC CAACTCGCGC CTGTTGCTGC
        GGCGCGCTGG CACAGATCGA ACGACTGCGG GTTGAGCGCG GACAACGACG

12551   TGCTAATAGC GCCCTTCACG GACAGTGGCA GCGTGTCCCG GGACACATAC
        ACGATTATCG CGGGAAGTGC CTGTCACCGT CGCACAGGGC CCTGTGTATG

12601   CTAGGTCACT TGCTGACACT GTACCGCGAG GCCATAGGTC AGGCGCATGT
        GATCCAGTGA ACGACTGTGA CATGGCGCTC CGGTATCCAG TCCGCGTACA

12651   GGACGAGCAT ACTTTCCAGG AGATTACAAG TGTCAGCCGC GCGCTGGGGC
        CCTGCTCGTA TGAAAGGTCC TCTAATGTTC ACAGTCGGCG CGCGACCCCG

12701   AGGAGGACAC GGGCAGCCTG GAGGCAACCC TAAACTACCT GCTGACCAAC
        TCCTCCTGTG CCCGTCGGAC CTCCGTTGGG ATTTGATGGA CGACTGGTTG

12751   CGGCGGCAGA AGATCCCCTC GTTGCACAGT TTAAACAGCG AGGAGGAGCG
        GCCGCCGTCT TCTAGGGGAG CAACGTGTCA AATTTGTCGC TCCTCCTCGC
```

FIG. 10A-16

```
12801   CATTTTGCGC TACGTGCAGC AGAGCGTGAG CCTTAACCTG ATGCGCGACG
        GTAAAACGCG ATGCACGTCG TCTCGCACTC GGAATTGGAC TACGCGCTGC

12851   GGGTAACGCC CAGCGTGGCG CTGGACATGA CCGCGCGCAA CATGGAACCG
        CCCATTGCGG GTCGCACCGC GACCTGTACT GGCGCGCGTT GTACCTTGGC

12901   GGCATGTATG CCTCAAACCG GCCGTTTATC AACCGCCTAA TGGACTACTT
        CCGTACATAC GGAGTTTGGC CGGCAAATAG TTGGCGGATT ACCTGATGAA

12951   GCATCGCGCG GCCGCCGTGA ACCCCGAGTA TTTCACCAAT GCCATCTTGA
        CGTAGCGCGC CGGCGGCACT TGGGGCTCAT AAAGTGGTTA CGGTAGAACT

13001   ACCCGCACTG GCTACCGCCC CCTGGTTTCT ACACCGGGGG ATTCGAGGTG
        TGGGCGTGAC CGATGGCGGG GGACCAAAGA TGTGGCCCCC TAAGCTCCAC

13051   CCCGAGGGTA ACGATGGATT CCTCTGGGAC GACATAGACG ACAGCGTGTT
        GGGCTCCCAT TGCTACCTAA GGAGACCCTG CTGTATCTGC TGTCGCACAA

13101   TTCCCCGCAA CCGCAGACCC TGCTAGAGTT GCAACAGCGC GAGCAGGCAG
        AAGGGGCGTT GGCGTCTGGG ACGATCTCAA CGTTGTCGCG CTCGTCCGTC

13151   AGGCGGCGCT GCGAAAGGAA AGCTTCCGCA GGCCAAGCAG CTTGTCCGAT
        TCCGCCGCGA CGCTTTCCTT TCGAAGGCGT CCGGTTCGTC GAACAGGCTA

13201   CTAGGCGCTG CGGCCCCGCG GTCAGATGCT AGTAGCCCAT TTCCAAGCTT
        GATCCGCGAC GCCGGGGCGC CAGTCTACGA TCATCGGGTA AAGGTTCGAA

13251   GATAGGGTCT CTTACCAGCA CTCGCACCAC CCGCCCGCGC CTGCTGGGCG
        CTATCCCAGA GAATGGTCGT GAGCGTGGTG GGCGGGCGCG GACGACCCGC

13301   AGGAGGAGTA CCTAAACAAC TCGCTGCTGC AGCCGCAGCG CGAAAAAAAC
        TCCTCCTCAT GGATTTGTTG AGCGACGACG TCGGCGTCGC GCTTTTTTTG

13351   CTGCCTCCGG CATTTCCCAA CAACGGGATA GAGAGCCTAG TGGACAAGAT
        GACGGAGGCC GTAAAGGGTT GTTGCCCTAT CTCTCGGATC ACCTGTTCTA

13401   GAGTAGATGG AAGACGTACG CGCAGGAGCA CAGGGACGTG CCAGGCCCGC
        CTCATCTACC TTCTGCATGC GCGTCCTCGT GTCCCTGCAC GGTCCGGGCG

13451   GCCCGCCCAC CCGTCGTCAA AGGCACGACC GTCAGCGGGG TCTGGTGTGG
        CGGGCGGGTG GGCAGCAGTT TCCGTGCTGG CAGTCGCCCC AGACCACACC

13501   GAGGACGATG ACTCGGCAGA CGACAGCAGC GTCCTGGATT TGGGAGGGAG
        CTCCTGCTAC TGAGCCGTCT GCTGTCGTCG CAGGACCTAA ACCCTCCCTC

13551   TGGCAACCCG TTTGCGCACC TTCGCCCCAG GCTGGGGAGA ATGTTTTAAA
        ACCGTTGGGC AAACGCGTGG AAGCGGGGTC CGACCCCTCT TACAAAATTT
```

FIG. 10A-17

```
13601   AAAAAAAAAA GCATGATGCA AAATAAAAAA CTCACCAAGG CCATGGCACC
        TTTTTTTTTT CGTACTACGT TTTATTTTTT GAGTGGTTCC GGTACCGTGG

13651   GAGCGTTGGT TTTCTTGTAT TCCCCTTAGT ATGCGGCGCG CGGCGATGTA
        CTCGCAACCA AAAGAACATA AGGGGAATCA TACGCCGCGC GCCGCTACAT

13701   TGAGGAAGGT CCTCCTCCCT CCTACGAGAG TGTGGTGAGC GCGGCGCCAG
        ACTCCTTCCA GGAGGAGGGA GGATGCTCTC ACACCACTCG CGCCGCGGTC

13751   TGGCGGCGGC GCTGGGTTCT CCCTTCGATG CTCCCCTGGA CCCGCCGTTT
        ACCGCCGCCG CGACCCAAGA GGGAAGCTAC GAGGGGACCT GGGCGGCAAA

13801   GTGCCTCCGC GGTACCTGCG GCCTACCGGG GGGAGAAACA GCATCCGTTA
        CACGGAGGCG CCATGGACGC CGGATGGCCC CCCTCTTTGT CGTAGGCAAT

13851   CTCTGAGTTG GCACCCCTAT TCGACACCAC CCGTGTGTAC CTGGTGGACA
        GAGACTCAAC CGTGGGGATA AGCTGTGGTG GGCACACATG GACCACCTGT

13901   ACAAGTCAAC GGATGTGGCA TCCCTGAACT ACCAGAACGA CCACAGCAAC
        TGTTCAGTTG CCTACACCGT AGGGACTTGA TGGTCTTGCT GGTGTCGTTG

13951   TTTCTGACCA CGGTCATTCA AAACAATGAC TACAGCCCGG GGGAGGCAAG
        AAAGACTGGT GCCAGTAAGT TTTGTTACTG ATGTCGGGCC CCCTCCGTTC

14001   CACACAGACC ATCAATCTTG ACGACCGGTC GCACTGGGGC GGCGACCTGA
        GTGTGTCTGG TAGTTAGAAC TGCTGGCCAG CGTGACCCCG CCGCTGGACT

14051   AAACCATCCT GCATACCAAC ATGCCAAATG TGAACGAGTT CATGTTTACC
        TTTGGTAGGA CGTATGGTTG TACGGTTTAC ACTTGCTCAA GTACAAATGG

14101   AATAAGTTTA AGGCGCGGGT GATGGTGTCG CGCTTGCCTA CTAAGGACAA
        TTATTCAAAT TCCGCGCCCA CTACCACAGC GCGAACGGAT GATTCCTGTT

14151   TCAGGTGGAG CTGAAATACG AGTGGGTGGA GTTCACGCTG CCCGAGGGCA
        AGTCCACCTC GACTTTATGC TCACCCACCT CAAGTGCGAC GGGCTCCCGT

14201   ACTACTCCGA GACCATGACC ATAGACCTTA TGAACAACGC GATCGTGGAG
        TGATGAGGCT CTGGTACTGG TATCTGGAAT ACTTGTTGCG CTAGCACCTC

14251   CACTACTTGA AAGTGGGCAG ACAGAACGGG GTTCTGGAAA GCGACATCGG
        GTGATGAACT TTCACCCGTC TGTCTTGCCC CAAGACCTTT CGCTGTAGCC

14301   GGTAAAGTTT GACACCCGCA ACTTCAGACT GGGGTTTGAC CCCGTCACTG
        CCATTTCAAA CTGTGGGCGT TGAAGTCTGA CCCCAAACTG GGGCAGTGAC

14351   GTCTTGTCAT GCCTGGGGTA TATACAAACG AAGCCTTCCA TCCAGACATC
        CAGAACAGTA CGGACCCCAT ATATGTTTGC TTCGGAAGGT AGGTCTGTAG
```

FIG. 10A-18

```
14401   ATTTTGCTGC CAGGATGCGG GGTGGACTTC ACCCACAGCC GCCTGAGCAA
        TAAAACGACG GTCCTACGCC CCACCTGAAG TGGGTGTCGG CGGACTCGTT

14451   CTTGTTGGGC ATCCGCAAGC GGCAACCCTT CCAGGAGGGC TTTAGGATCA
        GAACAACCCG TAGGCGTTCG CCGTTGGGAA GGTCCTCCCG AAATCCTAGT

14501   CCTACGATGA TCTGGAGGGT GGTAACATTC CCGCACTGTT GGATGTGGAC
        GGATGCTACT AGACCTCCCA CCATTGTAAG GGCGTGACAA CCTACACCTG

14551   GCCTACCAGG CGAGCTTGAA AGATGACACC GAACAGGGCG GGGGTGGCGC
        CGGATGGTCC GCTCGAACTT TCTACTGTGG CTTGTCCCGC CCCCACCGCG

14601   AGGCGGCAGC AACAGCAGTG GCAGCGGCGC GGAAGAGAAC TCCAACGCGG
        TCCGCCGTCG TTGTCGTCAC CGTCGCCGCG CCTTCTCTTG AGGTTGCGCC

14651   CAGCCGCGGC AATGCAGCCG GTGGAGGACA TGAACGATCA TGCCATTCGC
        GTCGGCGCCG TTACGTCGGC CACCTCCTGT ACTTGCTAGT ACGGTAAGCG

14701   GGCGACACCT TTGCCACACG GGCTGAGGAG AAGCGCGCTG AGGCCGAAGC
        CCGCTGTGGA AACGGTGTGC CCGACTCCTC TTCGCGCGAC TCCGGCTTCG

14751   AGCGGCCGAA GCTGCCGCCC CCGCTGCGCA ACCCGAGGTC GAGAAGCCTC
        TCGCCGGCTT CGACGGCGGG GGCGACGCGT TGGGCTCCAG CTCTTCGGAG

14801   AGAAGAAACC GGTGATCAAA CCCCTGACAG AGGACAGCAA GAAACGCAGT
        TCTTCTTTGG CCACTAGTTT GGGGACTGTC TCCTGTCGTT CTTTGCGTCA

14851   TACAACCTAA TAAGCAATGA CAGCACCTTC ACCCAGTACC GCAGCTGGTA
        ATGTTGGATT ATTCGTTACT GTCGTGGAAG TGGGTCATGG CGTCGACCAT

14901   CCTTGCATAC AACTACGGCG ACCCTCAGAC CGGAATCCGC TCATGGACCC
        GGAACGTATG TTGATGCCGC TGGGAGTCTG GCCTTAGGCG AGTACCTGGG

14951   TGCTTTGCAC TCCTGACGTA ACCTGCGGCT CGGAGCAGGT CTACTGGTCG
        ACGAAACGTG AGGACTGCAT TGGACGCCGA GCCTCGTCCA GATGACCAGC

15001   TTGCCAGACA TGATGCAAGA CCCCGTGACC TTCCGCTCCA CGCGCCAGAT
        AACGGTCTGT ACTACGTTCT GGGGCACTGG AAGGCGAGGT GCGCGGTCTA

15051   CAGCAACTTT CCGGTGGTGG GCGCCGAGCT GTTGCCCGTG CACTCCAAGA
        GTCGTTGAAA GGCCACCACC CGCGGCTCGA CAACGGGCAC GTGAGGTTCT

15101   GCTTCTACAA CGACCAGGCC GTCTACTCCC AACTCATCCG CCAGTTTACC
        CGAAGATGTT GCTGGTCCGG CAGATGAGGG TTGAGTAGGC GGTCAAATGG

15151   TCTCTGACCC ACGTGTTCAA TCGCTTTCCC GAGAACCAGA TTTTGGCGCG
        AGAGACTGGG TGCACAAGTT AGCGAAAGGG CTCTTGGTCT AAAACCGCGC
```

FIG. 10A-19

```
15201   CCCGCCAGCC CCCACCATCA CCACCGTCAG TGAAAACGTT CCTGCTCTCA
        GGGCGGTCGG GGGTGGTAGT GGTGGCAGTC ACTTTTGCAA GGACGAGAGT

15251   CAGATCACGG GACGCTACCG CTGCGCAACA GCATCGGAGG AGTCCAGCGA
        GTCTAGTGCC CTGCGATGGC GACGCGTTGT CGTAGCCTCC TCAGGTCGCT

15301   GTGACCATTA CTGACGCCAG ACGCCGCACC TGCCCCTACG TTTACAAGGC
        CACTGGTAAT GACTGCGGTC TGCGGCGTGG ACGGGGATGC AAATGTTCCG

15351   CCTGGGCATA GTCTCGCCGC GCGTCCTATC GAGCCGCACT TTTTGAGCAA
        GGACCCGTAT CAGAGCGGCG CGCAGGATAG CTCGGCGTGA AAAACTCGTT

15401   GCATGTCCAT CCTTATATCG CCCAGCAATA ACACAGGCTG GGGCCTGCGC
        CGTACAGGTA GGAATATAGC GGGTCGTTAT TGTGTCCGAC CCCGGACGCG

15451   TTCCCAAGCA AGATGTTTGG CGGGGCCAAG AAGCGCTCCG ACCAACACCC
        AAGGGTTCGT TCTACAAACC GCCCCGGTTC TTCGCGAGGC TGGTTGTGGG

15501   AGTGCGCGTG CGCGGGCACT ACCGCGCGCC CTGGGGCGCG CACAAACGCG
        TCACGCGCAC GCGCCCGTGA TGGCGCGCGG GACCCCGCGC GTGTTTGCGC

15551   GCCGCACTGG GCGCACCACC GTCGATGACG CCATCGACGC GGTGGTGGAG
        CGGCGTGACC CGCGTGGTGG CAGCTACTGC GGTAGCTGCG CCACCACCTC

15601   GAGGCGCGCA ACTACACGCC CACGCCGCCA CCAGTGTCCA CAGTGGACGC
        CTCCGCGCGT TGATGTGCGG GTGCGGCGGT GGTCACAGGT GTCACCTGCG

15651   GGCCATTCAG ACCGTGGTGC GCGGAGCCCG GCGCTATGCT AAAATGAAGA
        CCGGTAAGTC TGGCACCACG CGCCTCGGGC CGCGATACGA TTTTACTTCT

15701   GACGGCGGAG GCGCGTAGCA CGTCGCCACC GCCGCCGACC CGGCACTGCC
        CTGCCGCCTC CGCGCATCGT GCAGCGGTGG CGGCGGCTGG GCCGTGACGG

15751   GCCCAACGCG CGGCGGCGGC CCTGCTTAAC CGCGCACGTC GCACCGGCCG
        CGGGTTGCGC GCCGCCGCCG GGACGAATTG GCGCGTGCAG CGTGGCCGGC

15801   ACGGGCGGCC ATGCGGGCCG CTCGAAGGCT GGCCGCGGGT ATTGTCACTG
        TGCCCGCCGG TACGCCCGGC GAGCTTCCGA CCGGCGCCCA TAACAGTGAC

15851   TGCCCCCCAG GTCCAGGCGA CGAGCGGCCG CCGCAGCAGC CGCGGCCATT
        ACGGGGGGTC CAGGTCCGCT GCTCGCCGGC GGCGTCGTCG GCGCCGGTAA

15901   AGTGCTATGA CTCAGGGTCG CAGGGGCAAC GTGTATTGGG TGCGCGACTC
        TCACGATACT GAGTCCCAGC GTCCCCGTTG CACATAACCC ACGCGCTGAG

15951   GGTTAGCGGC CTGCGCGTGC CCGTGCGCAC CCGCCCCCCG CGCAACTAGA
        CCAATCGCCG GACGCGCACG GGCACGCGTG GGCGGGGGGC GCGTTGATCT
```

FIG. 10A-20

```
16001   TTGCAAGAAA AAACTACTTA GACTCGTACT GTTGTATGTA TCCAGCGGCG
        AACGTTCTTT TTTGATGAAT CTGAGCATGA CAACATACAT AGGTCGCCGC

16051   GCGGCGCGCA ACGAAGCTAT GTCCAAGCGC AAAATCAAAG AAGAGATGCT
        CGCCGCGCGT TGCTTCGATA CAGGTTCGCG TTTTAGTTTC TTCTCTACGA

16101   CCAGGTCATC GCGCCGGAGA TCTATGGCCC CCCGAAGAAG GAAGAGCAGG
        GGTCCAGTAG CGCGGCCTCT AGATACCGGG GGGCTTCTTC CTTCTCGTCC

16151   ATTACAAGCC CCGAAAGCTA AAGCGGGTCA AAAAGAAAAA GAAAGATGAT
        TAATGTTCGG GGCTTTCGAT TTCGCCCAGT TTTTCTTTTT CTTTCTACTA

16201   GATGATGAAC TTGACGACGA GGTGGAACTG CTGCACGCTA CCGCGCCCAG
        CTACTACTTG AACTGCTGCT CCACCTTGAC GACGTGCGAT GGCGCGGGTC

16251   GCGACGGGTA CAGTGGAAAG GTCGACGCGT AAAACGTGTT TTGCGACCCG
        CGCTGCCCAT GTCACCTTTC CAGCTGCGCA TTTTGCACAA AACGCTGGGC

16301   GCACCACCGT AGTCTTTACG CCCGGTGAGC GCTCCACCCG CACCTACAAG
        CGTGGTGGCA TCAGAAATGC GGGCCACTCG CGAGGTGGGC GTGGATGTTC

16351   CGCGTGTATG ATGAGGTGTA CGGCGACGAG GACCTGCTTG AGCAGGCCAA
        GCGCACATAC TACTCCACAT GCCGCTGCTC CTGGACGAAC TCGTCCGGTT

16401   CGAGCGCCTC GGGGAGTTTG CCTACGGAAA GCGGCATAAG GACATGCTGG
        GCTCGCGGAG CCCCTCAAAC GGATGCCTTT CGCCGTATTC CTGTACGACC

16451   CGTTGCCGCT GGACGAGGGC AACCCAACAC CTAGCCTAAA GCCCGTAACA
        GCAACGGCGA CCTGCTCCCG TTGGGTTGTG GATCGGATTT CGGGCATTGT

16501   CTGCAGCAGG TGCTGCCCGC GCTTGCACCG TCCGAAGAAA AGCGCGGCCT
        GACGTCGTCC ACGACGGGCG CGAACGTGGC AGGCTTCTTT TCGCGCCGGA

16551   AAAGCGCGAG TCTGGTGACT TGGCACCCAC CGTGCAGCTG ATGGTACCCA
        TTTCGCGCTC AGACCACTGA ACCGTGGGTG GCACGTCGAC TACCATGGGT

16601   AGCGCCAGCG ACTGGAAGAT GTCTTGGAAA AAATGACCGT GGAACCTGGG
        TCGCGGTCGC TGACCTTCTA CAGAACCTTT TTTACTGGCA CCTTGGACCC

16651   CTGGAGCCCG AGGTCCGCGT GCGGCCAATC AAGCAGGTGG CGCCGGGACT
        GACCTCGGGC TCCAGGCGCA CGCCGGTTAG TTCGTCCACC GCGGCCCTGA

16701   GGGCGTGCAG ACCGTGGACG TTCAGATACC CACTACCAGT AGCACCAGTA
        CCCGCACGTC TGGCACCTGC AAGTCTATGG GTGATGGTCA TCGTGGTCAT

16751   TTGCCACCGC CACAGAGGGC ATGGAGACAC AAACGTCCCC GGTTGCCTCA
        AACGGTGGCG GTGTCTCCCG TACCTCTGTG TTTGCAGGGG CCAACGGAGT
```

FIG. 10A-21

```
16801   GCGGTGGCGG ATGCCGCGGT GCAGGCGGTC GCTGCGGCCG CGTCCAAGAC
        CGCCACCGCC TACGGCGCCA CGTCCGCCAG CGACGCCGGC GCAGGTTCTG

16851   CTCTACGGAG GTGCAAACGG ACCCGTGGAT GTTTCGCGTT TCAGCCCCCC
        GAGATGCCTC CACGTTTGCC TGGGCACCTA CAAAGCGCAA AGTCGGGGGG

16901   GGCGCCCGCG CCGTTCGAGG AAGTACGGCG CCGCCAGCGC GCTACTGCCC
        CCGCGGGCGC GGCAAGCTCC TTCATGCCGC GGCGGTCGCG CGATGACGGG

