

US 20130022574A1

(19) United States (12) Patent Application Publication CHOI et al.

(10) Pub. No.: US 2013/0022574 A1 (43) Pub. Date: Jan. 24, 2013

(54) AVIRULENT SALMONELLA GALLINARUM VARIANTS AND PHARMACEUTICAL COMPOSITION USING THE SAME

- Inventors: Hyang CHOI, Anyang-si (KR); Soo An Shin, Scoul (KR); Si Yong Yang, Incheon (KR); Young Wook Cho, Seoul (KR)
- (73) Assignee: CJ Cheiljedang Corporation, Seoul (KR)
- (21) Appl. No.: 13/618,169
- (22) Filed: Sep. 14, 2012

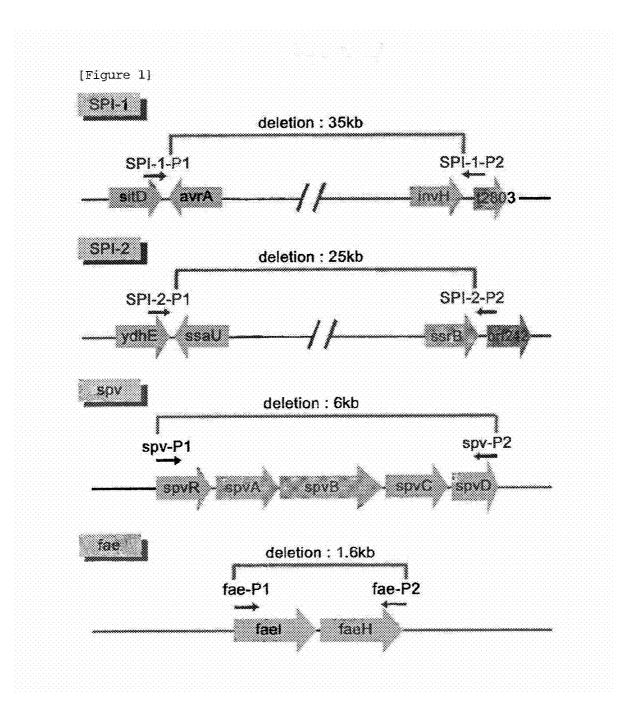
Related U.S. Application Data

(62) Division of application No. 13/274,854, filed on Oct. 17, 2011. (60) Provisional application No. 61/487,137, filed on May 17, 2011.

Publication Classification

- (57) **ABSTRACT**

The present invention relates to avirulent *Salmonella Gallinarum* variants by inactivating virulence gene clusters of *Salmonella Gallinarum* (SG), a main pathogen of avian salmonellosis, and various uses thereof notably in the production of *Salmonella*-specific lytic bacteriophages, pharmaceutical compositions and feed additives.



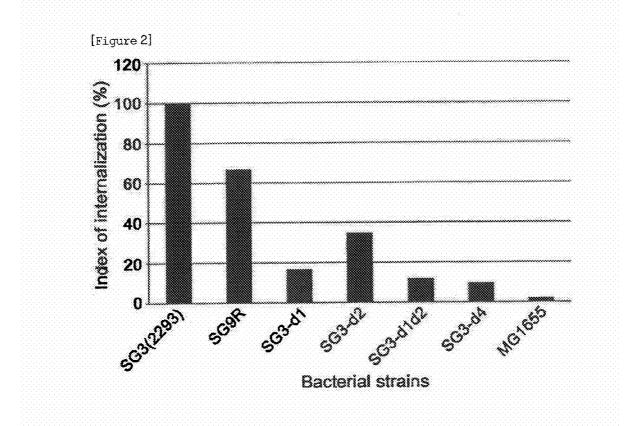


TABLE 1

and their functions are summarized in Table 1, below.