16951   GAATATGCCC TACATCCTTC CATTGCGCCT ACCCCCGGCT ATCGTGGCTA
        CTTATACGGG ATGTAGGAAG GTAACGCGGA TGGGGGCCGA TAGCACCGAT

17001   CACCTACCGC CCCAGAAGAC GAGCAACTAC CCGACGCCGA ACCACCACTG
        GTGGATGGCG GGGTCTTCTG CTCGTTGATG GGCTGCGGCT TGGTGGTGAC

17051   GAACCCGCCG CCGCCGTCGC CGTCGCCAGC CCGTGCTGGC CCCGATTTCC
        CTTGGGCGGC GGCGGCAGCG GCAGCGGTCG GGCACGACCG GGGCTAAAGG

17101   GTGCGCAGGG TGGCTCGCGA AGGAGGCAGG ACCCTGGTGC TGCCAACAGC
        CACGCGTCCC ACCGAGCGCT TCCTCCGTCC TGGGACCACG ACGGTTGTCG

17151   GCGCTACCAC CCCAGCATCG TTTAAAAGCC GGTCTTTGTG GTTCTTGCAG
        CGCGATGGTG GGGTCGTAGC AAATTTTCGG CCAGAAACAC CAAGAACGTC

17201   ATATGGCCCT CACCTGCCGC CTCCGTTTCC CGGTGCCGGG ATTCCGAGGA
        TATACCGGGA GTGGACGGCG GAGGCAAAGG GCCACGGCCC TAAGGCTCCT

17251   AGAATGCACC GTAGGAGGGG CATGGCCGGC CACGGCCTGA CGGGCGGCAT
        TCTTACGTGG CATCCTCCCC GTACCGGCCG GTGCCGGACT GCCCGCCGTA

17301   GCGTCGTGCG CACCACCGGC GGCGGCGCGC GTCGCACCGT CGCATGCGCG
        CGCAGCACGC GTGGTGGCCG CCGCCGCGCG CAGCGTGGCA GCGTACGCGC

17351   GCGGTATCCT GCCCCTCCTT ATTCCACTGA TCGCCGCGGC GATTGGCGCC
        CGCCATAGGA CGGGGAGGAA TAAGGTGACT AGCGGCGCCG CTAACCGCGG

17401   GTGCCCGGAA TTGCATCCGT GGCCTTGCAG GCGCAGAGAC ACTGATTAAA
        CACGGGCCTT AACGTAGGCA CCGGAACGTC CGCGTCTCTG TGACTAATTT

17451   AACAAGTTGC ATGTGGAAAA ATCAAAATAA AAAGTCTGGA CTCTCACGCT
        TTGTTCAACG TACACCTTTT TAGTTTTATT TTTCAGACCT GAGAGTGCGA

17501   CGCTTGGTCC TGTAACTATT TTGTAGAATG GAAGACATCA ACTTTGCGTC
        GCGAACCAGG ACATTGATAA AACATCTTAC CTTCTGTAGT TGAAACGCAG

17551   TCTGGCCCCG CGACACGGCT CGCGCCCGTT CATGGGAAAC TGGCAAGATA
        AGACCGGGGC GCTGTGCCGA GCGCGGGCAA GTACCCTTTG ACCGTTCTAT
```

FIG. 10A-22

```
17601   TCGGCACCAG CAATATGAGC GGTGGCGCCT TCAGCTGGGG CTCGCTGTGG
        AGCCGTGGTC GTTATACTCG CCACCGCGGA AGTCGACCCC GAGCGACACC

17651   AGCGGCATTA AAAATTTCGG TTCCACCGTT AAGAACTATG GCAGCAAGGC
        TCGCCGTAAT TTTTAAAGCC AAGGTGGCAA TTCTTGATAC CGTCGTTCCG

17701   CTGGAACAGC AGCACAGGCC AGATGCTGAG GGATAAGTTG AAAGAGCAAA
        GACCTTGTCG TCGTGTCCGG TCTACGACTC CCTATTCAAC TTTCTCGTTT

17751   ATTTCCAACA AAAGGTGGTA GATGGCCTGG CCTCTGGCAT TAGCGGGGTG
        TAAAGGTTGT TTTCCACCAT CTACCGGACC GGAGACCGTA ATCGCCCCAC

17801   GTGGACCTGG CCAACCAGGC AGTGCAAAAT AAGATTAACA GTAAGCTTGA
        CACCTGGACC GGTTGGTCCG TCACGTTTTA TTCTAATTGT CATTCGAACT

17851   TCCCCGCCCT CCCGTAGAGG AGCCTCCACC GGCCGTGGAG ACAGTGTCTC
        AGGGGCGGGA GGGCATCTCC TCGGAGGTGG CCGGCACCTC TGTCACAGAG

17901   CAGAGGGGCG TGGCGAAAAG CGTCCGCGCC CCGACAGGGA AGAAACTCTG
        GTCTCCCCGC ACCGCTTTTC GCAGGCGCGG GGCTGTCCCT TCTTTGAGAC

17951   GTGACGCAAA TAGACGAGCC TCCCTCGTAC GAGGAGGCAC TAAAGCAAGG
        CACTGCGTTT ATCTGCTCGG AGGGAGCATG CTCCTCCGTG ATTTCGTTCC

18001   CCTGCCCACC ACCCGTCCCA TCGCGCCCAT GGCTACCGGA GTGCTGGGCC
        GGACGGGTGG TGGGCAGGGT AGCGCGGGTA CCGATGGCCT CACGACCCGG

18051   AGCACACACC CGTAACGCTG GACCTGCCTC CCCCCGCCGA CACCCAGCAG
        TCGTGTGTGG GCATTGCGAC CTGGACGGAG GGGGGCGGCT GTGGGTCGTC

18101   AAACCTGTGC TGCCAGGCCC GACCGCCGTT GTTGTAACCC GTCCTAGCCG
        TTTGGACACG ACGGTCCGGG CTGGCGGCAA CAACATTGGG CAGGATCGGC

18151   CGCGTCCCTG CGCCGCGCCG CCAGCGGTCC GCGATCGTTG CGGCCCGTAG
        GCGCAGGGAC GCGGCGCGGC GGTCGCCAGG CGCTAGCAAC GCCGGGCATC

18201   CCAGTGGCAA CTGGCAAAGC ACACTGAACA GCATCGTGGG TCTGGGGGTG
        GGTCACCGTT GACCGTTTCG TGTGACTTGT CGTAGCACCC AGACCCCCAC

18251   CAATCCCTGA AGCGCCGACG ATGCTTCTGA TAGCTAACGT GTCGTATGTG
        GTTAGGGACT TCGCGGCTGC TACGAAGACT ATCGATTGCA CAGCATACAC

18301   TGTCATGTAT GCGTCCATGT CGCCGCCAGA GGAGCTGCTG AGCCGCCGCG
        ACAGTACATA CGCAGGTACA GCGGCGGTCT CCTCGACGAC TCGGCGGCGC

18351   CGCCCGCTTT CCAAGATGGC TACCCCTTCG ATGATGCCGC AGTGGTCTTA
        GCGGGCGAAA GGTTCTACCG ATGGGGAAGC TACTACGGCG TCACCAGAAT
```

FIG. 10A-23

```
18401   CATGCACATC TCGGGCCAGG ACGCCTCGGA GTACCTGAGC CCCGGGCTGG
        GTACGTGTAG AGCCCGGTCC TGCGGAGCCT CATGGACTCG GGGCCCGACC

18451   TGCAGTTTGC CCGCGCCACC GAGACGTACT TCAGCCTGAA TAACAAGTTT
        ACGTCAAACG GGCGCGGTGG CTCTGCATGA AGTCGGACTT ATTGTTCAAA

18501   AGAAACCCCA CGGTGGCGCC TACGCACGAC GTGACCACAG ACCGGTCCCA
        TCTTTGGGGT GCCACCGCGG ATGCGTGCTG CACTGGTGTC TGGCCAGGGT

18551   GCGTTTGACG CTGCGGTTCA TCCCTGTGGA CCGTGAGGAT ACTGCGTACT
        CGCAAACTGC GACGCCAAGT AGGGACACCT GGCACTCCTA TGACGCATGA

18601   CGTACAAGGC GCGGTTCACC CTAGCTGTGG GTGATAACCG TGTGCTGGAC
        GCATGTTCCG CGCCAAGTGG GATCGACACC CACTATTGGC ACACGACCTG

18651   ATGGCTTCCA CGTACTTTGA CATCCGCGGC GTGCTGGACA GGGGCCCTAC
        TACCGAAGGT GCATGAAACT GTAGGCGCCG CACGACCTGT CCCCGGGATG

18701   TTTTAAGCCC TACTCTGGCA CTGCCTACAA CGCCCTGGCT CCCAAGGGTG
        AAAATTCGGG ATGAGACCGT GACGGATGTT GCGGGACCGA GGGTTCCCAC

18751   CCCCAAATCC TTGCGAATGG GATGAAGCTG CTACTGCTCT TGAAATAAAC
        GGGGTTTAGG AACGCTTACC CTACTTCGAC GATGACGAGA ACTTTATTTG

18801   CTAGAAGAAG AGGACGATGA CAACGAAGAC GAAGTAGACG AGCAAGCTGA
        GATCTTCTTC TCCTGCTACT GTTGCTTCTG CTTCATCTGC TCGTTCGACT

18851   GCAGCAAAAA ACTCACGTAT TTGGGCAGGC GCCTTATTCT GGTATAAATA
        CGTCGTTTTT TGAGTGCATA AACCCGTCCG CGGAATAAGA CCATATTTAT

18901   TTACAAAGGA GGGTATTCAA ATAGGTGTCG AAGGTCAAAC ACCTAAATAT
        AATGTTTCCT CCCATAAGTT TATCCACAGC TTCCAGTTTG TGGATTTATA

18951   GCCGATAAAA CATTTCAACC TGAACCTCAA ATAGGAGAAT CTCAGTGGTA
        CGGCTATTTT GTAAAGTTGG ACTTGGAGTT TATCCTCTTA GAGTCACCAT

19001   CGAAACAGAA ATTAATCATG CAGCTGGGAG AGTCCTAAAA AAGACTACCC
        GCTTTGTCTT TAATTAGTAC GTCGACCCTC TCAGGATTTT TTCTGATGGG

19051   CAATGAAACC ATGTTACGGT TCATATGCAA AACCCACAAA TGAAAATGGA
        GTTACTTTGG TACAATGCCA AGTATACGTT TTGGGTGTTT ACTTTTACCT

19101   GGGCAAGGCA TTCTTGTAAA GCAACAAAAT GGAAAGCTAG AAAGTCAAGT
        CCCGTTCCGT AAGAACATTT CGTTGTTTTA CCTTTCGATC TTTCAGTTCA

19151   GGAAATGCAA TTTTTCTCAA CTACTGAGGC AGCCGCAGGC AATGGTGATA
        CCTTTACGTT AAAAAGAGTT GATGACTCCG TCGGCGTCCG TTACCACTAT
```

FIG. 10A-24

```
19201   ACTTGACTCC TAAAGTGGTA TTGTACAGTG AAGATGTAGA TATAGAAACC
        TGAACTGAGG ATTTCACCAT AACATGTCAC TTCTACATCT ATATCTTTGG

19251   CCAGACACTC ATATTTCTTA CATGCCCACT ATTAAGGAAG GTAACTCACG
        GGTCTGTGAG TATAAAGAAT GTACGGGTGA TAATTCCTTC CATTGAGTGC

19301   AGAACTAATG GGCCAACAAT CTATGCCCAA CAGGCCTAAT TACATTGCTT
        TCTTGATTAC CCGGTTGTTA GATACGGGTT GTCCGGATTA ATGTAACGAA

19351   TTAGGGACAA TTTTATTGGT CTAATGTATT ACAACAGCAC GGGTAATATG
        AATCCCTGTT AAAATAACCA GATTACATAA TGTTGTCGTG CCCATTATAC

19401   GGTGTTCTGG CGGGCCAAGC ATCGCAGTTG AATGCTGTTG TAGATTTGCA
        CCACAAGACC GCCCGGTTCG TAGCGTCAAC TTACGACAAC ATCTAAACGT

19451   AGACAGAAAC ACAGAGCTTT CATACCAGCT TTGCTTGAT TCCATTGGTG
        TCTGTCTTTG TGTCTCGAAA GTATGGTCGA AAACGAACTA AGGTAACCAC

19501   ATAGAACCAG GTACTTTTCT ATGTGGAATC AGGCTGTTGA CAGCTATGAT
        TATCTTGGTC CATGAAAAGA TACACCTTAG TCCGACAACT GTCGATACTA

19551   CCAGATGTTA GAATTATTGA AAATCATGGA ACTGAAGATG AACTTCCAAA
        GGTCTACAAT CTTAATAACT TTTAGTACCT TGACTTCTAC TTGAAGGTTT

19601   TTACTGCTTT CCACTGGGAG GTGTGATTAA TACAGAGACT CTTACCAAGG
        AATGACGAAA GGTGACCCTC CACACTAATT ATGTCTCTGA GAATGGTTCC

19651   TAAAACCTAA AACAGGTCAG GAAAATGGAT GGGAAAAAGA TGCTACAGAA
        ATTTTGGATT TTGTCCAGTC CTTTTACCTA CCCTTTTTCT ACGATGTCTT

19701   TTTTCAGATA AAAATGAAAT AAGAGTTGGA AATAATTTTG CCATGGAAAT
        AAAAGTCTAT TTTTACTTTA TTCTCAACCT TTATTAAAAC GGTACCTTTA

19751   CAATCTAAAT GCCAACCTGT GGAGAAATTT CCTGTACTCC AACATAGCGC
        GTTAGATTTA CGGTTGGACA CCTCTTTAAA GGACATGAGG TTGTATCGCG

19801   TGTATTTGCC CGACAAGCTA AAGTACAGTC CTTCCAACGT AAAAATTTCT
        ACATAAACGG GCTGTTCGAT TTCATGTCAG GAAGGTTGCA TTTTTAAAGA

19851   GATAACCCAA ACACCTACGA CTACATGAAC AAGCGAGTGG TGGCTCCCGG
        CTATTGGGTT TGTGGATGCT GATGTACTTG TTCGCTCACC ACCGAGGGCC

19901   GCTAGTGGAC TGCTACATTA ACCTTGGAGC ACGCTGGTCC CTTGACTATA
        CGATCACCTG ACGATGTAAT TGGAACCTCG TGCGACCAGG GAACTGATAT

19951   TGGACAACGT CAACCCATTT AACCACCACC GCAATGCTGG CCTGCGCTAC
        ACCTGTTGCA GTTGGGTAAA TTGGTGGTGG CGTTACGACC GGACGCGATG
```

FIG. 10A-25

```
20001   CGCTCAATGT TGCTGGGCAA TGGTCGCTAT GTGCCCTTCC ACATCCAGGT
        GCGAGTTACA ACGACCCGTT ACCAGCGATA CACGGGAAGG TGTAGGTCCA

20051   GCCTCAGAAG TTCTTTGCCA TTAAAAACCT CCTTCTCCTG CCGGGCTCAT
        CGGAGTCTTC AAGAAACGGT AATTTTTGGA GGAAGAGGAC GGCCCGAGTA

20101   ACACCTACGA GTGGAACTTC AGGAAGGATG TTAACATGGT TCTGCAGAGC
        TGTGGATGCT CACCTTGAAG TCCTTCCTAC AATTGTACCA AGACGTCTCG

20151   TCCCTAGGAA ATGACCTAAG GGTTGACGGA GCCAGCATTA AGTTTGATAG
        AGGGATCCTT TACTGGATTC CCAACTGCCT CGGTCGTAAT TCAAACTATC

20201   CATTTGCCTT TACGCCACCT TCTTCCCCAT GGCCCACAAC ACCGCCTCCA
        GTAAACGGAA ATGCGGTGGA AGAAGGGGTA CCGGGTGTTG TGGCGGAGGT

20251   CGCTTGAGGC CATGCTTAGA AACGACACCA ACGACCAGTC CTTTAACGAC
        GCGAACTCCG GTACGAATCT TTGCTGTGGT TGCTGGTCAG GAAATTGCTG

20301   TATCTCTCCG CCGCCAACAT GCTCTACCCT ATACCCGCCA ACGCTACCAA
        ATAGAGAGGC GGCGGTTGTA CGAGATGGGA TATGGGCGGT TGCGATGGTT

20351   CGTGCCCATA TCCATCCCCT CCCGCAACTG GGCGGCTTTC CGCGGCTGGG
        GCACGGGTAT AGGTAGGGGA GGGCGTTGAC CCGCCGAAAG GCGCCGACCC

20401   CCTTCACGCG CCTTAAGACT AAGGAAACCC CATCACTGGG CTCGGGCTAC
        GGAAGTGCGC GGAATTCTGA TTCCTTTGGG GTAGTGACCC GAGCCCGATG

20451   GACCCTTATT ACACCTACTC TGGCTCTATA CCCTACCTAG ATGGAACCTT
        CTGGGAATAA TGTGGATGAG ACCGAGATAT GGGATGGATC TACCTTGGAA

20501   TTACCTCAAC CACACCTTTA AGAAGGTGGC CATTACCTTT GACTCTTCTG
        AATGGAGTTG GTGTGGAAAT TCTTCCACCG GTAATGGAAA CTGAGAAGAC

20551   TCAGCTGGCC TGGCAATGAC CGCCTGCTTA CCCCCAACGA GTTTGAAATT
        AGTCGACCGG ACCGTTACTG GCGGACGAAT GGGGGTTGCT CAAACTTTAA

20601   AAGCGCTCAG TTGACGGGGA GGGTTACAAC GTTGCCCAGT GTAACATGAC
        TTCGCGAGTC AACTGCCCCT CCCAATGTTG CAACGGGTCA CATTGTACTG

20651   CAAAGACTGG TTCCTGGTAC AAATGCTAGC TAACTATAAC ATTGGCTACC
        GTTTCTGACC AAGGACCATG TTTACGATCG ATTGATATTG TAACCGATGG

20701   AGGGCTTCTA TATCCCAGAG AGCTACAAGG ACCGCATGTA CTCCTTCTTT
        TCCCGAAGAT ATAGGGTCTC TCGATGTTCC TGGCGTACAT GAGGAAGAAA

20751   AGAAACTTCC AGCCCATGAG CCGTCAGGTG GTGGATGATA CTAAATACAA
        TCTTTGAAGG TCGGGTACTC GGCAGTCCAC CACCTACTAT GATTTATGTT
```

FIG. 10A-26

```
20801   GGACTACCAA CAGGTGGGCA TCCTACACCA ACACAACAAC TCTGGATTTG
        CCTGATGGTT GTCCACCCGT AGGATGTGGT TGTGTTGTTG AGACCTAAAC

20851   TTGGCTACCT TGCCCCCACC ATGCGCGAAG GACAGGCCTA CCCTGCTAAC
        AACCGATGGA ACGGGGGTGG TACGCGCTTC CTGTCCGGAT GGGACGATTG

20901   TTCCCCTATC CGCTTATAGG CAAGACCGCA GTTGACAGCA TTACCCAGAA
        AAGGGGATAG GCGAATATCC GTTCTGGCGT CAACTGTCGT AATGGGTCTT

20951   AAAGTTTCTT TGCGATCGCA CCCTTTGGCG CATCCCATTC TCCAGTAACT
        TTTCAAAGAA ACGCTAGCGT GGGAAACCGC GTAGGGTAAG AGGTCATTGA

21001   TTATGTCCAT GGGCGCACTC ACAGACCTGG GCCAAAACCT TCTCTACGCC
        AATACAGGTA CCCGCGTGAG TGTCTGGACC CGGTTTTGGA AGAGATGCGG

21051   AACTCCGCCC ACGCGCTAGA CATGACTTTT GAGGTGGATC CCATGGACGA
        TTGAGGCGGG TGCGCGATCT GTACTGAAAA CTCCACCTAG GGTACCTGCT

21101   GCCCACCCTT CTTTATGTTT TGTTTGAAGT CTTTGACGTG GTCCGTGTGC
        CGGGTGGGAA GAAATACAAA ACAAACTTCA GAAACTGCAC CAGGCACACG

21151   ACCAGCCGCA CCGCGGCGTC ATCGAAACCG TGTACCTGCG CACGCCCTTC
        TGGTCGGCGT GGCGCCGCAG TAGCTTTGGC ACATGGACGC GTGCGGGAAG

21201   TCGGCCGGCA ACGCCACAAC ATAAAGAAGC AAGCAACATC AACAACAGCT
        AGCCGGCCGT TGCGGTGTTG TATTTCTTCG TTCGTTGTAG TTGTTGTCGA

21251   GCCGCCATGG GCTCCAGTGA GCAGGAACTG AAAGCCATTG TCAAAGATCT
        CGGCGGTACC CGAGGTCACT CGTCCTTGAC TTTCGGTAAC AGTTTCTAGA

21301   TGGTTGTGGG CCATATTTTT TGGGCACCTA TGACAAGCGC TTTCCAGGCT
        ACCAACACCC GGTATAAAAA ACCCGTGGAT ACTGTTCGCG AAAGGTCCGA

21351   TTGTTTCTCC ACACAAGCTC GCCTGCGCCA TAGTCAATAC GGCCGGTCGC
        AACAAAGAGG TGTGTTCGAG CGGACGCGGT ATCAGTTATG CCGGCCAGCG

21401   GAGACTGGGG GCGTACACTG GATGGCCTTT GCCTGGAACC CGCACTCAAA
        CTCTGACCCC CGCATGTGAC CTACCGGAAA CGGACCTTGG GCGTGAGTTT

21451   AACATGCTAC CTCTTTGAGC CCTTTGGCTT TTCTGACCAG CGACTCAAGC
        TTGTACGATG GAGAAACTCG GGAAACCGAA AAGACTGGTC GCTGAGTTCG

21501   AGGTTTACCA GTTTGAGTAC GAGTCACTCC TGCGCCGTAG CGCCATTGCT
        TCCAAATGGT CAAACTCATG CTCAGTGAGG ACGCGGCATC GCGGTAACGA

21551   TCTTCCCCCG ACCGCTGTAT AACGCTGGAA AAGTCCACCC AAAGCGTACA
        AGAAGGGGGC TGGCGACATA TTGCGACCTT TTCAGGTGGG TTTCGCATGT
```

FIG. 10A-27

```
21601   GGGGCCCAAC TCGGCCGCCT GTGGACTATT CTGCTGCATG TTTCTCCACG
        CCCCGGGTTG AGCCGGCGGA CACCTGATAA GACGACGTAC AAAGAGGTGC

21651   CCTTTGCCAA CTGGCCCCAA ACTCCCATGG ATCACAACCC CACCATGAAC
        GGAAACGGTT GACCGGGGTT TGAGGGTACC TAGTGTTGGG GTGGTACTTG

21701   CTTATTACCG GGGTACCCAA CTCCATGCTC AACAGTCCCC AGGTACAGCC
        GAATAATGGC CCCATGGGTT GAGGTACGAG TTGTCAGGGG TCCATGTCGG

21751   CACCCTGCGT CGCAACCAGG AACAGCTCTA CAGCTTCCTG GAGCGCCACT
        GTGGGACGCA GCGTTGGTCC TTGTCGAGAT GTCGAAGGAC CTCGCGGTGA

21801   CGCCCTACTT CCGCAGCCAC AGTGCGCAGA TTAGGAGCGC CACTTCTTTT
        GCGGGATGAA GGCGTCGGTG TCACGCGTCT AATCCTCGCG GTGAAGAAAA

21851   TGTCACTTGA AAAACATGTA AAAATAATGT ACTAGAGACA CTTTCAATAA
        ACAGTGAACT TTTTGTACAT TTTTATTACA TGATCTCTGT GAAAGTTATT

21901   AGGCAAATGC TTTTATTTGT ACACTCTCGG GTGATTATTT ACCCCCACCC
        TCCGTTTACG AAAATAAACA TGTGAGAGCC CACTAATAAA TGGGGGTGGG

21951   TTGCCGTCTG CGCCGTTTAA AAATCAAAGG GGTTCTGCCG CGCATCGCTA
        AACGGCAGAC GCGGCAAATT TTTAGTTTCC CCAAGACGGC GCGTAGCGAT

22001   TGCGCCACTG GCAGGGACAC GTTGCGATAC TGGTGTTTAG TGCTCCACTT
        ACGCGGTGAC CGTCCCTGTG CAACGCTATG ACCACAAATC ACGAGGTGAA

22051   AAACTCAGGC ACAACCATCC GCGGCAGCTC GGTGAAGTTT TCACTCCACA
        TTTGAGTCCG TGTTGGTAGG CGCCGTCGAG CCACTTCAAA AGTGAGGTGT

22101   GGCTGCGCAC CATCACCAAC GCGTTTAGCA GGTCGGGCGC CGATATCTTG
        CCGACGCGTG GTAGTGGTTG CGCAAATCGT CCAGCCCGCG GCTATAGAAC

22151   AAGTCGCAGT TGGGGCCTCC GCCCTGCGCG CGCGAGTTGC GATACACAGG
        TTCAGCGTCA ACCCCGGAGG CGGGACGCGC GCGCTCAACG CTATGTGTCC

22201   GTTGCAGCAC TGGAACACTA TCAGCGCCGG GTGGTGCACG CTGGCCAGCA
        CAACGTCGTG ACCTTGTGAT AGTCGCGGCC CACCACGTGC GACCGGTCGT

22251   CGCTCTTGTC GGAGATCAGA TCCGCGTCCA GGTCCTCCGC GTTGCTCAGG
        GCGAGAACAG CCTCTAGTCT AGGCGCAGGT CCAGGAGGCG CAACGAGTCC

22301   GCGAACGGAG TCAACTTTGG TAGCTGCCTT CCCAAAAAGG GCGCGTGCCC
        CGCTTGCCTC AGTTGAAACC ATCGACGGAA GGGTTTTTCC CGCGCACGGG

22351   AGGCTTTGAG TTGCACTCGC ACCGTAGTGG CATCAAAAGG TGACCGTGCC
        TCCGAAACTC AACGTGAGCG TGGCATCACC GTAGTTTTCC ACTGGCACGG
```

FIG. 10A-28

```
22401   CGGTCTGGGC GTTAGGATAC AGCGCCTGCA TAAAAGCCTT GATCTGCTTA
        GCCAGACCCG CAATCCTATG TCGCGGACGT ATTTTCGGAA CTAGACGAAT

22451   AAAGCCACCT GAGCCTTTGC GCCTTCAGAG AAGAACATGC CGCAAGACTT
        TTTCGGTGGA CTCGGAAACG CGGAAGTCTC TTCTTGTACG GCGTTCTGAA

22501   GCCGGAAAAC TGATTGGCCG GACAGGCCGC GTCGTGCACG CAGCACCTTG
        CGGCCTTTTG ACTAACCGGC CTGTCCGGCG CAGCACGTGC GTCGTGGAAC

22551   CGTCGGTGTT GGAGATCTGC ACCACATTTC GGCCCCACCG GTTCTTCACG
        GCAGCCACAA CCTCTAGACG TGGTGTAAAG CCGGGGTGGC CAAGAAGTGC

22601   ATCTTGGCCT TGCTAGACTG CTCCTTCAGC GCGCGCTGCC CGTTTTCGCT
        TAGAACCGGA ACGATCTGAC GAGGAAGTCG CGCGCGACGG GCAAAAGCGA

22651   CGTCACATCC ATTTCAATCA CGTGCTCCTT ATTTATCATA ATGCTTCCGT
        GCAGTGTAGG TAAAGTTAGT GCACGAGGAA TAAATAGTAT TACGAAGGCA

22701   GTAGACACTT AAGCTCGCCT TCGATCTCAG CGCAGCGGTG CAGCCACAAC
        CATCTGTGAA TTCGAGCGGA AGCTAGAGTC GCGTCGCCAC GTCGGTGTTG

22751   GCGCAGCCCG TGGGCTCGTG ATGCTTGTAG GTCACCTCTG CAAACGACTG
        CGCGTCGGGC ACCCGAGCAC TACGAACATC CAGTGGAGAC GTTTGCTGAC

22801   CAGGTACGCC TGCAGGAATC GCCCCATCAT CGTCACAAAG GTCTTGTTGC
        GTCCATGCGG ACGTCCTTAG CGGGGTAGTA GCAGTGTTTC CAGAACAACG

22851   TGGTGAAGGT CAGCTGCAAC CCGCGGTGCT CCTCGTTCAG CCAGGTCTTG
        ACCACTTCCA GTCGACGTTG GGCGCCACGA GGAGCAAGTC GGTCCAGAAC

22901   CATACGGCCG CCAGAGCTTC CACTTGGTCA GGCAGTAGTT TGAAGTTCGC
        GTATGCCGGC GGTCTCGAAG GTGAACCAGT CCGTCATCAA ACTTCAAGCG

22951   CTTTAGATCG TTATCCACGT GGTACTTGTC CATCAGCGCG CGCGCAGCCT
        GAAATCTAGC AATAGGTGCA CCATGAACAG GTAGTCGCGC GCGCGTCGGA

23001   CCATGCCCTT CTCCCACGCA GACACGATCG GCACACTCAG CGGGTTCATC
        GGTACGGGAA GAGGGTGCGT CTGTGCTAGC CGTGTGAGTC GCCCAAGTAG

23051   ACCGTAATTT CACTTTCCGC TTCGCTGGGC TCTTCCTCTT CCTCTTGCGT
        TGGCATTAAA GTGAAAGGCG AAGCGACCCG AGAAGGAGAA GGAGAACGCA

23101   CCGCATACCA CGCGCCACTG GGTCGTCTTC ATTCAGCCGC CGCACTGTGC
        GGCGTATGGT GCGCGGTGAC CCAGCAGAAG TAAGTCGGCG GCGTGACACG

23151   GCTTACCTCC TTTGCCATGC TTGATTAGCA CCGGTGGGTT GCTGAAACCC
        CGAATGGAGG AAACGGTACG AACTAATCGT GGCCACCCAA CGACTTTGGG
```

FIG. 10A-29

```
23201   ACCATTTGTA GCGCCACATC TTCTCTTTCT TCCTCGCTGT CCACGATTAC
        TGGTAAACAT CGCGGTGTAG AAGAGAAAGA AGGAGCGACA GGTGCTAATG

23251   CTCTGGTGAT GGCGGGCGCT CGGGCTTGGG AGAAGGGCGC TTCTTTTTCT
        GAGACCACTA CCGCCCGCGA GCCCGAACCC TCTTCCCGCG AAGAAAAAGA

23301   TCTTGGGCGC AATGGCCAAA TCCGCCGCCG AGGTCGATGG CCGCGGGCTG
        AGAACCCGCG TTACCGGTTT AGGCGGCGGC TCCAGCTACC GGCGCCCGAC

23351   GGTGTGCGCG GCACCAGCGC GTCTTGTGAT GAGTCTTCCT CGTCCTCGGA
        CCACACGCGC CGTGGTCGCG CAGAACACTA CTCAGAAGGA GCAGGAGCCT

23401   CTCGATACGC CGCCTCATCC GCTTTTTTGG GGGCGCCCGG GGAGGCGGCG
        GAGCTATGCG GCGGAGTAGG CGAAAAAACC CCCGCGGGCC CCTCCGCCGC

23451   GCGACGGGGA CGGGGACGAC ACGTCCTCCA TGGTTGGGGG ACGTCGCGCC
        CGCTGCCCCT GCCCCTGCTG TGCAGGAGGT ACCAACCCCC TGCAGCGCGG

23501   GCACCGCGTC CGCGCTCGGG GGTGGTTTCG CGCTGCTCCT CTTCCCGACT
        CGTGGCGCAG GCGCGAGCCC CCACCAAAGC GCGACGAGGA GAAGGGCTGA

23551   GGCCATTTCC TTCTCCTATA GGCAGAAAAA GATCATGGAG TCAGTCGAGA
        CCGGTAAAGG AAGAGGATAT CCGTCTTTTT CTAGTACCTC AGTCAGCTCT

23601   AGAAGGACAG CCTAACCGCC CCCTCTGAGT TCGCCACCAC CGCCTCCACC
        TCTTCCTGTC GGATTGGCGG GGGAGACTCA AGCGGTGGTG GCGGAGGTGG

23651   GATGCCGCCA ACGCGCCTAC CACCTTCCCC GTCGAGGCAC CCCCGCTTGA
        CTACGGCGGT TGCGCGGATG GTGGAAGGGG CAGCTCCGTG GGGGCGAACT

23701   GGAGGAGGAA GTGATTATCG AGCAGGACCC AGGTTTTGTA AGCGAAGACG
        CCTCCTCCTT CACTAATAGC TCGTCCTGGG TCCAAAACAT TCGCTTCTGC

23751   ACGAGGACCG CTCAGTACCA ACAGAGGATA AAAAGCAAGA CCAGGACAAC
        TGCTCCTGGC GAGTCATGGT TGTCTCCTAT TTTTCGTTCT GGTCCTGTTG

23801   GCAGAGGCAA ACGAGGAACA AGTCGGGCGG GGGGACGAAA GGCATGGCGA
        CGTCTCCGTT TGCTCCTTGT TCAGCCCGCC CCCCTGCTTT CCGTACCGCT

23851   CTACCTAGAT GTGGGAGACG ACGTGCTGTT GAAGCATCTG CAGCGCCAGT
        GATGGATCTA CACCCTCTGC TGCACGACAA CTTCGTAGAC GTCGCGGTCA

23901   GCGCCATTAT CTGCGACGCG TTGCAAGAGC GCAGCGATGT GCCCCTCGCC
        CGCGGTAATA GACGCTGCGC AACGTTCTCG CGTCGCTACA CGGGGAGCGG

23951   ATAGCGGATG TCAGCCTTGC CTACGAACGC CACCTATTCT CACCGCGCGT
        TATCGCCTAC AGTCGGAACG GATGCTTGCG GTGGATAAGA GTGGCGCGCA
```

FIG. 10A-30

```
24001   ACCCCCCAAA CGCCAAGAAA ACGGCACATG CGAGCCCAAC CCGCGCCTCA
        TGGGGGGTTT GCGGTTCTTT TGCCGTGTAC GCTCGGGTTG GGCGCGGAGT

24051   ACTTCTACCC CGTATTTGCC GTGCCAGAGG TGCTTGCCAC CTATCACATC
        TGAAGATGGG GCATAAACGG CACGGTCTCC ACGAACGGTG GATAGTGTAG

24101   TTTTTCCAAA ACTGCAAGAT ACCCCTATCC TGCCGTGCCA ACCGCAGCCG
        AAAAAGGTTT TGACGTTCTA TGGGGATAGG ACGGCACGGT TGGCGTCGGC

24151   AGCGGACAAG CAGCTGGCCT TGCGGCAGGG CGCTGTCATA CCTGATATCG
        TCGCCTGTTC GTCGACCGGA ACGCCGTCCC GCGACAGTAT GGACTATAGC

24201   CCTCGCTCAA CGAAGTGCCA AAAATCTTTG AGGGTCTTGG ACGCGACGAG
        GGAGCGAGTT GCTTCACGGT TTTTAGAAAC TCCCAGAACC TGCGCTGCTC

24251   AAGCGCGCGG CAAACGCTCT GCAACAGGAA AACAGCGAAA ATGAAAGTCA
        TTCGCGCGCC GTTTGCGAGA CGTTGTCCTT TTGTCGCTTT TACTTTCAGT

24301   CTCTGGAGTG TTGGTGGAAC TCGAGGGTGA CAACGCGCGC CTAGCCGTAC
        GAGACCTCAC AACCACCTTG AGCTCCCACT GTTGCGCGCG GATCGGCATG

24351   TAAAACGCAG CATCGAGGTC ACCCACTTTG CCTACCCGGC ACTTAACCTA
        ATTTTGCGTC GTAGCTCCAG TGGGTGAAAC GGATGGGCCG TGAATTGGAT

24401   CCCCCCAAGG TCATGAGCAC AGTCATGAGT GAGCTGATCG TGCGCCGTGC
        GGGGGGTTCC AGTACTCGTG TCAGTACTCA CTCGACTAGC ACGCGGCACG

24451   GCAGCCCCTG GAGAGGGATG CAAATTTGCA AGAACAAACA GAGGAGGGCC
        CGTCGGGGAC CTCTCCCTAC GTTTAAACGT TCTTGTTTGT CTCCTCCCGG

24501   TACCCGCAGT TGGCGACGAG CAGCTAGCGC GCTGGCTTCA AACGCGCGAG
        ATGGGCGTCA ACCGCTGCTC GTCGATCGCG CGACCGAAGT TTGCGCGCTC

24551   CCTGCCGACT TGGAGGAGCG ACGCAAACTA ATGATGGCCG CAGTGCTCGT
        GGACGGCTGA ACCTCCTCGC TGCGTTTGAT TACTACCGGC GTCACGAGCA

24601   TACCGTGGAG CTTGAGTGCA TGCAGCGGTT CTTTGCTGAC CCGGAGATGC
        ATGGCACCTC GAACTCACGT ACGTCGCCAA GAAACGACTG GGCCTCTACG

24651   AGCGCAAGCT AGAGGAAACA TTGCACTACA CCTTTCGACA GGGCTACGTA
        TCGCGTTCGA TCTCCTTTGT AACGTGATGT GGAAAGCTGT CCCGATGCAT

24701   CGCCAGGCCT GCAAGATCTC CAACGTGGAG CTCTGCAACC TGGTCTCCTA
        GCGGTCCGGA CGTTCTAGAG GTTGCACCTC GAGACGTTGG ACCAGAGGAT

24751   CCTTGGAATT TTGCACGAAA ACCGCCTTGG GCAAAACGTG CTTCATTCCA
        GGAACCTTAA AACGTGCTTT TGGCGGAACC CGTTTTGCAC GAAGTAAGGT
```

FIG. 10A-31

```
24801   CGCTCAAGGG CGAGGCGCGC CGCGACTACG TCCGCGACTG CGTTTACTTA
        GCGAGTTCCC GCTCCGCGCG GCGCTGATGC AGGCGCTGAC GCAAATGAAT

24851   TTTCTATGCT ACACCTGGCA GACGGCCATG GGCGTTTGGC AGCAGTGCTT
        AAAGATACGA TGTGGACCGT CTGCCGGTAC CCGCAAACCG TCGTCACGAA

24901   GGAGGAGTGC AACCTCAAGG AGCTGCAGAA ACTGCTAAAG CAAAACTTGA
        CCTCCTCACG TTGGAGTTCC TCGACGTCTT TGACGATTTC GTTTTGAACT

24951   AGGACCTATG GACGGCCTTC AACGAGCGCT CCGTGGCCGC GCACCTGGCG
        TCCTGGATAC CTGCCGGAAG TTGCTCGCGA GGCACCGGCG CGTGGACCGC

25001   GACATCATTT TCCCCGAACG CCTGCTTAAA ACCCTGCAAC AGGGTCTGCC
        CTGTAGTAAA AGGGGCTTGC GGACGAATTT TGGGACGTTG TCCCAGACGG

25051   AGACTTCACC AGTCAAAGCA TGTTGCAGAA CTTTAGGAAC TTTATCCTAG
        TCTGAAGTGG TCAGTTTCGT ACAACGTCTT GAAATCCTTG AAATAGGATC

25101   AGCGCTCAGG AATCTTGCCC GCCACCTGCT GTGCACTTCC TAGCGACTTT
        TCGCGAGTCC TTAGAACGGG CGGTGGACGA CACGTGAAGG ATCGCTGAAA

25151   GTGCCCATTA AGTACCGCGA ATGCCCTCCG CCGCTTTGGG GCCACTGCTA
        CACGGGTAAT TCATGGCGCT TACGGGAGGC GGCGAAACCC CGGTGACGAT

25201   CCTTCTGCAG CTAGCCAACT ACCTTGCCTA CCACTCTGAC ATAATGGAAG
        GGAAGACGTC GATCGGTTGA TGGAACGGAT GGTGAGACTG TATTACCTTC

25251   ACGTGAGCGG TGACGGTCTA CTGGAGTGTC ACTGTCGCTG CAACCTATGC
        TGCACTCGCC ACTGCCAGAT GACCTCACAG TGACAGCGAC GTTGGATACG

25301   ACCCCGCACC GCTCCCTGGT TTGCAATTCG CAGCTGCTTA ACGAAAGTCA
        TGGGGCGTGG CGAGGGACCA AACGTTAAGC GTCGACGAAT TGCTTTCAGT

25351   AATTATCGGT ACCTTTGAGC TGCAGGGTCC CTCGCCTGAC GAAAAGTCCG
        TTAATAGCCA TGGAAACTCG ACGTCCCAGG GAGCGGACTG CTTTTCAGGC

25401   CGGCTCCGGG GTTGAAACTC ACTCCGGGGC TGTGGACGTC GGCTTACCTT
        GCCGAGGCCC CAACTTTGAG TGAGGCCCCG ACACCTGCAG CCGAATGGAA

25451   CGCAAATTTG TACCTGAGGA CTACCACGCC CACGAGATTA GGTTCTACGA
        GCGTTTAAAC ATGGACTCCT GATGGTGCGG GTGCTCTAAT CCAAGATGCT

25501   AGACCAATCC CGCCCGCCTA ATGCGGAGCT TACCGCCTGC GTCATTACCC
        TCTGGTTAGG GCGGGCGGAT TACGCCTCGA ATGGCGGACG CAGTAATGGG

25551   AGGGCCACAT TCTTGGCCAA TTGCAAGCCA TCAACAAAGC CCGCCAAGAG
        TCCCGGTGTA AGAACCGGTT AACGTTCGGT AGTTGTTTCG GGCGGTTCTC
```

FIG. 10A-32

```
25601   TTTCTGCTAC GAAAGGGACG GGGGGTTTAC TTGGACCCCC AGTCCGGCGA
        AAAGACGATG CTTTCCCTGC CCCCCAAATG AACCTGGGGG TCAGGCCGCT

25651   GGAGCTCAAC CCAATCCCCC CGCCGCCGCA GCCCTATCAG CAGCAGCCGC
        CCTCGAGTTG GGTTAGGGGG GCGGCGGCGT CGGGATAGTC GTCGTCGGCG

25701   GGGCCCTTGC TTCCCAGGAT GGCACCCAAA AAGAAGCTGC AGCTGCCGCC
        CCCGGGAACG AAGGGTCCTA CCGTGGGTTT TTCTTCGACG TCGACGGCGG

25751   GCCACCCACG GACGAGGAGG AATACTGGGA CAGTCAGGCA GAGGAGGTTT
        CGGTGGGTGC CTGCTCCTCC TTATGACCCT GTCAGTCCGT CTCCTCCAAA

25801   TGGACGAGGA GGAGGAGGAC ATGATGGAAG ACTGGGAGAG CCTAGACGAG
        ACCTGCTCCT CCTCCTCCTG TACTACCTTC TGACCCTCTC GGATCTGCTC

25851   GAAGCTTCCG AGGTCGAAGA GGTGTCAGAC GAAACACCGT CACCCTCGGT
        CTTCGAAGGC TCCAGCTTCT CCACAGTCTG CTTTGTGGCA GTGGGAGCCA

25901   CGCATTCCCC TCGCCGGCGC CCCAGAAATC GGCAACCGGT TCCAGCATGG
        GCGTAAGGGG AGCGGCCGCG GGGTCTTTAG CCGTTGGCCA AGGTCGTACC

25951   CTACAACCTC CGCTCCTCAG GCGCCGCCGG CACTGCCCGT TCGCCGACCC
        GATGTTGGAG GCGAGGAGTC CGCGGCGGCC GTGACGGGCA AGCGGCTGGG

26001   AACCGTAGAT GGGACACCAC TGGAACCAGG GCCGGTAAGT CCAAGCAGCC
        TTGGCATCTA CCCTGTGGTG ACCTTGGTCC CGGCCATTCA GGTTCGTCGG

26051   GCCGCCGTTA GCCCAAGAGC AACAACAGCG CCAAGGCTAC CGCTCATGGC
        CGGCGGCAAT CGGGTTCTCG TTGTTGTCGC GGTTCCGATG GCGAGTACCG

26101   GCGGGCACAA GAACGCCATA GTTGCTTGCT TGCAAGACTG TGGGGGCAAC
        CGCCCGTGTT CTTGCGGTAT CAACGAACGA ACGTTCTGAC ACCCCCGTTG

26151   ATCTCCTTCG CCCGCCGCTT TCTTCTCTAC CATCACGGCG TGGCCTTCCC
        TAGAGGAAGC GGGCGGCGAA AGAAGAGATG GTAGTGCCGC ACCGGAAGGG

26201   CCGTAACATC CTGCATTACT ACCGTCATCT CTACAGCCCA TACTGCACCG
        GGCATTGTAG GACGTAATGA TGGCAGTAGA GATGTCGGGT ATGACGTGGC

26251   GCGGCAGCGG CAGCAACAGC AGCGGCCACA CAGAAGCAAA GGCGACCGGA
        CGCCGTCGCC GTCGTTGTCG TCGCCGGTGT GTCTTCGTTT CCGCTGGCCT

26301   TAGCAAGACT CTGACAAAGC CCAAGAAATC CACAGCGGCG GCAGCAGCAG
        ATCGTTCTGA GACTGTTTCG GGTTCTTTAG GTGTCGCCGC CGTCGTCGTC

26351   GAGGAGGAGC GCTGCGTCTG GCGCCCAACG AACCCGTATC GACCCGCGAG
        CTCCTCCTCG CGACGCAGAC CGCGGGTTGC TTGGGCATAG CTGGGCGCTC
```

FIG. 10A-33

```
26401   CTTAGAAACA GGATTTTTCC CACTCTGTAT GCTATATTTC AACAGAGCAG
        GAATCTTTGT CCTAAAAAGG GTGAGACATA CGATATAAAG TTGTCTCGTC

26451   GGGCCAAGAA CAAGAGCTGA AAATAAAAAA CAGGTCTCTG CGATCCCTCA
        CCCGGTTCTT GTTCTCGACT TTTATTTTTT GTCCAGAGAC GCTAGGGAGT

26501   CCCGCAGCTG CCTGTATCAC AAAAGCGAAG ATCAGCTTCG GCGCACGCTG
        GGGCGTCGAC GGACATAGTG TTTTCGCTTC TAGTCGAAGC CGCGTGCGAC

26551   GAAGACGCGG AGGCTCTCTT CAGTAAATAC TGCGCGCTGA CTCTTAAGGA
        CTTCTGCGCC TCCGAGAGAA GTCATTTATG ACGCGCGACT GAGAATTCCT

26601   CTAGTTTCGC GCCCTTTCTC AAATTTAAGC GCGAAAACTA CGTCATCTCC
        GATCAAAGCG CGGGAAAGAG TTTAAATTCG CGCTTTTGAT GCAGTAGAGG

26651   AGCGGCCACA CCCGGCGCCA GCACCTGTTG TCAGCGCCAT TATGAGCAAG
        TCGCCGGTGT GGGCCGCGGT CGTGGACAAC AGTCGCGGTA ATACTCGTTC

26701   GAAATTCCCA CGCCCTACAT GTGGAGTTAC CAGCCACAAA TGGGACTTGC
        CTTTAAGGGT GCGGGATGTA CACCTCAATG GTCGGTGTTT ACCCTGAACG

26751   GGCTGGAGCT GCCCAAGACT ACTCAACCCG AATAAACTAC ATGAGCGCGG
        CCGACCTCGA CGGGTTCTGA TGAGTTGGGC TTATTTGATG TACTCGCGCC

26801   GACCCCACAT GATATCCCGG GTCAACGGAA TACGCGCCCA CCGAAACCGA
        CTGGGGTGTA CTATAGGGCC CAGTTGCCTT ATGCGCGGGT GGCTTTGGCT

26851   ATTCTCCTGG AACAGGCGGC TATTACCACC ACACCTCGTA ATAACCTTAA
        TAAGAGGACC TTGTCCGCCG ATAATGGTGG TGTGGAGCAT TATTGGAATT

26901   TCCCCGTAGT TGGCCCGCTG CCCTGGTGTA CCAGGAAAGT CCCGCTCCCA
        AGGGGCATCA ACCGGGCGAC GGGACCACAT GGTCCTTTCA GGGCGAGGGT

26951   CCACTGTGGT ACTTCCCAGA GACGCCCAGG CCGAAGTTCA GATGACTAAC
        GGTGACACCA TGAAGGGTCT CTGCGGGTCC GGCTTCAAGT CTACTGATTG

27001   TCAGGGGCGC AGCTTGCGGG CGGCTTTCGT CACAGGGTGC GGTCGCCCGG
        AGTCCCCGCG TCGAACGCCC GCCGAAAGCA GTGTCCCACG CCAGCGGGCC

27051   GCAGGGTATA ACTCACCTGA CAATCAGAGG GCGAGGTATT CAGCTCAACG
        CGTCCCATAT TGAGTGGACT GTTAGTCTCC CGCTCCATAA GTCGAGTTGC

27101   ACGAGTCGGT GAGCTCCTCG CTTGGTCTCC GTCCGGACGG GACATTTCAG
        TGCTCAGCCA CTCGAGGAGC GAACCAGAGG CAGGCCTGCC CTGTAAAGTC

27151   ATCGGCGGCG CCGGCCGCTC TTCATTCACG CCTCGTCAGG CAATCCTAAC
        TAGCCGCCGC GGCCGGCGAG AAGTAAGTGC GGAGCAGTCC GTTAGGATTG
```

FIG. 10A-34

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27201   TCTGCAGACC TCGTCCTCTG AGCCGCGCTC TGGAGGCATT GGAACTCTGC
        AGACGTCTGG AGCAGGAGAC TCGGCGCGAG ACCTCCGTAA CCTTGAGACG

27251   AATTTATTGA GGAGTTTGTG CCATCGGTCT ACTTTAACCC CTTCTCGGGA
        TTAAATAACT CCTCAAACAC GGTAGCCAGA TGAAATTGGG GAAGAGCCCT

27301   CCTCCCGGCC ACTATCCGGA TCAATTTATT CCTAACTTTG ACGCGGTAAA
        GGAGGGCCGG TGATAGGCCT AGTTAAATAA GGATTGAAAC TGCGCCATTT

27351   GGACTCGGCG GACGGCTACG ACTGAATGTT AAGTGGAGAG GCAGAGCAAC
        CCTGAGCCGC CTGCCGATGC TGACTTACAA TTCACCTCTC CGTCTCGTTG

27401   TGCGCCTGAA ACACCTGGTC CACTGTCGCC GCCACAAGTG CTTTGCCCGC
        ACGCGGACTT TGTGGACCAG GTGACAGCGG CGGTGTTCAC GAAACGGGCG

27451   GACTCCGGTG AGTTTTGCTA CTTTGAATTG CCCGAGGATC ATATCGAGGG
        CTGAGGCCAC TCAAAACGAT GAAACTTAAC GGGCTCCTAG TATAGCTCCC

27501   CCCGGCGCAC GGCGTCCGGC TTACCGCCCA GGGAGAGCTT GCCCGTAGCC
        GGGCCGCGTG CCGCAGGCCG AATGGCGGGT CCCTCTCGAA CGGGCATCGG

27551   TGATTCGGGA GTTTACCCAG CGCCCCCTGC TAGTTGAGCG GGACAGGGGA
        ACTAAGCCCT CAAATGGGTC GCGGGGGACG ATCAACTCGC CCTGTCCCCT

27601   CCCTGTGTTC TCACTGTGAT TTGCAACTGT CCTAACCCTG GATTACATCA
        GGGACACAAG AGTGACACTA AACGTTGACA GGATTGGGAC CTAATGTAGT

27651   AGATCTTTGT TGCCATCTCT GTGCTGAGTA TAATAAATAC AGAAATTAAA
        TCTAGAAACA ACGGTAGAGA CACGACTCAT ATTATTTATG TCTTTAATTT

27701   ATATACTGGG GCTCCTATCG CCATCCTGTA AACGCCACCG TCTTCACCCG
        TATATGACCC CGAGGATAGC GGTAGGACAT TTGCGGTGGC AGAAGTGGGC

27751   CCCAAGCAAA CCAAGGCGAA CCTTACCTGG TACTTTTAAC ATCTCTCCCT
        GGGTTCGTTT GGTTCCGCTT GGAATGGACC ATGAAAATTG TAGAGAGGGA

27801   CTGTGATTTA CAACAGTTTC AACCCAGACG GAGTGAGTCT ACGAGAGAAC
        GACACTAAAT GTTGTCAAAG TTGGGTCTGC CTCACTCAGA TGCTCTCTTG

27851   CTCTCCGAGC TCAGCTACTC CATCAGAAAA AACACCACCC TCCTTACCTG
        GAGAGGCTCG AGTCGATGAG GTAGTCTTTT TTGTGGTGGG AGGAATGGAC

27901   CCGGGAACGT ACGAGTGCGT CACCGGCCGC TGCACCACAC CTACCGCCTG
        GGCCCTTGCA TGCTCACGCA GTGGCCGGCG ACGTGGTGTG GATGGCGGAC

27951   ACCGTAAACC AGACTTTTTC CGGACAGACC TCAATAACTC TGTTTACCAG
        TGGCATTTGG TCTGAAAAAG GCCTGTCTGG AGTTATTGAG ACAAATGGTC
```

FIG. 10A-35

```
28001   AACAGGAGGT GAGCTTAGAA AACCCTTAGG GTATTAGGCC AAAGGCGCAG
        TTGTCCTCCA CTCGAATCTT TTGGGAATCC CATAATCCGG TTTCCGCGTC

28051   CTACTGTGGG GTTTATGAAC AATTCAAGCA ACTCTACGGG CTATTCTAAT
        GATGACACCC CAAATACTTG TTAAGTTCGT TGAGATGCCC GATAAGATTA

28101   TCAGGTTTCT CTAGAATCGG GGTTGGGGTT ATTCTCTGTC TTGTGATTCT
        AGTCCAAAGA GATCTTAGCC CCAACCCCAA TAAGAGACAG AACACTAAGA

28151   CTTTATTCTT ATACTAACGC TTCTCTGCCT AAGGCTCGCC GCCTGCTGTG
        GAAATAAGAA TATGATTGCG AAGAGACGGA TTCCGAGCGG CGGACGACAC

28201   TGCACATTTG CATTTATTGT CAGCTTTTTA AACGCTGGGG TCGCCACCCA
        ACGTGTAAAC GTAAATAACA GTCGAAAAAT TTGCGACCCC AGCGGTGGGT

28251   AGATGATTAG GTACATAATC CTAGGTTTAC TCACCCTTGC GTCAGCCCAC
        TCTACTAATC CATGTATTAG GATCCAAATG AGTGGGAACG CAGTCGGGTG

28301   GGTACCACCC AAAAGGTGGA TTTTAAGGAG CCAGCCTGTA ATGTTACATT
        CCATGGTGGG TTTTCCACCT AAAATTCCTC GGTCGGACAT TACAATGTAA

28351   CGCAGCTGAA GCTAATGAGT GCACCACTCT TATAAAATGC ACCACAGAAC
        GCGTCGACTT CGATTACTCA CGTGGTGAGA ATATTTTACG TGGTGTCTTG

28401   ATGAAAAGCT GCTTATTCGC CACAAAAACA AAATTGGCAA GTATGCTGTT
        TACTTTTCGA CGAATAAGCG GTGTTTTTGT TTTAACCGTT CATACGACAA

28451   TATGCTATTT GGCAGCCAGG TGACACTACA GAGTATAATG TTACAGTTTT
        ATACGATAAA CCGTCGGTCC ACTGTGATGT CTCATATTAC AATGTCAAAA

28501   CCAGGGTAAA AGTCATAAAA CTTTTATGTA TACTTTTCCA TTTTATGAAA
        GGTCCCATTT TCAGTATTTT GAAAATACAT ATGAAAAGGT AAAATACTTT

28551   TGTGCGACAT TACCATGTAC ATGAGCAAAC AGTATAAGTT GTGGCCCCCA
        ACACGCTGTA ATGGTACATG TACTCGTTTG TCATATTCAA CACCGGGGGT

28601   CAAAATTGTG TGGAAAACAC TGGCACTTTC TGCTGCACTG CTATGCTAAT
        GTTTTAACAC ACCTTTTGTG ACCGTGAAAG ACGACGTGAC GATACGATTA

28651   TACAGTGCTC GCTTTGGTCT GTACCCTACT CTATATTAAA TACAAAAGCA
        ATGTCACGAG CGAAACCAGA CATGGGATGA GATATAATTT ATGTTTTCGT

28701   GACGCAGCTT TATTGAGGAA AAGAAAATGC CTTAATTTAC TAAGTTACAA
        CTGCGTCGAA ATAACTCCTT TTCTTTTACG GAATTAAATG ATTCAATGTT

28751   AGCTAATGTC ACCACTAACT GCTTTACTCG CTGCTTGCAA AACAAATTCA
        TCGATTACAG TGGTGATTGA CGAAATGAGC GACGAACGTT TTGTTTAAGT
```

FIG. 10A-36

```
28801   AAAAGTTAGC ATTATAATTA GAATAGGATT TAAACCCCCC GGTCATTTCC
        TTTTCAATCG TAATATTAAT CTTATCCTAA ATTTGGGGGG CCAGTAAAGG

28851   TGCTCAATAC CATTCCCCTG AACAATTGAC TCTATGTGGG ATATGCTCCA
        ACGAGTTATG GTAAGGGGAC TTGTTAACTG AGATACACCC TATACGAGGT

28901   GCGCTACAAC CTTGAAGTCA GGCTTCCTGG ATGTCAGCAT CTGACTTTGG
        CGCGATGTTG GAACTTCAGT CCGAAGGACC TACAGTCGTA GACTGAAACC

28951   CCAGCACCTG TCCCGCGGAT TTGTTCCAGT CCAACTACAG CGACCCACCC
        GGTCGTGGAC AGGGCGCCTA AACAAGGTCA GGTTGATGTC GCTGGGTGGG

29001   TAACAGAGAT GACCAACACA ACCAACGCGG CCGCCGCTAC CGGACTTACA
        ATTGTCTCTA CTGGTTGTGT TGGTTGCGCC GGCGGCGATG GCCTGAATGT

29051   TCTACCACAA ATACACCCCA AGTTTCTGCC TTTGTCAATA ACTGGGATAA
        AGATGGTGTT TATGTGGGGT TCAAAGACGG AAACAGTTAT TGACCCTATT

29101   CTTGGGCATG TGGTGGTTCT CCATAGCGCT TATGTTTGTA TGCCTTATTA
        GAACCCGTAC ACCACCAAGA GGTATCGCGA ATACAAACAT ACGGAATAAT

29151   TTATGTGGCT CATCTGCTGC CTAAAGCGCA AACGCGCCCG ACCACCCATC
        AATACACCGA GTAGACGACG GATTTCGCGT TTGCGCGGGC TGGTGGGTAG

29201   TATAGTCCCA TCATTGTGCT ACACCCAAAC AATGATGGAA TCCATAGATT
        ATATCAGGGT AGTAACACGA TGTGGGTTTG TTACTACCTT AGGTATCTAA

29251   GGACGGACTG AAACACATGT TCTTTTCTCT TACAGTATGA TTAAATGAGA
        CCTGCCTGAC TTTGTGTACA AGAAAAGAGA ATGTCATACT AATTTACTCT

29301   CATGATTCCT CGAGTTTTTA TATTACTGAC CCTTGTTGCG CTTTTTTGTG
        GTACTAAGGA GCTCAAAAAT ATAATGACTG GGAACAACGC GAAAAAACAC

29351   CGTGCTCCAC ATTGGCTGCG GTTTCTCACA TCGAAGTAGA CTGCATTCCA
        GCACGAGGTG TAACCGACGC CAAAGAGTGT AGCTTCATCT GACGTAAGGT

29401   GCCTTCACAG TCTATTTGCT TTACGGATTT GTCACCCTCA CGCTCATCTG
        CGGAAGTGTC AGATAAACGA AATGCCTAAA CAGTGGGAGT GCGAGTAGAC

29451   CAGCCTCATC ACTGTGGTCA TCGCCTTTAT CCAGTGCATT GACTGGGTCT
        GTCGGAGTAG TGACACCAGT AGCGGAAATA GGTCACGTAA CTGACCCAGA

29501   GTGTGCGCTT TGCATATCTC AGACACCATC CCCAGTACAG GGACAGGACT
        CACACGCGAA ACGTATAGAG TCTGTGGTAG GGGTCATGTC CCTGTCCTGA

29551   ATAGCTGAGC TTCTTAGAAT TCTTTAATTA TGAAATTTAC TGTGACTTTT
        TATCGACTCG AAGAATCTTA AGAAATTAAT ACTTTAAATG ACACTGAAAA
```

FIG. 10A-37

```
29601   CTGCTGATTA TTTGCACCCT ATCTGCGTTT TGTTCCCCGA CCTCCAAGCC
        GACGACTAAT AAACGTGGGA TAGACGCAAA ACAAGGGGCT GGAGGTTCGG

29651   TCAAAGACAT ATATCATGCA GATTCACTCG TATATGGAAT ATTCCAAGTT
        AGTTTCTGTA TATAGTACGT CTAAGTGAGC ATATACCTTA TAAGGTTCAA

29701   GCTACAATGA AAAAAGCGAT CTTTCCGAAG CCTGGTTATA TGCAATCATC
        CGATGTTACT TTTTTCGCTA GAAAGGCTTC GGACCAATAT ACGTTAGTAG

29751   TCTGTTATGG TGTTCTGCAG TACCATCTTA GCCCTAGCTA TATATCCCTA
        AGACAATACC ACAAGACGTC ATGGTAGAAT CGGGATCGAT ATATAGGGAT

29801   CCTTGACATT GGCTGGAACG CAATAGATGC CATGAACCAC CCAACTTTCC
        GGAACTGTAA CCGACCTTGC GTTATCTACG GTACTTGGTG GGTTGAAAGG

29851   CCGCGCCCGC TATGCTTCCA CTGCAACAAG TTGTTGCCGG CGGCTTTGTC
        GGCGCGGGCG ATACGAAGGT GACGTTGTTC AACAACGGCC GCCGAAACAG

29901   CCAGCCAATC AGCCTCGCCC ACCTTCTCCC ACCCCCACTG AAATCAGCTA
        GGTCGGTTAG TCGGAGCGGG TGGAAGAGGG TGGGGGTGAC TTTAGTCGAT

29951   CTTTAATCTA ACAGGAGGAG ATGACTGACA CCCTAGATCT AGAAATGGAC
        GAAATTAGAT TGTCCTCCTC TACTGACTGT GGGATCTAGA TCTTTACCTG

30001   GGAATTATTA CAGAGCAGCG CCTGCTAGAA AGACGCAGGG CAGCGGCCGA
        CCTTAATAAT GTCTCGTCGC GGACGATCTT TCTGCGTCCC GTCGCCGGCT

30051   GCAACAGCGC ATGAATCAAG AGCTCCAAGA CATGGTTAAC TTGCACCAGT
        CGTTGTCGCG TACTTAGTTC TCGAGGTTCT GTACCAATTG AACGTGGTCA

30101   GCAAAAGGGG TATCTTTTGT CTCGTAAAGC AGGCCAAAGT CACCTACGAC
        CGTTTTCCCC ATAGAAAACA GAGCATTTCG TCCGGTTTCA GTGGATGCTG

30151   AGTAATACCA CCGGACACCG CCTTAGCTAC AAGTTGCCAA CCAAGCGTCA
        TCATTATGGT GGCCTGTGGC GGAATCGATG TTCAACGGTT GGTTCGCAGT

30201   GAAATTGGTG GTCATGGTGG GAGAAAAGCC CATTACCATA ACTCAGCACT
        CTTTAACCAC CAGTACCACC CTCTTTTCGG GTAATGGTAT TGAGTCGTGA

30251   CGGTAGAAAC CGAAGGCTGC ATTCACTCAC CTTGTCAAGG ACCTGAGGAT
        GCCATCTTTG GCTTCCGACG TAAGTGAGTG GAACAGTTCC TGGACTCCTA

30301   CTCTGCACCC TTATTAAGAC CCTGTGCGGT CTCAAAGATC TTATTCCCTT
        GAGACGTGGG AATAATTCTG GGACACGCCA GAGTTTCTAG AATAAGGGAA

30351   TAACTAATAA AAAAAAATAA TAAAGCATCA CTTACTTAAA ATCAGTTAGC
        ATTGATTATT TTTTTTTATT ATTTCGTAGT GAATGAATTT TAGTCAATCG
```

FIG. 10A-38

```
30401   AAATTTCTGT CCAGTTTATT CAGCAGCACC TCCTTGCCCT CCTCCCAGCT
        TTTAAAGACA GGTCAAATAA GTCGTCGTGG AGGAACGGGA GGAGGGTCGA

30451   CTGGTATTGC AGCTTCCTCC TGGCTGCAAA CTTTCTCCAC AATCTAAATG
        GACCATAACG TCGAAGGAGG ACCGACGTTT GAAAGAGGTG TTAGATTTAC

30501   GAATGTCAGT TTCCTCCTGT TCCTGTCCAT CCGCACCCAC TATCTTCATG
        CTTACAGTCA AAGGAGGACA AGGACAGGTA GGCGTGGGTG ATAGAAGTAC

30551   TTGTTGCAGA TGAAGCGCGC AAGACCGTCT GAAGATACCT TCAACCCCGT
        AACAACGTCT ACTTCGCGCG TTCTGGCAGA CTTCTATGGA AGTTGGGGCA

30601   GTATCCATAT GACACGGAAA CCGGTCCTCC AACTGTGCCT TTTCTTACTC
        CATAGGTATA CTGTGCCTTT GGCCAGGAGG TTGACACGGA AAAGAATGAG

30651   CTCCCTTTGT ATCCCCCAAT GGGTTTCAAG AGAGTCCCCC TGGGGTACTC
        GAGGGAAACA TAGGGGGTTA CCCAAAGTTC TCTCAGGGGG ACCCCATGAG

30701   TCTTTGCGCC TATCCGAACC TCTAGTTACC TCCAATGGCA TGCTTGCGCT
        AGAAACGCGG ATAGGCTTGG AGATCAATGG AGGTTACCGT ACGAACGCGA

30751   CAAAATGGGC AACGGCCTCT CTCTGGACGA GGCCGGCAAC CTTACCTCCC
        GTTTTACCCG TTGCCGGAGA GAGACCTGCT CCGGCCGTTG GAATGGAGGG

30801   AAAATGTAAC CACTGTGAGC CCACCTCTCA AAAAAACCAA GTCAAACATA
        TTTTACATTG GTGACACTCG GGTGGAGAGT TTTTTTGGTT CAGTTTGTAT

30851   AACCTGGAAA TATCTGCACC CCTCACAGTT ACCTCAGAAG CCCTAACTGT
        TTGGACCTTT ATAGACGTGG GGAGTGTCAA TGGAGTCTTC GGGATTGACA

30901   GGCTGCCGCC GCACCTCTAA TGGTCGCGGG CAACACACTC ACCATGCAAT
        CCGACGGCGG CGTGGAGATT ACCAGCGCCC GTTGTGTGAG TGGTACGTTA

30951   CACAGGCCCC GCTAACCGTG CACGACTCCA AACTTAGCAT TGCCACCCAA
        GTGTCCGGGG CGATTGGCAC GTGCTGAGGT TTGAATCGTA ACGGTGGGTT

31001   GGACCCCTCA CAGTGTCAGA AGGAAAGCTA GCCCTGCAAA CATCAGGCCC
        CCTGGGGAGT GTCACAGTCT TCCTTTCGAT CGGGACGTTT GTAGTCCGGG

31051   CCTCACCACC ACCGATAGCA GTACCCTTAC TATCACTGCC TCACCCCCTT
        GGAGTGGTGG TGGCTATCGT CATGGGAATG ATAGTGACGG AGTGGGGGAA

31101   TAACTACTGC CACTGGTAGC TTGGGCATTG ACTTGAAAGA GCCCATTTAT
        ATTGATGACG GTGACCATCG AACCCGTAAC TGAACTTTCT CGGGTAAATA

31151   ACACAAAATG GAAAACTAGG ACTAAAGTAC GGGGCTCCTT TGCATGTAAC
        TGTGTTTTAC CTTTTGATCC TGATTTCATG CCCCGAGGAA ACGTACATTG
```

FIG. 10A-39

```
31201   AGACGACCTA AACACTTTGA CCGTAGCAAC TGGTCCAGGT GTGACTATTA
        TCTGCTGGAT TTGTGAAACT GGCATCGTTG ACCAGGTCCA CACTGATAAT

31251   ATAATACTTC CTTGCAAACT AAAGTTACTG GAGCCTTGGG TTTTGATTCA
        TATTATGAAG GAACGTTTGA TTTCAATGAC CTCGGAACCC AAAACTAAGT

31301   CAAGGCAATA TGCAACTTAA TGTAGCAGGA GGACTAAGGA TTGATTCTCA
        GTTCCGTTAT ACGTTGAATT ACATCGTCCT CCTGATTCCT AACTAAGAGT

31351   AAACAGACGC CTTATACTTG ATGTTAGTTA TCCGTTTGAT GCTCAAAACC
        TTTGTCTGCG GAATATGAAC TACAATCAAT AGGCAAACTA CGAGTTTTGG

31401   AACTAAATCT AAGACTAGGA CAGGGCCCTC TTTTTATAAA CTCAGCCCAC
        TTGATTTAGA TTCTGATCCT GTCCCGGGAG AAAAATATTT GAGTCGGGTG

31451   AACTTGGATA TTAACTACAA CAAAGGCCTT TACTTGTTTA CAGCTTCAAA
        TTGAACCTAT AATTGATGTT GTTTCCGGAA ATGAACAAAT GTCGAAGTTT

31501   CAATTCCAAA AAGCTTGAGG TTAACCTAAG CACTGCCAAG GGGTTGATGT
        GTTAAGGTTT TTCGAACTCC AATTGGATTC GTGACGGTTC CCCAACTACA

31551   TTGACGCTAC AGCCATAGCC ATTAATGCAG GAGATGGGCT TGAATTTGGT
        AACTGCGATG TCGGTATCGG TAATTACGTC CTCTACCCGA ACTTAAACCA

31601   TCACCTAATG CACCAAACAC AAATCCCCTC AAAACAAAAA TTGGCCATGG
        AGTGGATTAC GTGGTTTGTG TTTAGGGGAG TTTTGTTTTT AACCGGTACC

31651   CCTAGAATTT GATTCAAACA AGGCTATGGT TCCTAAACTA GGAACTGGCC
        GGATCTTAAA CTAAGTTTGT TCCGATACCA AGGATTTGAT CCTTGACCGG

31701   TTAGTTTTGA CAGCACAGGT GCCATTACAG TAGGAAACAA AAATAATGAT
        AATCAAAACT GTCGTGTCCA CGGTAATGTC ATCCTTTGTT TTTATTACTA

31751   AAGCTAACTT TGTGGACCAC ACCAGCTCCA TCTCCTAACT GTAGACTAAA
        TTCGATTGAA ACACCTGGTG TGGTCGAGGT AGAGGATTGA CATCTGATTT

31801   TGCAGAGAAA GATGCTAAAC TCACTTTGGT CTTAACAAAA TGTGGCAGTC
        ACGTCTCTTT CTACGATTTG AGTGAAACCA GAATTGTTTT ACACCGTCAG

31851   AAATACTTGC TACAGTTTCA GTTTTGGCTG TTAAAGGCAG TTTGGCTCCA
        TTTATGAACG ATGTCAAAGT CAAAACCGAC AATTTCCGTC AAACCGAGGT

31901   ATATCTGGAA CAGTTCAAAG TGCTCATCTT ATTATAAGAT TTGACGAAAA
        TATAGACCTT GTCAAGTTTC ACGAGTAGAA TAATATTCTA AACTGCTTTT

31951   TGGAGTGCTA CTAAACAATT CCTTCCTGGA CCCAGAATAT TGGAACTTTA
        ACCTCACGAT GATTTGTTAA GGAAGGACCT GGGTCTTATA ACCTTGAAAT
```

FIG. 10A-40

```
32001   GAAATGGAGA TCTTACTGAA GGCACAGCCT ATACAAACGC TGTTGGATTT
        CTTTACCTCT AGAATGACTT CCGTGTCGGA TATGTTTGCG ACAACCTAAA

32051   ATGCCTAACC TATCAGCTTA TCCAAAATCT CACGGTAAAA CTGCCAAAAG
        TACGGATTGG ATAGTCGAAT AGGTTTTAGA GTGCCATTTT GACGGTTTTC

32101   TAACATTGTC AGTCAAGTTT ACTTAAACGG AGACAAAACT AAACCTGTAA
        ATTGTAACAG TCAGTTCAAA TGAATTTGCC TCTGTTTTGA TTTGGACATT

32151   CACTAACCAT TACACTAAAC GGTACACAGG AAACAGGAGA CACAACTCCA
        GTGATTGGTA ATGTGATTTG CCATGTGTCC TTTGTCCTCT GTGTTGAGGT

32201   AGTGCATACT CTATGTCATT TTCATGGGAC TGGTCTGGCC ACAACTACAT
        TCACGTATGA GATACAGTAA AAGTACCCTG ACCAGACCGG TGTTGATGTA

32251   TAATGAAATA TTTGCCACAT CCTCTTACAC TTTTTCATAC ATTGCCCAAG
        ATTACTTTAT AAACGGTGTA GGAGAATGTG AAAAAGTATG TAACGGGTTC

32301   AATAAAGAAT CGTTTGTGTT ATGTTTCAAC GTGTTTATTT TTCAATTGCA
        TTATTTCTTA GCAAACACAA TACAAAGTTG CACAAATAAA AAGTTAACGT

32351   GAAAATTTCA AGTCATTTTT CATTCAGTAG TATAGCCCCA CCACCACATA
        CTTTTAAAGT TCAGTAAAAA GTAAGTCATC ATATCGGGGT GGTGGTGTAT

32401   GCTTATACAG ATCACCGTAC CTTAATCAAA CTCACAGAAC CCTAGTATTC
        CGAATATGTC TAGTGGCATG GAATTAGTTT GAGTGTCTTG GGATCATAAG

32451   AACCTGCCAC CTCCCTCCCA ACACACAGAG TACACAGTCC TTTCTCCCCG
        TTGGACGGTG GAGGGAGGGT TGTGTGTCTC ATGTGTCAGG AAAGAGGGGC

32501   GCTGGCCTTA AAAAGCATCA TATCATGGGT AACAGACATA TTCTTAGGTG
        CGACCGGAAT TTTTCGTAGT ATAGTACCCA TTGTCTGTAT AAGAATCCAC

32551   TTATATTCCA CACGGTTTCC TGTCGAGCCA AACGCTCATC AGTGATATTA
        AATATAAGGT GTGCCAAAGG ACAGCTCGGT TTGCGAGTAG TCACTATAAT

32601   ATAAACTCCC CGGGCAGCTC ACTTAAGTTC ATGTCGCTGT CCAGCTGCTG
        TATTTGAGGG GCCCGTCGAG TGAATTCAAG TACAGCGACA GGTCGACGAC

32651   AGCCACAGGC TGCTGTCCAA CTTGCGGTTG CTTAACGGGC GGCGAAGGAG
        TCGGTGTCCG ACGACAGGTT GAACGCCAAC GAATTGCCCG CCGCTTCCTC

32701   AAGTCCACGC CTACATGGGG GTAGAGTCAT AATCGTGCAT CAGGATAGGG
        TTCAGGTGCG GATGTACCCC CATCTCAGTA TTAGCACGTA GTCCTATCCC

32751   CGGTGGTGCT GCAGCAGCGC GCGAATAAAC TGCTGCCGCC GCCGCTCCGT
        GCCACCACGA CGTCGTCGCG CGCTTATTTG ACGACGGCGG CGGCGAGGCA
```

FIG. 10A-41

```
32801   CCTGCAGGAA TACAACATGG CAGTGGTCTC CTCAGCGATG ATTCGCACCG
        GGACGTCCTT ATGTTGTACC GTCACCAGAG GAGTCGCTAC TAAGCGTGGC

32851   CCCGCAGCAT AAGGCGCCTT GTCCTCCGGG CACAGCAGCG CACCCTGATC
        GGGCGTCGTA TTCCGCGGAA CAGGAGGCCC GTGTCGTCGC GTGGGACTAG

32901   TCACTTAAAT CAGCACAGTA ACTGCAGCAC AGCACCACAA TATTGTTCAA
        AGTGAATTTA GTCGTGTCAT TGACGTCGTG TCGTGGTGTT ATAACAAGTT

32951   AATCCCACAG TGCAAGGCGC TGTATCCAAA GCTCATGGCG GGGACCACAG
        TTAGGGTGTC ACGTTCCGCG ACATAGGTTT CGAGTACCGC CCCTGGTGTC

33001   AACCCACGTG GCCATCATAC CACAAGCGCA GGTAGATTAA GTGGCGACCC
        TTGGGTGCAC CGGTAGTATG GTGTTCGCGT CCATCTAATT CACCGCTGGG

33051   CTCATAAACA CGCTGGACAT AAACATTACC TCTTTTGGCA TGTTGTAATT
        GAGTATTTGT GCGACCTGTA TTTGTAATGG AGAAAACCGT ACAACATTAA

33101   CACCACCTCC CGGTACCATA TAAACCTCTG ATTAAACATG GCGCCATCCA
        GTGGTGGAGG GCCATGGTAT ATTTGGAGAC TAATTTGTAC CGCGGTAGGT

33151   CCACCATCCT AAACCAGCTG GCCAAAACCT GCCCGCCGGC TATACACTGC
        GGTGGTAGGA TTTGGTCGAC CGGTTTTGGA CGGGCGGCCG ATATGTGACG

33201   AGGGAACCGG GACTGGAACA ATGACAGTGG AGAGCCCAGG ACTCGTAACC
        TCCCTTGGCC CTGACCTTGT TACTGTCACC TCTCGGGTCC TGAGCATTGG

33251   ATGGATCATC ATGCTCGTCA TGATATCAAT GTTGGCACAA CACAGGCACA
        TACCTAGTAG TACGAGCAGT ACTATAGTTA CAACCGTGTT GTGTCCGTGT

33301   CGTGCATACA CTTCCTCAGG ATTACAAGCT CCTCCCGCGT TAGAACCATA
        GCACGTATGT GAAGGAGTCC TAATGTTCGA GGAGGGCGCA ATCTTGGTAT

33351   TCCCAGGGAA CAACCCATTC CTGAATCAGC GTAAATCCCA CACTGCAGGG
        AGGGTCCCTT GTTGGGTAAG GACTTAGTCG CATTTAGGGT GTGACGTCCC

33401   AAGACCTCGC ACGTAACTCA CGTTGTGCAT TGTCAAAGTG TTACATTCGG
        TTCTGGAGCG TGCATTGAGT GCAACACGTA ACAGTTTCAC AATGTAAGCC

33451   GCAGCAGCGG ATGATCCTCC AGTATGGTAG CGCGGGTTTC TGTCTCAAAA
        CGTCGTCGCC TACTAGGAGG TCATACCATC GCGCCCAAAG ACAGAGTTTT

33501   GGAGGTAGAC GATCCCTACT GTACGGAGTG CGCCGAGACA ACCGAGATCG
        CCTCCATCTG CTAGGGATGA CATGCCTCAC GCGGCTCTGT TGGCTCTAGC

33551   TGTTGGTCGT AGTGTCATGC CAAATGGAAC GCCGGACGTA GTCATATTTC
        ACAACCAGCA TCACAGTACG GTTTACCTTG CGGCCTGCAT CAGTATAAAG
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FIG. 10A-42

```
33601   CTGAAGCAAA ACCAGGTGCG GGCGTGACAA ACAGATCTGC GTCTCCGGTC
        GACTTCGTTT TGGTCCACGC CCGCACTGTT TGTCTAGACG CAGAGGCCAG

33651   TCGCCGCTTA GATCGCTCTG TGTAGTAGTT GTAGTATATC CACTCTCTCA
        AGCGGCGAAT CTAGCGAGAC ACATCATCAA CATCATATAG GTGAGAGAGT

33701   AAGCATCCAG GCGCCCCCTG GCTTCGGGTT CTATGTAAAC TCCTTCATGC
        TTCGTAGGTC CGCGGGGGAC CGAAGCCCAA GATACATTTG AGGAAGTACG

33751   GCCGCTGCCC TGATAACATC CACCACCGCA GAATAAGCCA CACCCAGCCA
        CGGCGACGGG ACTATTGTAG GTGGTGGCGT CTTATTCGGT GTGGGTCGGT

33801   ACCTACACAT TCGTTCTGCG AGTCACACAC GGGAGGAGCG GGAAGAGCTG
        TGGATGTGTA AGCAAGACGC TCAGTGTGTG CCCTCCTCGC CCTTCTCGAC

33851   GAAGAACCAT GTTTTTTTTT TTATTCCAAA AGATTATCCA AAACCTCAAA
        CTTCTTGGTA CAAAAAAAAA AATAAGGTTT TCTAATAGGT TTTGGAGTTT

33901   ATGAAGATCT ATTAAGTGAA CGCGCTCCCC TCCGGTGGCG TGGTCAAACT
        TACTTCTAGA TAATTCACTT GCGCGAGGGG AGGCCACCGC ACCAGTTTGA

33951   CTACAGCCAA AGAACAGATA ATGGCATTTG TAAGATGTTG CACAATGGCT
        GATGTCGGTT TCTTGTCTAT TACCGTAAAC ATTCTACAAC GTGTTACCGA

34001   TCCAAAAGGC AAACGGCCCT CACGTCCAAG TGGACGTAAA GGCTAAACCC
        AGGTTTTCCG TTTGCCGGGA GTGCAGGTTC ACCTGCATTT CCGATTTGGG

34051   TTCAGGGTGA ATCTCCTCTA TAAACATTCC AGCACCTTCA ACCATGCCCA
        AAGTCCCACT TAGAGGAGAT ATTTGTAAGG TCGTGGAAGT TGGTACGGGT

34101   AATAATTCTC ATCTCGCCAC CTTCTCAATA TATCTCTAAG CAAATCCCGA
        TTATTAAGAG TAGAGCGGTG GAAGAGTTAT ATAGAGATTC GTTTAGGGCT

34151   ATATTAAGTC CGGCCATTGT AAAAATCTGC TCCAGAGCGC CCTCCACCTT
        TATAATTCAG GCCGGTAACA TTTTTAGACG AGGTCTCGCG GGAGGTGGAA

34201   CAGCCTCAAG CAGCGAATCA TGATTGCAAA AATTCAGGTT CCTCACAGAC
        GTCGGAGTTC GTCGCTTAGT ACTAACGTTT TTAAGTCCAA GGAGTGTCTG

34251   CTGTATAAGA TTCAAAAGCG GAACATTAAC AAAAATACCG CGATCCCGTA
        GACATATTCT AAGTTTTCGC CTTGTAATTG TTTTTATGGC GCTAGGGCAT

34301   GGTCCCTTCG CAGGGCCAGC TGAACATAAT CGTGCAGGTC TGCACGGACC
        CCAGGGAAGC GTCCCGGTCG ACTTGTATTA GCACGTCCAG ACGTGCCTGG

34351   AGCGCGGCCA CTTCCCCGCC AGGAACCATG ACAAAAGAAC CCACACTGAT
        TCGCGCCGGT GAAGGGGCGG TCCTTGGTAC TGTTTTCTTG GGTGTGACTA
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FIG. 10A-43

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34401   TATGACACGC ATACTCGGAG CTATGCTAAC CAGCGTAGCC CCGATGTAAG
        ATACTGTGCG TATGAGCCTC GATACGATTG GTCGCATCGG GGCTACATTC

34451   CTTGTTGCAT GGGCGGCGAT ATAAAATGCA AGGTGCTGCT CAAAAAATCA
        GAACAACGTA CCCGCCGCTA TATTTTACGT TCCACGACGA GTTTTTTAGT

34501   GGCAAAGCCT CGCGCAAAAA AGAAAGCACA TCGTAGTCAT GCTCATGCAG
        CCGTTTCGGA GCGCGTTTTT TCTTTCGTGT AGCATCAGTA CGAGTACGTC

34551   ATAAAGGCAG GTAAGCTCCG GAACCACCAC AGAAAAAGAC ACCATTTTTC
        TATTTCCGTC CATTCGAGGC CTTGGTGGTG TCTTTTTCTG TGGTAAAAAG

34601   TCTCAAACAT GTCTGCGGGT TTCTGCATAA ACACAAAATA AAATAACAAA
        AGAGTTTGTA CAGACGCCCA AAGACGTATT TGTGTTTTAT TTTATTGTTT

34651   AAAACATTTA AACATTAGAA GCCTGTCTTA CAACAGGAAA AACAACCCTT
        TTTTGTAAAT TTGTAATCTT CGGACAGAAT GTTGTCCTTT TTGTTGGGAA

34701   ATAAGCATAA GACGGACTAC GGCCATGCCG GCGTGACCGT AAAAAAACTG
        TATTCGTATT CTGCCTGATG CCGGTACGGC CGCACTGGCA TTTTTTTGAC

34751   GTCACCGTGA TTAAAAAGCA CCACCGACAG CTCCTCGGTC ATGTCCGGAG
        CAGTGGCACT AATTTTTCGT GGTGGCTGTC GAGGAGCCAG TACAGGCCTC

34801   TCATAATGTA AGACTCGGTA AACACATCAG GTTGATTCAC ATCGGTCAGT
        AGTATTACAT TCTGAGCCAT TTGTGTAGTC CAACTAAGTG TAGCCAGTCA

34851   GCTAAAAAGC GACCGAAATA GCCCGGGGGA ATACATACCC GCAGGCGTAG
        CGATTTTTCG CTGGCTTTAT CGGGCCCCCT TATGTATGGG CGTCCGCATC

34901   AGACAACATT ACAGCCCCCA TAGGAGGTAT AACAAAATTA ATAGGAGAGA
        TCTGTTGTAA TGTCGGGGGT ATCCTCCATA TTGTTTTAAT TATCCTCTCT

34951   AAAACACATA AACACCTGAA AAACCCTCCT GCCTAGGCAA AATAGCACCC
        TTTTGTGTAT TTGTGGACTT TTTGGGAGGA CGGATCCGTT TTATCGTGGG

35001   TCCCGCTCCA GAACAACATA CAGCGCTTCC ACAGCGGCAG CCATAACAGT
        AGGGCGAGGT CTTGTTGTAT GTCGCGAAGG TGTCGCCGTC GGTATTGTCA

35051   CAGCCTTACC AGTAAAAAAG AAAACCTATT AAAAAAACAC CACTCGACAC
        GTCGGAATGG TCATTTTTTC TTTTGGATAA TTTTTTTGTG GTGAGCTGTG

35101   GGCACCAGCT CAATCAGTCA CAGTGTAAAA AAGGGCCAAG TGCAGAGCGA
        CCGTGGTCGA GTTAGTCAGT GTCACATTTT TTCCCGGTTC ACGTCTCGCT

35151   GTATATATAG GACTAAAAAA TGACGTAACG GTTAAAGTCC ACAAAAAACA
        CATATATATC CTGATTTTTT ACTGCATTGC CAATTTCAGG TGTTTTTTGT
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FIG. 10A-44

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35201   CCCAGAAAAC CGCACGCGAA CCTACGCCCA GAAACGAAAG CCAAAAAACC
        GGGTCTTTTG GCGTGCGCTT GGATGCGGGT CTTTGCTTTC GGTTTTTTGG

35251   CACAACTTCC TCAAATCGTC ACTTCCGTTT TCCCACGTTA CGTCACTTCC
        GTGTTGAAGG AGTTTAGCAG TGAAGGCAAA AGGGTGCAAT GCAGTGAAGG

35301   CATTTTAAGA AAACTACAAT TCCCAACACA TACAAGTTAC TCCGCCCTAA
        GTAAAATTCT TTTGATGTTA AGGGTTGTGT ATGTTCAATG AGGCGGGATT

35351   AACCTACGTC ACCCGCCCCG TTCCCACGCC CCGCGCCACG TCACAAACTC
        TTGGATGCAG TGGGCGGGGC AAGGGTGCGG GGCGCGGTGC AGTGTTTGAG

35401   CACCCCCTCA TTATCATATT GGCTTCAATC CAAAATAAGG TATATTATTG
        GTGGGGGAGT AATAGTATAA CCGAAGTTAG GTTTTATTCC ATATAATAAC

                  PacI
                ~~~~~~~~~~
35451   ATGATGTTAA TTAAGAATTC GGATCTGCGA CGCGAGGCTG GATGGCCTTC
        TACTACAATT AATTCTTAAG CCTAGACGCT GCGCTCCGAC CTACCGGAAG

35501   CCCATTATGA TTCTTCTCGC TTCCGGCGGC ATCGGGATGC CCGCGTTGCA
        GGGTAATACT AAGAAGAGCG AAGGCCGCCG TAGCCCTACG GGCGCAACGT

35551   GGCCATGCTG TCCAGGCAGG TAGATGACGA CCATCAGGGA CAGCTTCAAG
        CCGGTACGAC AGGTCCGTCC ATCTACTGCT GGTAGTCCCT GTCGAAGTTC

35601   GCCAGCAAAA GGCCAGGAAC CGTAAAAAGG CCGCGTTGCT GGCGTTTTTC
        CGGTCGTTTT CCGGTCCTTG GCATTTTTCC GGCGCAACGA CCGCAAAAAG

35651   CATAGGCTCC GCCCCCCTGA CGAGCATCAC AAAAATCGAC GCTCAAGTCA
        GTATCCGAGG CGGGGGGACT GCTCGTAGTG TTTTTAGCTG CGAGTTCAGT

35701   GAGGTGGCGA AACCCGACAG GACTATAAAG ATACCAGGCG TTTCCCCCTG
        CTCCACCGCT TTGGGCTGTC CTGATATTTC TATGGTCCGC AAAGGGGGAC

35751   GAAGCTCCCT CGTGCGCTCT CCTGTTCCGA CCCTGCCGCT TACCGGATAC
        CTTCGAGGGA GCACGCGAGA GGACAAGGCT GGGACGGCGA ATGGCCTATG

35801   CTGTCCGCCT TTCTCCCTTC GGGAAGCGTG GCGCTTTCTC ATAGCTCACG
        GACAGGCGGA AAGAGGGAAG CCCTTCGCAC CGCGAAAGAG TATCGAGTGC

35851   CTGTAGGTAT CTCAGTTCGG TGTAGGTCGT TCGCTCCAAG CTGGGCTGTG
        GACATCCATA GAGTCAAGCC ACATCCAGCA AGCGAGGTTC GACCCGACAC

35901   TGCACGAACC CCCCGTTCAG CCCGACCGCT GCGCCTTATC CGGTAACTAT
        ACGTGCTTGG GGGGCAAGTC GGGCTGGCGA CGCGGAATAG GCCATTGATA
```

FIG. 10A-45

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35951   CGTCTTGAGT CCAACCCGGT AAGACACGAC TTATCGCCAC TGGCAGCAGC
        GCAGAACTCA GGTTGGGCCA TTCTGTGCTG AATAGCGGTG ACCGTCGTCG

36001   CACTGGTAAC AGGATTAGCA GAGCGAGGTA TGTAGGCGGT GCTACAGAGT
        GTGACCATTG TCCTAATCGT CTCGCTCCAT ACATCCGCCA CGATGTCTCA

36051   TCTTGAAGTG GTGGCCTAAC TACGGCTACA CTAGAAGGAC AGTATTTGGT
        AGAACTTCAC CACCGGATTG ATGCCGATGT GATCTTCCTG TCATAAACCA

36101   ATCTGCGCTC TGCTGAAGCC AGTTACCTTC GGAAAAAGAG TTGGTAGCTC
        TAGACGCGAG ACGACTTCGG TCAATGGAAG CCTTTTTCTC AACCATCGAG

36151   TTGATCCGGC AAACAAACCA CCGCTGGTAG CGGTGGTTTT TTTGTTTGCA
        AACTAGGCCG TTTGTTTGGT GGCGACCATC GCCACCAAAA AAACAAACGT

36201   AGCAGCAGAT TACGCGCAGA AAAAAAGGAT CTCAAGAAGA TCCTTTGATC
        TCGTCGTCTA ATGCGCGTCT TTTTTTCCTA GAGTTCTTCT AGGAAACTAG

36251   TTTTCTACGG GGTCTGACGC TCAGTGGAAC GAAAACTCAC GTTAAGGGAT
        AAAAGATGCC CCAGACTGCG AGTCACCTTG CTTTTGAGTG CAATTCCCTA

36301   TTTGGTCATG AGATTATCAA AAAGGATCTT CACCTAGATC CTTTTAAATC
        AAACCAGTAC TCTAATAGTT TTTCCTAGAA GTGGATCTAG GAAAATTTAG

36351   AATCTAAAGT ATATATGAGT AAACTTGGTC TGACAGTTAC CAATGCTTAA
        TTAGATTTCA TATATACTCA TTTGAACCAG ACTGTCAATG GTTACGAATT

36401   TCAGTGAGGC ACCTATCTCA GCGATCTGTC TATTTCGTTC ATCCATAGTT
        AGTCACTCCG TGGATAGAGT CGCTAGACAG ATAAAGCAAG TAGGTATCAA

36451   GCCTGACTCC CCGTCGTGTA GATAACTACG ATACGGGAGG GCTTACCATC
        CGGACTGAGG GGCAGCACAT CTATTGATGC TATGCCCTCC CGAATGGTAG

36501   TGGCCCCAGT GCTGCAATGA TACCGCGAGA CCCACGCTCA CCGGCTCCAG
        ACCGGGGTCA CGACGTTACT ATGGCGCTCT GGGTGCGAGT GGCCGAGGTC

36551   ATTTATCAGC AATAAACCAG CCAGCCGGAA GGGCCGAGCG CAGAAGTGGT
        TAAATAGTCG TTATTTGGTC GGTCGGCCTT CCCGGCTCGC GTCTTCACCA

36601   CCTGCAACTT TATCCGCCTC CATCCAGTCT ATTAATTGTT GCCGGGAAGC
        GGACGTTGAA ATAGGCGGAG GTAGGTCAGA TAATTAACAA CGGCCCTTCG

36651   TAGAGTAAGT AGTTCGCCAG TTAATAGTTT GCGCAACGTT GTTGCCATTG
        ATCTCATTCA TCAAGCGGTC AATTATCAAA CGCGTTGCAA CAACGGTAAC

36701   CTACAGGCAT CGTGGTGTCA CGCTCGTCGT TTGGTATGGC TTCATTCAGC
        GATGTCCGTA GCACCACAGT GCGAGCAGCA AACCATACCG AAGTAAGTCG
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FIG. 10A-46

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36751   TCCGGTTCCC AACGATCAAG GCGAGTTACA TGATCCCCCA TGTTGTGCAA
        AGGCCAAGGG TTGCTAGTTC CGCTCAATGT ACTAGGGGGT ACAACACGTT

36801   AAAAGCGGTT AGCTCCTTCG GTCCTCCGAT CGTTGTCAGA AGTAAGTTGG
        TTTTCGCCAA TCGAGGAAGC CAGGAGGCTA GCAACAGTCT TCATTCAACC

36851   CCGCAGTGTT ATCACTCATG GTTATGGCAG CACTGCATAA TTCTCTTACT
        GGCGTCACAA TAGTGAGTAC CAATACCGTC GTGACGTATT AAGAGAATGA

36901   GTCATGCCAT CCGTAAGATG CTTTTCTGTG ACTGGTGAGT ACTCAACCAA
        CAGTACGGTA GGCATTCTAC GAAAAGACAC TGACCACTCA TGAGTTGGTT

36951   GTCATTCTGA GAATAGTGTA TGCGGCGACC GAGTTGCTCT TGCCCGGCGT
        CAGTAAGACT CTTATCACAT ACGCCGCTGG CTCAACGAGA ACGGGCCGCA

37001   CAACACGGGA TAATACCGCG CCACATAGCA GAACTTTAAA AGTGCTCATC
        GTTGTGCCCT ATTATGGCGC GGTGTATCGT CTTGAAATTT TCACGAGTAG

37051   ATTGGAAAAC GTTCTTCGGG GCGAAAACTC TCAAGGATCT TACCGCTGTT
        TAACCTTTTG CAAGAAGCCC CGCTTTTGAG AGTTCCTAGA ATGGCGACAA

37101   GAGATCCAGT TCGATGTAAC CCACTCGTGC ACCCAACTGA TCTTCAGCAT
        CTCTAGGTCA AGCTACATTG GGTGAGCACG TGGGTTGACT AGAAGTCGTA

37151   CTTTTACTTT CACCAGCGTT TCTGGGTGAG CAAAAACAGG AAGGCAAAAT
        GAAAATGAAA GTGGTCGCAA AGACCCACTC GTTTTTGTCC TTCCGTTTTA

37201   GCCGCAAAAA AGGGAATAAG GGCGACACGG AAATGTTGAA TACTCATACT
        CGGCGTTTTT TCCCTTATTC CCGCTGTGCC TTTACAACTT ATGAGTATGA

37251   CTTCCTTTTT CAATATTATT GAAGCATTTA TCAGGGTTAT TGTCTCATGA
        GAAGGAAAAA GTTATAATAA CTTCGTAAAT AGTCCCAATA ACAGAGTACT

37301   GCGGATACAT ATTTGAATGT ATTTAGAAAA ATAAACAAAT AGGGGTTCCG
        CGCCTATGTA TAAACTTACA TAAATCTTTT TATTTGTTTA TCCCCAAGGC

37351   CGCACATTTC CCCGAAAAGT GCCACCTGAC GTCTAAGAAA CCATTATTAT
        GCGTGTAAAG GGGCTTTTCA CGGTGGACTG CAGATTCTTT GGTAATAATA

37401   CATGACATTA ACCTATAAAA ATAGGCGTAT CACGAGGCCC TTTCGTCTTC
        GTACTGTAAT TGGATATTTT TATCCGCATA GTGCTCCGGG AAAGCAGAAG

37451   AAGAATTGGA TCCGAATTCT TAAT
        TTCTTAACCT AGGCTTAAGA ATTA
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FIG. 10A-47

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   1 catcatcaat aatatacctt atagatggaa tggtgccaat atgtaaatga ggtgatttta
  61 aaaagtgtgg gccgtgtggt gattggctgt ggggttaacg gttaaaaggg gcggcgcggc
 121 cgtgggaaaa tgacgtttta tgggggtgga gtttttttgc aagttgtcgc gggaaatgtt
 181 acgcataaaa aggcttcttt tctcacggaa ctacttagtt ttcccacggt atttaacagg
 241 aaatgaggta gttttgaccg gatgcaagtg aaaattgctg attttcgcgc gaaaactgaa
 301 tgaggaagtg tttttctgaa taatgtggta tttatggcag ggtggagtat ttgttcaggg
 361 ccaggtagac tttgacccat tacgtggagg tttcgattac cgtgtttttt acctgaattt
 421 ccgcgtaccg tgtcaaagtc ttctgttttt acgtaggtgt cagctgatcg ctagggtatt
 481 tatacctcag ggtttgtgtc aagaggccac tcttgagtgc cagcgagaag agttttctcc
 541 tctgcgccgg cagtttaata ataaaaaaat gagagatttg cgatttctgc ctcaggaaat
 601 aatctctgct gagactggaa atgaaatatt ggagcttgtg gtgcacgccc tgatgggaga
 661 cgatccggag ccacctgtgc agctttttga gcctcctacg cttcaggaac tgtatgattt
 721 agaggtagag ggatcggagg attctaatga ggaagctgtg aatggctttt ttaccgattc
 781 tatgctttta gctgctaatg aaggattaga attagatccg cctttggaca ctttcaatac
 841 tccaggggtg attgtggaaa gcggtacagg tgtaagaaaa ttacctgatt tgagttccgt
 901 ggactgtgat ttgcactgct atgaagacgg gtttcctccg agtgatgagg aggaccatga
 961 aaaggagcag tccatgcaga ctgcagcggg tgagggagtg aaggctgcca atgttggttt
1021 tcagttggat tgcccggagc ttctggacat ggctgtaagt cttgtgaatt tcacaggaaa
1081 aatactggag taaaggaact gttatgttcg cttttgttat atgaaaaccc actgccactt
1141 tatttacagt aaagtgtgtt taagttaaaa tttaaaggaa tatgctgttt ttcacatgta
1201 tattgagtgt gagttttgtg cttcttatta taagtcctgt gtctgatgct gatgaatcac
1261 catctcctga ttctactacc tcacctcctg atattcaagc acctgttcct gtggacgtgc
1321 gcaagcccat tcctgtgaag cttaagcctg ggaaacgtcc agcagtggag aaacttgagg
1381 acttgttaca gggtggggac ggacctttgg acttgagtac acggaaacgt ccaagacaat
1441 aagtgttcca tatccgtgtt tacttaaggt gacgtcaata tttgtgtgag agtgcaatgt
1501 aataaaaata tgttaactgt tcactggttt ttattgcttt ttgggcgggg actcaggtat
1561 ataagtagaa gcagacctgt gtggttagct cataggagct ggctttcatc catggaggtt
1621 tgggccattt tggaagacct taggaagact aggcaactgt tagagagcgc ttcggacgga
1681 gtctccggtt tttggagatt ctggttcgct agtgaattag ctagggtagt ttttaggata
1741 aaacaggact ataaacaaga atttgaaaag ttgttggtag attgcccagg actttttgaa
1801 gctcttaatt tgggccatca ggttcacttt aaagaaaaag ttttatcagt tttagacttt
1861 tcaaccccag gtagaactgc tgctgctgtg gcttttctta cttttatatt agataaatgg
1921 atcccgcaga ctcatttcag caggggatac gttttggatt tcatagccac agcattgtgg
1981 agaacatgga aggttcgcaa gatgaggaca atcttaggtt actggccagt gcagcctttg
2041 ggtgtagcgg gaatcctgag gcatccaccg gtcatgccag cggttctgga ggaggaacag
2101 caagaggaca acccgagagc cggcctggac cctccagtgg aggaggcgga gtagctgact
2161 tgtctcctga actgcaacgg gtgcttactg gatctacgtc cactggacgg gatagggggcg
2221 ttaagaggga gagggcatcc agtggtactg atgctagatc tgagttggct ttaagtttaa
2281 tgagtcgcag acgtcctgaa accatttggt ggcatgaggt tcagaaagag ggaagggatg
2341 aagtttctgt attgcaggag aaatattcac tggaacaggt gaaaacatgt tggttggagc
2401 cagaggatga ttgggaggtg gccattaaaa attatgccaa gatagctttg aggcctgata
2461 aacagtataa gatcagtaga cggattaata tccggaatgc ttgttacata tctggaaatg
2521 gggctgaggt ggtaatagat actcaagaca agacagttat tagatgctgc atgatggata
2581 tgtggcctgg agtagtcggt atggaagcag tcacttttgt aaatgttaag tttaggggag
2641 atggttataa tggaatagtg tttatggcca ataccaaact tatattgcat ggttgtagct
2701 tttttggttt caacaatacc tgtgtagatg cctggggaca ggttagtgta cgggggtgta
2761 gtttctatgc gtgttggatt gccacagctg gcagaaccaa gagtcaattg tctctgaaga
2821 aatgcatatt ccaaagatgt aacctgggca ttctgaatga aggcgaagca agggtccgtc
2881 actgcgcttc tacagatact ggatgtttta ttttaattaa gggaaatgcc agcgtaaagc
2941 ataacatgat ttgtggtgct tccgatgaga ggccttatca aatgctcact tgtgctggtg
3001 ggcattgtaa tatgctggct actgtgcata ttgtttccca tcaacgcaaa aaatggcctg
3061 tttttgatca caatgtgttg accaagtgca ccatgcatgc aggtgggcgt agaggaatgt
3121 ttatgcctta ccagtgtaac atgaatcatg tgaaagtgtt gttggaacca gatgccttt
3181 ccagaatgag cctaacagga atctttgaca tgaacacgca aatctggaag atcctgaggt
3241 atgatgatac gagatcgagg gtgcgcgcat gcgaatgcgg aggcaagcat gccaggttcc
3301 agccggtgtg tgtagatgtg accgaagatc tcagaccgga tcatttggtt attgcccgca
3361 ctggagcaga gttcggatcc agtggagaag aaactgacta aggtgagtat tgggaaaact
3421 ttggggtggg attttcagat ggacagattg agtaaaaatt tgtttttttct gtcttgcagc
3481 tgacatgagt ggaaatgctt cttttaaggg gggagtcttc agcccttatc tgacagggcg
3541 tctcccatcc tgggcaggag ttcgtcagaa tgttatggga tctactgtgg atggaagacc
3601 cgttcaaccc gccaattctt caacgctgac ctatgctact ttaagttctt caccttttgga
3661 cgcagctgca gccgctgccg ccgcctctgt cgccgctaac actgtgcttg gaatgggtta
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FIG. 11A-1

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3721 ctatggaagc atcgtggcta attccacttc ctctaataac ccttctacac tgactcagga
3781 caagttactt gtccttttgg cccagctgga ggctttgacc caacgtctgg gtgaactttc
3841 tcagcaggtg gccgagttgc gagtacaaac tgagtctgct gtcggcacgg caaagtctaa
3901 ataaaaaaaa ttccagaatc aatgaataaa taaacgagct tgttgttgat ttaaaatcaa
3961 gtgtttttat ttcatttttc gcgcacggta tgccctggac caccgatctc gatcattgag
4021 aactcggtgg atttttttcca gaatcctata gaggtgggat tgaatgttta gatacatggg
4081 cattaggccg tctttggggt ggagatagct ccattgaagg gattcatgct ccggggtagt
4141 gttgtaaatc acccagtcat aacaaggtcg cagtgcatgg tgttgcacaa tatcttttag
4201 aagtaggctg attgccacag ataagccctt ggtgtaggtg tttacaaacc ggttgagctg
4261 ggaggggtgc attcgaggtg aaattatgtg cattttggat tggatttta agttggcaat
4321 attgccgcca agatcccgtc ttgggttcat gttatgaagg actaccaaga cggtgtatcc
4381 ggtacattta ggaaatttat cgtgcagctt ggatggaaaa gcgtggaaaa atttggagac
4441 acccttgtgt cctccgagat tttccatgca ctcatccatg ataatagcaa tggggccgtg
4501 ggcagcggcg cgggcaaaca cgttccgtgg gtctgacaca tcatagttat gttcctgagt
4561 taaatcatca taagccattt taatgaattt ggggcggagc gtaccagatt ggggtatgaa
4621 tgttccttcg ggccccggag catagttccc ctcacagatt tgcatttccc aagctttcag
4681 ttctgagggt ggaatcatgt ccacctgggg ggctatgaag aacaccgttt cgggggcggg
4741 ggtgattagt tgggatgata gcaagtttct gagcaattga gatttgccac atccggtggg
4801 gccataaata attccgatta caggttgcag gtggtagttt agggaacggc aactgccgtc
4861 ttctcgaagc aaggggggcca cctcgttcat catttcccctt acatgcatat tttcccgcac
4921 caaatccatt aggaggcgct ctcctcctag tgatagaagt tcttgtagtg aggaaaagtt
4981 tttcagcggt tttagaccgt cagccatggg cattttggaa agagtttgct gcaaaagttc
5041 tagtctgttc cacagttcag tgatgtgttc tatggcatct cgatccagca gacctcctcg
5101 tttcgcgggt ttggacggct cctggagtag ggtatgagac gatgggcgtc cagcgctgcc
5161 agggttcggt ccttccaggg tctcagtgtt cgagtcaggg ttgtttccgt cacagtgaag
5221 gggtgtgcgc ctgcttgggc gcttgccagg gtgcgcttca gactcattct gctggtggag
5281 aacttctgtc gcttggcgcc ctgtatgtcg gccaagtagc agtttaccat gagttcgtag
5341 ttgagcgcct cggctgcgtg gcctttggcg cggagcttac ctttggaagt tttcttgcat
5401 accgggcagt ataggcattt cagcgcatac agcttgggcg caaggaaaat ggattctggg
5461 gagtatgcat ccgcgccgca ggaggcgcaa acagtttcac attccaccag ccaggttaaa
5521 tccggttcat tggggtcaaa aacaagtttt ccgccatatt ttttgatgcg tttcttacct
5581 ttggtctcca taagttcgtg tcctcgttga gtgacaaaca ggctgtccgt atctccgtag
5641 actgatttta caggcctctt ctccagtgga gtgcctcggt cttcttcgta caggaactct
5701 gaccactctg atacaaaggc gcgcgtccag gccagcacaa aggaggctat gtgggagggg
5761 tagcgatcgt tgtcaaccag ggggtccacc ttttccaaag tatgcaaaca catgtcaccc
5821 tcttcaacat ccaggaatgt gattggcttg taggtgtatt tcacgtgacc tggggtcccc
5881 gctgggggggg tataaaaggg ggcggttctt tgctcttcct cactgtcttc cggatcgctg
5941 tccaggaacg tcagctgttg gggtaggtat tccctctcga aggcgggcat gacctctgca
6001 ctcaggttgt cagtttctaa gaacgaggag gatttgatat tgacagtgcc ggttgagatg
6061 cctttcatga ggttttcgtc catttggtca gaaaacacaa ttttttttatt gtcaagtttg
6121 gtggcaaatg atccatacag ggcgttggat aaaagtttgg caatggatcg catggtttgg
6181 ttcttttcct tgtccgcgcg ctctttggcg gcgatgttga gttggacata ctcgcgtgcc
6241 aggcacttcc attcggggaa gatagttgtt aattcatctg gcacgattct cacttgccac
6301 cctcgattat gcaaggtaat taaatccaca ctggtggcca cctcgcctcg aaggggttca
6361 ttggtccaac agagcctacc tcctttccta gaacagaaag ggggaagtgg gtctagcata
6421 agttcatcgg gagggtctgc atccatggta aagattcccg gaagtaaatc cttatcaaaa
6481 tagctgatgg gagtggggtc atctaaggcc atttgccatt ctcgagctgc cagtgcgcgc
6541 tcatatgggt taaggggact gccccagggc atgggatggg tgagagcaga ggcatacatg
6601 ccacagatgt catagacgta gatgggatcc tcaaagatgc ctatgtaggt tggatagcat
6661 cgcccccctc tgatacttgc tcgcacatag tcatatagtt catgtgatgg cgctagcagc
6721 cccggaccca agttggtgcg attgggtttt tctgttctgt agacgatctg gcgaaagatg
6781 gcgtgagaat tggaagagat ggtgggtctt tgaaaaatgt tgaaatgggc atgaggtaga
6841 cctacagagt ctctgacaaa gtgggcataa gattcttgaa gcttggttac cagttcggcg
6901 gtgacaagta cgtctagggc gcagtagtca agtgtttctt gaatgatgtc ataacctggt
6961 tggtttttct tttcccacag ttcgcggttg agaaggtatt cttcgcgatc cttccagtac
7021 tcttctagcg gaaacccgtc tttgtctgca cggtaagatc ctagcatgta gaactgatta
7081 actgccttgt aagggcagca gcccttctct acgggtagag agtatgcttg agcagctttt
7141 cgtagcgaag cgtgagtaag ggcaaaggtg tctctgacca tgactttgag aaattggtat
7201 ttgaagtcca tgtcgtcaca ggctccctgt tcccagagtt ggaagtctac ccgtttcttg
7261 taggcggggt tgggcaaagc gaaagtaaca tcattgaaga gaatcttacc ggctctgggc
7321 ataaaattgc gagtgatgcg gaaaggctgt ggtacttccg ctcgattgtt gatcacctgg
7381 gcagctagga cgatttcgtc gaaaccgttg atgttgtgtc ctacgatgta taattctatg
```

FIG. 11A-2

```
7441 aaacgcggcg tgcctctgac gtgaggtagc ttactgagct catcaaaggt taggtctgtg
7501 gggtcagata aggcgtagtg ttcgagagcc cattcgtgca ggtgaggatt tgcatgtagg
7561 aatgatgacc aaagatctac cgccagtgct gtttgtaact ggtcccgata ctgacgaaaa
7621 tgccggccaa ttgccatttt ttctggagtg acacagtaga aggttctggg gtcttgttgc
7681 catcgatccc acttgagttt aatggctaga tcgtgggcca tgttgacgag acgctcttct
7741 cctgagagtt tcatgaccag catgaaagga actagttgtt tgccaaagga tcccatccag
7801 gtgtaagttt ccacatcgta ggtcaggaag agtctttctg tgcgaggatg agagccgatc
7861 gggaagaact ggatttcctg ccaccagttg gaggattggc tgttgatgtg atggaagtag
7921 aagtttctgc ggcgcgccga gcattcgtgt ttgtgcttgt acagacggcc gcagtagtcg
7981 cagcgttgca cgggttgtat ctcgtgaatg agctgtacct ggcttccctt gacgagaaat
8041 ttcagtggga agccgaggcc tggcgattgt atctcgtgct cttctatatt cgctgtatcg
8101 gcctgttcat cttctgtttc gatggtggtc atgctgacga gccccgcgg gaggcaagtc
8161 cagacctcgg cgcgggaggg gcggagctga aggacgagag cgcgcaggct ggagctgtcc
8221 agagtcctga gacgctgcgg actcaggtta gtaggtaggg acagaagatt aacttgcatg
8281 atcttttcca gggcgtgcgg gaggttcaga tggtacttga tttccacagg ttcgtttgta
8341 gagacgtcaa tggcttgcag ggttccgtgt cctttgggcg ccactaccgt acctttgttt
8401 tttcttttga tcggtggtgg ctctcttgct tcttgcatgc tcagaagcgg tgacggggac
8461 gcgcgccggg cggcagcggt tgttccggac ccgggggcat ggctggtagt ggcacgtcgg
8521 cgccgcgcac gggcaggttc tggtattgcg ctctgagaag acttgcgtgc gccaccacgc
8581 gtcgattgac gtcttgtatc tgacgtctct gggtgaaagc taccggcccc gtgagcttga
8641 acctgaaaga gagttcaaca gaatcaattt cggtatcgtt aacggcagct tgtctcagta
8701 tttcttgtac gtcaccagag ttgtcctggt aggcgatctc cgccatgaac tgctcgattt
8761 cttcctcctg aagatctccg cgacccgctc tttcgacggt ggccgcgagg tcattggaga
8821 tacggcccat gagttgggag aatgcattca tgcccgcctc gttccagacg cggctgtaaa
8881 ccacggcccc ctcggagtct cttgcgcgca tcaccacctg agcgaggtta agctccacgt
8941 gtctggtgaa gaccgcatag ttgcataggc gctgaaaaag gtagttgagt gtggtggcaa
9001 tgtgttcggc gacgaagaaa tacatgatcc atcgtctcag cggcatttcg ctaacatcgc
9061 ccagagcttc caagcgctcc atggcctcgt agaagtccac ggcaaaatta aaaaactggg
9121 agtttcgcgc ggacacggtc aattcctcct cgagaagacg gatgagttcg gctatggtgg
9181 cccgtacttc gcgttcgaag gctcccggga tctcttcttc ctcttctatc tcttcttcca
9241 ctaacatctc ttcttcgtct tcaggcgggg gcggaggggg cacgcggcga cgtcgacggc
9301 gcacgggcaa acggtcgatg aatcgttcaa tgacctctcc gcggcggcgg cgcatggttt
9361 cagtgacggc gcggccgttc tcgcgcggtc gcagagtaaa aacaccgccg cgcatctcct
9421 taaagtggtg actgggaggt tctccgtttg ggagggagag ggcgctgatt atacatttta
9481 ttaattggcc cgtagggact gcgcgcagag atctgatcgt gtcaagatcc acgggatctg
9541 aaaaccttcc gacgaaagcg tctaaccagt cacagtcaca aggtaggctg agtacggctt
9601 cttgtgggcg ggggtggtta tgtgttcggt ctgggtcttc tgtttcttct tcatctcggg
9661 aaggtgagac gatgctgctg gtgatgaaat taaagtaggc agttctaaga cggcggatgg
9721 tggcgaggag caccaggtct ttgggtccgg cttgctggat acgcaggcga ttggccattc
9781 cccaagcatt atcctgacat ctagcaagat ctttgtagta gtcttgcatg agccgttcta
9841 cgggcacttc ttcctcaccc gttctgccat gcatacgtgt gagtccaaat ccgcgcattg
9901 gttgtaccag tgccaagtca gctacgactc tttcggcgag gatggcttgc tgtacttggg
9961 taagggtggc ttgaaagtca tcaaaatcca caaagcggtg gtaagcccct gtattaatgg
10021 tgtaagcaca gttggccatg actgaccagt taactgtctg gtgaccaggg cgcacgagct
10081 cggtgtattt aaggcgcgaa taggcgcggg tgtcaaagat gtaatcgttg caggtgcgca
10141 ccagatactg gtaccctata agaaaatgcg gcggtggttg gcggtagaga ggccatcgtt
10201 ctgtagctgg agcgccaggg gcgaggtctt ccaacataag gcggtgatag ccgtagatgt
10261 acctggacat ccaggtgatt cctgcggcgg tagtagaagc ccgaggaaac tcgcgtacgc
10321 ggttccaaat gttgcgtagc ggcatgaagt agttcattgt aggcacggtt tgaccagtga
10381 ggcgcgcgca gtcattgatg ctctatagac acggagaaaa tgaaagcgtt cagcgactcg
10441 actccgtagc ctggaggaac gtgaacgggt tgggtcgcgg tgtaccccgg ttcgagactt
10501 gtactcgagc cggccggagc cgcggctaac gtggtattgg cactcccgtc tcgacccagc
10561 ctacaaaaat ccaggatacg gaatcgagtc gttttgctgg tttccgaatg gcagggaagt
10621 gagtcctatt ttttttttt ttttgccgct cagatgcatc ccgtgctgcg acagatgcgc
10681 ccccaacaac agccccccctc gcagcagcag cagcagcagc aaccacaaaa ggctgtccct
10741 gcaactactg caactgccgc cgtgagcggt gcgggacagc ccgcctatga tctggacttg
10801 gaagagggcg aaggactggc acgtctaggt gcgccttcgc ccgagcggca tccgcgagtt
10861 caactgaaaa aagattctcg cgaggcgtat gtgccccaac agaacctatt tagagacaga
10921 agcggcgagg agccggagga gatgcgagct tcccgcttta acgcgggtcg tgagctgcgt
10981 cacggtttgg accgaagacg agtgttgcga gacgaggatt tcgaagttga tgaagtgaca
11041 gggatcagtc ctgccagggc acacgtggct gcagccaacc ttgtatcggc ttacgagcag
11101 acagtaaagg aagagcgtaa cttccaaaag tcttttaata atcatgtgcg aaccctgatt
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FIG. 11A-3

```
11161 gcccgcgaag aagttaccct tggtttgatg catttgtggg atttgatgga agctatcatt
11221 cagaacccta ctagcaaacc tctgaccgcc cagctgtttc tggtggtgca acacagcaga
11281 gacaatgagg ctttcagaga ggcgctgctg aacatcaccg aacccgaggg gagatggttg
11341 tatgatctta tcaacattct acagagtatc atagtgcagg agcggagcct gggcctggcc
11401 gagaaggtag ctgccatcaa ttactcggtt ttgagcttgg gaaaatatta cgctcgcaaa
11461 atctacaaga ctccatacgt tcccatagac aaggaggtga agatagatgg gttctacatg
11521 cgcatgacgc tcaaggtctt gaccctgagc gatgatcttg gggtgtatcg caatgacaga
11581 atgcatcgcg cggttagcgc cagcaggagg cgcgagttaa gcgacaggga actgatgcac
11641 agtttgcaaa gagctctgac tggagctgga accgagggtg agaattactt cgacatggga
11701 gctgacttgc agtggcagcc tagtcgcagg gctctgagcg ccgcgacggc aggatgtgag
11761 cttccttaca tagaagaggc ggatgaaggc gaggaggaag agggcgagta cttggaagac
11821 tgatggcaca acccgtgttt tttgctagat ggaacagcaa gcaccggatc ccgcaatgcg
11881 ggcggcgctg cagagccagc cgtccggcat taactcctcg gacgattgga cccaggccat
11941 gcaacgtatc atggcgttga cgactcgcaa ccccgaagcc tttagacagc aaccccaggc
12001 caaccgtcta tcggccatca tggaagctgt agtgccttcc cgatctaatc ccactcatga
12061 gaaggtcctg gccatcgtga acgcgttggt ggagaacaaa gctattcgtc cagatgaggc
12121 cggactggta tacaacgctc tcttagaacg cgtggctcgc tacaacagta gcaatgtgca
12181 aaccaatttg gaccgtatga taacagatgt acgcgaagcc gtgtctcagc gcgaaaggtt
12241 ccagcgtgat gccaacctgg gttcgctggt ggcgttaaat gctttcttga gtactcagcc
12301 tgctaatgtg ccgcgtggtc aacaggatta tactaacttt ttaagtgctt tgagactgat
12361 ggtatcagaa gtacctcaga gcgaagtgta tcagtccggt cctgattact tctttcagac
12421 tagcagacag ggcttgcaga cggtaaatct gagccaagct tttaaaaacc ttaaaggttt
12481 gtggggagtg catgccccgg taggagaaag agcaaccgtg tctagcttgt taactccgaa
12541 ctcccgcctg ttattactgt tggtagctcc tttcaccgac agcggtagca tcgaccgtaa
12601 ttcctatttg ggttacctac taaacctgta tcgcgaagcc atagggcaaa gtcaggtgga
12661 cgagcagacc tatcaagaaa ttacccaagt cagtcgcgct ttgggacagg aagacactgg
12721 cagtttggaa gccactctga acttcttgct taccaatcgg tctcaaaaga tccctcctca
12781 atatgctctt actgcggagg aggagaggat ccttagatat gtgcagcaga gcgtgggatt
12841 gtttctgatg caagaggggg caactccgac tgcagcactg gacatgacag cgcgaaatat
12901 ggagcccagc atgtatgcca gtaaccgacc tttcattaac aaactgctgg actacttgca
12961 cagagctgcc gctatgaact ctgattattt caccaatgcc atcttaaacc cgcactggct
13021 gcccccacct ggtttctaca cgggcgaata tgacatgccc gaccctaatg acggatttct
13081 gtgggacgac gtggacagcg atgtttttc acctctttct gatcatcgca cgtggaaaaa
13141 ggaaggcggt gatagaatgc attcttctgc atcgctgtcc ggggtcatgg gtgctaccgc
13201 ggctgagccc gagtctgcaa gtccttttcc tagtctaccc ttttctctac acagtgtacg
13261 tagcagcgaa gtgggtagaa taagtcgccc gagtttaatg ggcgaagagg agtacctaaa
13321 cgattccttg ctcagaccgg caagagaaaa aaatttccca aacaatggaa tagaaagttt
13381 ggtggataaa atgagtagat ggaagactta tgctcaggat cacagagacg agcctgggat
13441 catggggact acaagtagag cgagccgtag acgccagcgc catgacagac agaggggtct
13501 tgtgtgggac gatgaggatt cggccgatga tagcagcgtg ttggacttgg gtgggagagg
13561 aaggggcaac ccgtttgctc atttgcgccc tcgcttgggt ggtatgttgt gaaaaaaaat
13621 aaaaaagaaa aactcaccaa ggccatggcg acgagcgtac gttcgttctt ctttattatc
13681 tgtgtctagt ataatgaggc gagtcgtgct aggcggagcg gtggtgtatc cggagggtcc
13741 tcctccttcg tacgagagcg tgatgcagca gcagcaggcg acggcggtga tgcaatcccc
13801 actggaggct ccctttgtgc ctccgcgata cctggcacct acggagggca gaaacagcat
13861 tcgttactcg gaactggcac ctcagtacga taccaccagg ttgtatctgg tggacaacaa
13921 gtcggcggac attgcttctc tgaactatca gaatgaccac agcaacttct tgaccacggt
13981 ggtgcagaac aatgacttta cccctacgga agccagcacc cagaccatta actttgatga
14041 acgatcgcgg tggggcggtc agctaaagac catcatgcat actaacatgc caaacgtgaa
14101 cgagtatatg tttagtaaca agttcaaagc gcgtgtgatg gtgtccagaa aacctcccga
14161 cggtgctgca gttggggata cttatgatca caagcaggat attttggaat atgagtggtt
14221 cgagtttact ttgccagaag gcaacttttc agttactatg actattgatt tgatgaacaa
14281 tgccatcata gataattact tgaaagtggg tagacagaat ggagtgcttg aaagtgacat
14341 tggtgttaag ttcgacacca ggaacttcaa gctgggatgg gatcccgaaa ccaagttgat
14401 catgcctgga gtgtatacgt atgaagcctt ccatcctgac attgtcttac tgcctggctg
14461 cggagtggat tttaccgaga gtcgtttgag caaccttctt ggtatcagaa aaaaacagcc
14521 atttcaagag ggttttaaga ttttgtatga agatttagaa ggtggtaata ttccggccct
14581 cttggatgta gatgcctatg agaacagtaa gaaagaacaa aaagccaaaa tagaagctgc
14641 tacagctgct gcagaagcta aggcaaacat agttgccagc gactctacaa gggttgctaa
14701 cgctggagag gtcagaggag acaattttgc gccaacacct gttccgactg cagaatcatt
14761 attggccgat gtgtctgatg gaacggacgt gaaactcact attcaacctg tagaaaaaga
14821 tagtaagaat agaagctata atgtgttgga agacaaaatc aacacagcct atcgcagttg
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FIG. 11A-4

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14881 gtatctttcg tacaattatg gcgatcccga aaaaggagtg cgttcctgga cattgctcac
14941 cacctcagat gtcacctgcg gagcagagca ggtttactgg tcgcttccag acatgatgaa
15001 ggatcctgtc actttccgct ccactagaca agtcagtaac taccctgtgg tgggtgcaga
15061 gcttatgccc gtcttctcaa agagcttcta caacgaacaa gctgtgtact cccagcagct
15121 ccgccagtcc acctcgctta cgcacgtctt caaccgcttt cctgagaacc agattttaat
15181 ccgtccgccg gcgcccacca ttaccaccgt cagtgaaaac gttcctgctc tcacagatca
15241 cgggaccctg ccgttgcgca gcagtatccg gggagtccaa cgtgtgaccg ttactgacgc
15301 cagacgccgc acctgtccct acgtgtacaa ggcactgggc atagtcgcac cgcgcgtcct
15361 ttcaagccgc actttctaaa aaaaaaatgt ccattcttat ctcgcccagt aataacaccg
15421 gttggggtct gcgcgctcca agcaagatgt acggaggcgc acgcaaacgt tctacccaac
15481 atcccgtgcg tgttcgcgga cattttcgcg ctccatgggg tgccctcaag ggccgcactc
15541 gcgttcgaac caccgtcgat gatgtaatcg atcaggtggt tgccgacgcc cgtaattata
15601 ctcctactgc gcctacatct actgtggatg cagttattga cagtgtagtg gctgacgctc
15661 gcaactatgc tcgacgtaag agccggcgaa ggcgcattgc cagacgccac cgagctacca
15721 ctgccatgcg agccgcaaga gctctgctac gaagagctag acgcgtgggg cgaagagcca
15781 tgcttagggc ggccagacgt gcagcttcgg gcgccagcgc cggcaggtcc cgcaggcaag
15841 cagccgctgt cgcagcggcg actattgccg acatggccca atcgcgaaga ggcaatgtat
15901 actgggtgcg tgacgctgcc accggtcaac gtgtacccgt gcgcacccgt ccccctcgca
15961 cttagaagat actgagcagt ctccgatgtt gtgtcccagc ggcgaggatg tccaagcgca
16021 aatacaagga agaaatgctg caggttatcg cacctgaagt ctacggccaa ccgttgaagg
16081 atgaaaaaaa accccgcaaa atcaagcggg ttaaaaagga caaaaaagaa gaggaagatg
16141 gcgatgatgg gctggcggag tttgtgcgcg agtttgcccc acggcgacgc gtgcaatggc
16201 gtgggcgcaa agttcgacat gtgttgagac ctggaacttc ggtggtcttt acacccggcg
16261 agcgttcaag cgctactttt aagcgttcct atgatgaggt gtacggggat gatgatattc
16321 ttgagcaggc ggctgaccga ttaggcgagt ttgcttatgg caagcgtagt agaataactt
16381 ccaaggatga gacagtgtca ataccttgg atcatggaaa tcccacccct agtcttaaac
16441 cggtcacttt gcagcaagtg ttacccgtaa ctccgcgaac aggtgttaaa cgcgaaggtg
16501 aagatttgta tcccactatg caactgatgg tacccaaacg ccagaagttg gaggacgttt
16561 tggagaaagt aaaagtggat ccagatattc aacctgaggt taaagtgaga cccattaagc
16621 aggtagcgcc tggtctgggg gtacaaactg tagacattaa gattcccact gaaagtatgg
16681 aagtgcaaac tgaacccgca aagcctactg ccacctccac tgaagtgcaa acggatccat
16741 ggatgcccat gcctattaca actgacgccg ccggtcccac tcgaagatcc cgacgaaagt
16801 acggtccagc aagtctgttg atgcccaatt atgttgtaca cccatctatt attcctactc
16861 ctggttaccg aggcactcgc tactatcgca gccgaaacag tacctcccgc cgtcgccgca
16921 agacacctgc aaatcgcagt cgtcgccgta gacgcacaag caaaccgact cccggcgccc
16981 tggtgcggca agtgtaccgc aatggtagtg cggaaccttt gacactgccg cgtgcgcgtt
17041 accatccgag tatcatcact taatcaatgt tgccgctgcc tccttgcaga tatggccctc
17101 acttgtcgcc ttcgcgttcc catcactggt taccgaggaa gaaactcgcg ccgtagaaga
17161 gggatgttgg gacgcggaat gcgacgctac aggcgacggc gtgctatccg caagcaattg
17221 cggggtggtt ttttaccagc cttaattcca attatcgctg ctgcaattgg cgcgatacca
17281 ggcatagctt ccgtggcggt tcaggcctcg caacgacatt gacattggaa aaaaaacgta
17341 taaataaaaa aaaatacaat ggactctgac actcctggtc ctgtgactat gttttcttag
17401 agatggaaga catcaatttt tcatccttgg ctccgcgaca cggcacgaag ccgtacatgg
17461 gcacctggag cgacatcggc acgagccaac tgaacggggg cgccttcaat tggagcagta
17521 tctggagcgg gcttaaaaat tttggctcaa ccataaaaac atacgggaac aaagcttgga
17581 acagcagtac aggacaggcg cttagaaata aacttaaaga ccagaacttc caacaaaaag
17641 tagtcgatgg gatagcttcc ggcatcaatg gagtggtaga tttggctaac caggctgtgc
17701 agaaaaagat aaacagtcgt ttggacccgc cgccagcaac cccaggtgaa atgcaagtgg
17761 aggaagaaat tcctccgcca gaaaaacgag gcgacaagcg tccgcgtccc gatttggaag
17821 agacgctggt gacgcgcgta gatgaaccgc cttcttatga ggaagcaacg aagcttggaa
17881 tgcccaccac tagaccgata gccccaatgg ccaccggggt gatgaaacct tctcagttgc
17941 atcgacccgt caccttggat ttgccccctc cccctgctgc tactgctgta cccgcttcta
18001 agcctgtcgc tgccccgaaa ccagtcgccg tagccaggtc acgtcccggg ggcgctcctc
18061 gtccaaatgc gcactggcaa aatactctga acagcatcgt gggtctaggc gtgcaaagtg
18121 taaaacgccg tcgctgcttt taattaaata tggagtagcg cttaacttgc ctatctgtgt
18181 atatgtgtca ttacacgccg tcacagcagc agaggaaaaa aggaagaggt cgtgcgtcga
18241 cgctgagtta ctttcaagat ggccacccca tcgatgctgc cccaatgggc atacatgcac
18301 atcgccggac aggatgcttc ggagtacctg agtccgggtc tggtgcagtt cgcccgcgcc
18361 acagacacct acttcaatct gggaaataag tttagaaatc ccaccgtagc gccgacccac
18421 gatgtgacca ccgaccgtag ccagcggctc atgttgcgct tcgtgcccgt tgaccgggag
18481 gacaatacat actcttacaa agtgcggtac accctggccg tgggcgacaa cagagtgctg
18541 gatatggcca gcacgttctt tgacattagg ggcgtgttgg acagaggtcc cagtttcaaa
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FIG. 11A-5

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18601 ccctattctg gtacggctta caactctctg gctcctaaag gcgctccaaa tgcatctcaa
18661 tggattgcaa aaggcgtacc aactgcagca gccgcaggca atggtgaaga agaacatgaa
18721 acagaggaga aaactgctac ttacactttt gccaatgctc ctgtaaaagc cgaggctcaa
18781 attacaaaag agggcttacc aataggtttg gagatttcag ctgaaaacga atctaaaccc
18841 atctatgcag ataaacttta tcagccagaa cctcaagtgg gagatgaaac ttggactgac
18901 ctagacggaa aaaccgaaga gtatggaggc agggctctaa agcctactac taacatgaaa
18961 ccctgttacg ggtcctatgc gaagcctact aatttaaaag gtggtcaggc aaaaccgaaa
19021 aactcggaac cgtcgagtga aaaaattgaa tatgatattg acatggaatt ttttgataac
19081 tcatcgcaaa gaacaaactt cagtcctaaa attgtcatgt atgcagaaaa tgtaggtttg
19141 gaaacgccag acactcatgt agtgtacaaa cctggaacag aagacacaag ttccgaagct
19201 aatttgggac aacagtctat gcccaacaga cccaactaca ttggcttcag agataacttt
19261 attggactca tgtactataa cagtactggt aacatggggg tgctggctgg tcaagcgtct
19321 cagttaaatg cagtggttga cttgcaggac agaaacacag aactttctta ccaactcttg
19381 cttgactctc tgggcgacag aaccagatac tttagcatgt ggaatcaggc tgtggacagt
19441 tatgatcctg atgtacgtgt tattgaaaat catggtgtgg aagatgaact tcccaactat
19501 tgttttccac tggacggcat aggtgttcca acaaccagtt acaaatcaat agttccaaat
19561 ggagaagata ataataattg gaaagaacct gaagtaaatg gaacaagtga gatcggacag
19621 ggtaatttgt ttgccatgga aattaacctt caagccaatc tatggcgaag tttcctttat
19681 tccaatgtgg ctctgtatct cccagactcg tacaaataca ccccgtccaa tgtcactctt
19741 ccagaaaaca aaaacaccta cgactacatg aacgggcggg tggtgccgcc atctctagta
19801 gacacctatg tgaacattgg tgccaggtgg tctctggatg ccatggacaa tgtcaaccca
19861 ttcaaccacc accgtaacgc tggcttgcgt taccgatcta tgcttctggg taacggacgt
19921 tatgtgcctt tccacataca agtgcctcaa aaattcttcg ctgttaaaaa cctgctgctt
19981 ctcccaggct cctacactta tgagtggaac tttaggaagg atgtgaacat ggttctacag
20041 agttccctcg gtaacgacct gcgggtagat ggcgccagca tcagtttcac gagcatcaac
20101 ctctatgcta ctttttttccc catggctcac aacaccgctt ccacccttga agccatgctg
20161 cggaatgaca ccaatgatca gtcattcaac gactacctat ctgcagctaa catgctctac
20221 cccattcctg ccaatgcaac caatattccc atttccattc cttctcgcaa ctgggcggct
20281 ttcagaggct ggtcatttac cagactgaaa accaaagaaa ctcccctctt ggggtctgga
20341 tttgacccct actttgtcta ttctggttct attccctacc tggatggtac cttctacctg
20401 aaccacactt ttaagaaggt ttccatcatg tttgactctt cagtgagctg gcctggaaat
20461 gacaggttac tatctcctaa cgaatttgaa ataaagcgca ctgtggatgg cgaaggctac
20521 aacgtagccc aatgcaacat gaccaaagac tggttcttgg tacagatgct cgccaactac
20581 aacatcggct atcagggctt ctacattcca gaaggataca aagatcgcat gtattcattt
20641 ttcagaaact tccagcccat gagcaggcag gtggttgatg aggtcaatta caaagacttc
20701 aaggccgtcg ccatacccta ccaacacaac aactctggct ttgtgggtta catggctccg
20761 accatgcgcc aaggtcaacc ctatcccgct aactatccct atccactcat tggaacaact
20821 gccgtaaata gtgttacgca gaaaaagttc ttgtgtgaca gaaccatgtg gcgcataccg
20881 ttctcgagca acttcatgtc tatgggggcc cttacagact tgggacagaa tatgctctat
20941 gccaactcag ctcatgctct ggacatgacc tttgaggtgg atcccatgga tgagcccacc
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21121 gcttcttgct tcttgcaaat agcagctgca accatggcct gcggatccca aaacggctcc
21181 agcgagcaag agctcagagc cattgtccaa gacctgggtt gcggacccta ttttttggga
21241 acctacgata agcgcttccc ggggttcatg gcccccgata agctcgcctg tgccattgta
21301 aatacggccg gacgtgagac gggggggagag cactggttgg ctttcggttg gaacccacgt
21361 tctaacacct gctacctttt tgatcctttt ggattctcgg atgatcgtct caaacagatt
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21481 attacgctgg aaaaatctac ccagaccgtg cagggccccc gttctgccgc ctgcggactt
21541 ttctgctgca tgttccttca cgcctttgtg cactggcctg accgtcccat ggacggaaac
21601 cccaccatga aattgctaac tggagtgcca aacaacatgc ttcattctcc taaagtccag
21661 cccaccctgt gtgacaatca aaaagcactc taccattttc ttaataccca ttcgccttat
21721 tttcgctctc atcgtacaca catcgaaagg gccactgcgt tcgaccgtat ggatgttcaa
21781 taatgactca tgtaaacaac gtgttcaata aacatcactt tatttttta catgtatcaa
21841 ggctctggat tacttattta tttacaagtc gaatgggttc tgacgagaat cagaatgacc
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21961 caacttggga accggtatat cgggcaggat gtcactccac agctttctgg tcagctgcaa
22021 agctccaagc aggtcaggag ccgaaatctt gaaatcacaa ttaggaccag tgctctgagc
22081 gcgagagttg cggtacaccg gattgcagca ctgaaacacc atcagcgacg gatgtctcac
22141 gcttgccagc acggtgggat ctgcaatcat gcccacatcc agatcttcag cattggcaat
22201 gctgaacggg gtcatcttgc aggtctgcct acccatggcg ggcacccaat taggcttgtg
22261 gttgcaatcg cagtgcaggg ggatcagtat catcttggcc tgatcctgtc tgattcctgg
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FIG. 11A-6

22321 atacacggct ctcatgaaag catcatattg cttgaaagcc tgctgggctt tactaccctc
22381 ggtataaaac atcccgcagg acctgctcga aaactggtta gctgcacagc cggcatcatt
22441 cacacagcag cgggcgtcat tgttggctat ttgcaccaca cttctgcccc agcggttttg
22501 ggtgattttg gttcgctcgg gattctcctt taaggctcgt tgtccgttct cgctggccac
22561 atccatctcg ataatctgct ccttctgaat cataatattg ccatgcaggc acttcagctt
22621 gccctcataa tcattgcagc catgaggcca caacgcacag cctgtacatt cccaattatg
22681 gtgggcgatc tgagaaaaag aatgtatcat tccctgcaga aatcttccca tcatcgtgct
22741 cagtgtcttg tgactagtga aagttaactg gatgcctcgg tgctcttcgt ttacgtactg
22801 gtgacagatg cgcttgtatt gttcgtgttg ctcaggcatt agtttaaaac aggttctaag
22861 ttcgttatcc agcctgtact tctccatcag cagacacatc acttccatgc ctttctccca
22921 agcagacacc aggggcaagc taatcggatt cttaacagtg caggcagcag ctcctttagc
22981 cagagggtca tctttagcga tcttctcaat gcttcttttg ccatccttct caacgatgcg
23041 cacgggcggg tagctgaaac ccactgctac aagttgcgcc tcttctcttt cttcttcgct
23101 gtcttgactg atgtcttgca tggggatatg tttggtcttc cttggcttct ttttgggggg
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23341 actggcagaa ccccttccgc gttcgggggt gtgctccctg tggcggtcgc ttaactgatt
23401 tccttcgcgg ctggccattg tgttctccta ggcagagaaa caacagacat ggaaactcag
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23521 gagcagagct taagcattcc accgcccagt cctgccacca cctctaccct agaagataag
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23701 gagagagagg atgaaaactg cccaaaacag cgagcagata actatcacca agatgctgga
23761 aatagggatc agaacaccga ctacctcata gggcttgacg gggaagacgc gctccttaaa
23821 catctagcaa gacagtcgct catagtcaag gatgcattat tggacagaac tgaagtgccc
23881 atcagtgtgg aagagctcag ctgcgcctac gagcttaacc ttttttcacc tcgtactccc
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24481 gactctcccc gggatttgga agagcgtcgc aagcttatga tggccgtggt gctggttacc
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24601 gagaatctgc actacacttt tagacacggc tttgtgcggc aggcatgcaa gatatctaac
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24781 tatctctacc tgtgccacac gtggcaaacc ggcatgggtg tatggcagca atgtttagaa
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25321 agccaaggcg atgggtcttc tcctgggcaa agtttaaaac tgaccccggg actgtggacc
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25561 aaggggtct accttgaccc ccagaccggc gaggaactca acacaaggtt ccctcaggat
25621 gtcccaacga cgagaaaaca agaagttgaa ggtgcagccg ccgcccccag aagatatgga
25681 ggaagattgg gacagtcagg cagaggaggc ggaggaggac agtctggagg acagtctgga
25741 ggaagacagt ttggaggagg aaaacgagga ggcagaggag gtggaagaag taaccgccga
25801 caaacagtta tcctcggctg cggagacaag caacagcgct accatctccg ctccgagtcg
25861 aggaacccgg cggcgtccca gcagtagatg ggacgagacc ggacgcttcc cgaacccaac
25921 cagcgcttcc aagaccggta agaaggatcg gcagggatac aagtcctggc gggggcataa
25981 gaatgccatc atctcctgct tgcatgagtg cgggggcaac atatccttca cgcggcgcta

FIG. 11A-7

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26041 cttgctattc caccatgggg tgaactttcc gcgcaatgtt ttgcattact accgtcacct
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26161 cgacctccaa cagaaaacca gcagcggcag ttagaaaata cacaacaagt gcagcaacag
26221 gaggattaaa gattacagcc aacgagccag cgcaaacccg agagttaaga aatcggatct
26281 ttccaaccct gtatgccatc ttccagcaga gtcggggtca agagcaggaa ctgaaaataa
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26461 aagagtaggc agcgaccgcg cttattcaaa aaaggcggga attacatcat cctcgacatg
26521 agtaaagaaa ttcccacgcc ttacatgtgg agttatcaac cccaaatggg attggcagca
26581 ggcgcctccc aggactactc cacccgcatg aattggctca gcgccgggcc ttctatgatt
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26761 gaaagtcccg ctcccaccac tgtattactt cctcgagacg cccaggccga agtccaaatg
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26881 aatataaaac gcctgatgat cagaggccga ggtatccagc tcaacgacga gtcggtgagc
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27301 aactccccaa ggatcaccct caaggtccgg cccacggagt gcggattact atcgaaggca
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27421 agggaaacac cacggtttcc atctactgca tttgtaatca ccccggattg catgaaagcc
27481 tttgctgtct tatgtgtact gagtttaata aaaactgaat taagactctc ctacggactg
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27601 tctgttaact tcacctttcc tactcacaaa ctagaagctc aacgactaca ccgcttttcc
27661 agaagcattt tccctactaa tactactttc aaaaccggag gtgagctcca cggtctccct
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27781 gtgattattc tttgctacct atacacacct tgcttcactt tcctagtggt gttgtggtat
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29221 ttgtactgcc atctaccact ccagcacccc gcacaactac tttctctagc agcagtgtcg
29281 ctaacaatac aatttccaat ccaacctttg ccgcgctttt aaaacgcact gtgaataatt
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29521 agtatggtga acaccaatca tggtacctag aaatttcttc ttcaccatac tcatctgtgc
29581 ttttaatgtt tgcgctactt tcacagcagt agccacagca accccagact gtataggagc
29641 atttgcttcc tatgcacttt ttgcttttgt tacttgcatc tgcgtatgta gcatagtctg
29701 cctggttatt aatttttttcc aacttctaga ctggatcctt gtgcgaattg cctacctgcg
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FIG. 11A-8

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29761 ccaccatccc gaataccgca accaaaatat cgcggcactt cttagactca tctaaaacca
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29881 ctgcctatag tactccacca gaacacctta gaaaatgcaa attccaacaa ccgtggtcat
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31441 ttaactgagg aatcagactt aaaaattcca cttaaaaata aatcttctac agcgaccagt
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32761 agtaaagctg gcagaacaag gaagaccacg aacacaactt acactatgca tagtcatagt
32821 atcacaatct ggcaacagcg ggtggtcttc agtcatagaa gctcgggttt cattttcctc
32881 acaacgtggt aactgggctc tggtgtaagg gtgatgtctg gcgcatgatg tcgagcgtgc
32941 gcgcaacctt gtcataatgg agttgcttcc tgacattctc gtattttgta tagcaaaacg
33001 cggccctggc agaacacact cttcttcgcc ttctatcctg ccgcttagcg tgttccgtgt
33061 gatagttcaa gtacagccac actcttaagt tggtcaaaag aatgctggct tcagttgtaa
33121 tcaaaactcc atcgcatcta attgttctga ggaaatcatc cacggtagca tatgcaaatc
33181 ccaaccaagc aatgcaactg gattgcgttt caagcaggag aggagaggga agagacggaa
33241 gaaccatgtt aatttttatt ccaaacgatc tcgcagtact tcaaattgta gatcgcgcag
33301 atggcatctc tcgcccccac tgtgttggtg aaaaagcaca gctaaatcaa aagaaatgcg
33361 attttcaagg tgctcaacgg tggcttccaa caaagcctcc acgcgcacat ccaagaacaa
33421 aagaatacca aaagaaggag cattttctaa ctcctcaatc atcatattac attcctgcac
```

FIG. 11A-9

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33481 cattcccaga taattttcag ctttccagcc ttgaattatt cgtgtcagtt cttgtggtaa
33541 atccaatcca cacattacaa acaggtcccg gagggcgccc tccaccacca ttcttaaaca
33601 caccctcata atgacaaaat atcttgctcc tgtgtcacct gtagcgaatt gagaatggca
33661 acatcaattg acatgccctt ggctctaagt tcttctttaa gttctagttg taaaaactct
33721 ctcatattat caccaaactg cttagccaga agccccccgg gaacaagagc aggggacgct
33781 acagtgcagt acaagcgcag acctccccaa ttggctccag caaaaacaag attggaataa
33841 gcatattggg aaccaccagt aatatcatcg aagttgctgg aaatataatc aggcagagtt
33901 tcttgtagaa attgaataaa agaaaaattt gccaaaaaaa cattcaaaac ctctgggatg
33961 caaatgcaat aggttaccgc gctgcgctcc aacattgtta gttttgaatt agtctgcaaa
34021 aataaaaaaa aaacaagcgt catatcatag tagcctgacg aacaggtgga taaatcagtc
34081 tttccatcac aagacaagcc acagggtctc cagctcgacc ctcgtaaaac ctgtcatcgt
34141 gattaaacaa cagcaccgaa agttcctcgc ggtgaccagc atgaataagt cttgatgaag
34201 catacaatcc agacatgtta gcatcagtta aggagaaaaa acagccaaca tagcctttgg
34261 gtataattat gcttaatcgt aagtatagca aagccacccc tcgcggatac aaagtaaaag
34321 gcacaggaga ataaaaaata taattatttc tctgctgctg tttaggcaac gtcgcccccg
34381 gtccctctaa atacacatac aaagcctcat cagccatggc ttaccagaga aagtacagcg
34441 ggcacacaaa ccacaagctc taaagtcact ctccaacctc tccacaatat atatacacaa
34501 gccctaaact gacgtaatgg gactaaagtg taaaaaatcc cgccaaaccc aacacacacc
34561 ccgaaactgc gtcaccaggg aaaagtacag tttcacttcc gcaatcccaa caagcgtcac
34621 ttcctctttc tcacggtacg tcacatccca ttaacttaca acgtcatttt cccacggccg
34681 cgccgccccct tttaaccgtt aaccccacag ccaatcacca cacggcccac actttttaaa
34741 atcacctcat ttacatattg gcaccattcc atctataagg tatattattg atgatg
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FIG. 11A-10

Vaccine T=0, 4 wks	Vaccine T=24 wks	Monkey ID	Pre		T=4 wks		T=8 wks		T=24 wks		T=28 wks		T=32 wks	
			Mock	Gag[a]	Mock	Gag	Mock	Gag	Mock	Gag	Mock	Gag	Mock	Gag
Ad34ΔE1gagΔE4Ad5Orf6, 10^11 vp	Ad35ΔE1gagΔE4Ad5Orf6, 10^10 vp	00D016	4	6	1	84	5	334	5	99	0	306	3	244
Ad34ΔE1gagΔE4Ad5Orf6, 10^11 vp	Ad35ΔE1gagΔE4Ad5Orf6, 10^10 vp	00D044	1	1	8	79	0	374	8	136	0	493	1	253
Ad34ΔE1gagΔE4Ad5Orf6, 10^11 vp	Ad35ΔE1gagΔE4Ad5Orf6, 10^10 vp	00D064	4	6	1	125	8	655	6	145	0	351	1	236
Naïve		00D087	1	1	3	3	8	54	6	8	5	5	3	0

FIG. 12

Vaccine (T=0, 4 Wks)	Vaccine (T=24 Wk)	Monkey ID	IFN-γ+CD4+CD3+ per 10^6 Lymphocytes		IFN-γ+CD8+CD3+ per 10^6 Lymphocytes	
			Mock	Gag	Mock	Gag
Ad34ΔE1gagΔE4Ad5Orf6, 10^11 vp	Ad35ΔE1gagΔE4Ad5Orf6, 10^10 vp	00D016	62	433	176	1288
Ad34ΔE1gagΔE4Ad5Orf6, 10^11 vp	Ad35ΔE1gagΔE4Ad5Orf6, 10^10 vp	00D044	136	593	323	1871
Ad34ΔE1gagΔE4Ad5Orf6, 10^11 vp	Ad35ΔE1gagΔE4Ad5Orf6, 10^10 vp	00D064	188	785	292	992

FIG. 13