	Gene	Characteristics
SPI-1	avrA	putative inner membrane protein
	sprB	transcriptional regulator
	hilC	bacterial regulatory helix-turn-helix
		proteins, araC family
	orgA	putative flagellar biosynthesis/type
		III secretory pathway protein
	prgK	cell invasion protein; lipoprotein,
		may link inner and outer membranes
	prgЛH	cell invasion protein
	hilD	regulatory helix-turn-helix proteins,
		araC family
	hilA	invasion genes transcription activator
	iagB	cell invasion protein
	sptP	protein tyrosine phosphate
	sicP	chaperone, related to virulence
	iacP	putative acyl carrier protein
	sipADCB	cell invasion protein
	sicA	surface presentation of antigens;
		secretory proteins
	spaSRQPO	surface presentation of antigens;
		secretory proteins
	invJICB	surface presentation of antigens;
		secretory proteins
	invAEGFH	invasion protein
SPI-2	ssaUTSRQPON	Secretion system apparatus
	VMLKJIHG	
	sseGF	Secretion system effector
	sscB	Secretion system chaperone
	sseEDC	Secretion system effector
	sscA	Secretion system chaperone
	sseBA	Secretion system effector
	ssaE	Secretion system effector
	ssaDCB	Secretion system apparatus
	ssrA	Secretion system regulator: Sensor
		component
	ssrB	Secretion system regulator:
		transcriptional activator, homologous
		with degU/uvrY/bvgA

[0008] In addition to these type III secretion systems, fimbriae gene (faeHI) (Edwards R A et al., PNAS (2000); 97 (3):1258-1262) and the virulent factor (spvRABCD operon) present in virulent plasmids of *Salmonella* are implicated in the virulence of *Salmonella* (Gulig P A et al., Mol Microbiol (1993);7(6):825-830).

[0009] Salmonella-caused fowl diseases are difficult to control because they are transmitted in various ways including egg transmission, and feed or environmental infection, and show high recurrence rates even after post-infectious treatment with antibiotics. Therefore, it is importance of preventing the onset of disease by using a vaccine as well as sanitizing breeding farms and feed. In the poultry industry, a lot of effort has been poured into the use of live vaccines (attenuated Salmonella Gallinarum strains-SG9S, SG9R) and dead vaccines (gel vaccines, oil vaccines, etc.) to prevent the onset of fowl typhoid. However, the effects of the vaccine vary with the concentration of the vaccine used, the condition of the fowl vaccinated, and the environment of chicken houses. And, the efficacy of these vaccines is reported to be significantly lower than that of the vaccines for other diseases. Treatment with antibiotics, although reducing the lesion, con-

AVIRULENT SALMONELLA GALLINARUM VARIANTS AND PHARMACEUTICAL COMPOSITION USING THE SAME

REFERENCE TO A SEQUENCE LISTING SUBMITTED ELECTRONICALLY VIA EFS-WEB

[0001] The content of the electronically submitted sequence listing, file name: 2511_0120002_SEQ_ID_Listing.ascii.txt; size: 95,695 bytes; and date of creation: Sep. 14, 2012, filed herewith, is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention provides avirulent *Salmo-nella* variants and various uses thereof, particularly in the production of *Salmonella*-specific lytic bacteriophages, pharmaceutical compositions, and feed additives.

[0004] 2. Description of the Related Art

[0005] Currently over 2,000 Salmonella strains are generally classified into host-specific serotypes, and non-host-specific serotypes pathogenic for both animals and humans. Representative among fowl-adapted pathogens are Salmonella Gallinarum (SG) and Salmonella Pullorum (SP) which are known to cause fowl typhoid and *pullorum* disease, respectively. These Salmonella-caused fowl diseases occur at low frequency in advanced countries, but have inflicted tremendous economic damage on the poultry farming in developing countries.

[0006] Salmonella Gallinarum strains have serologically the same somatic antigen (O-antigen) structures and are classified as being non-motile because they have no flagella. When entering into a host animal via contaminated feed or a contaminated environment, Salmonella pass through the gastrointestinal tract, and invade intestinal epithelial cells by interaction with Peyer's patch M (microfold) cells and penetrate into the intestinal membrane. Salmonella are transported by the M cells to macrophages in adjacent intestinal membranes, and then Salmonella infection develops into a systemic disease.

[0007] The type III secretion system (TTSS) is a protein appendage found in Gram-negative bacteria, which consists of a needle-like protein complex structure through which virulence effector proteins pass from the bacterial cytoplasm directly into the host cytoplasm (Mota L J et al., Ann Med. (2005);37(4):234-249). The type III secretion system is essential for the delivery of the pathogenicity of Salmonella (Schlumberger M C et al., Curr Opin Microbiol. (2006);9(1): 46-54). Wild-type Salmonella take advantage of TTSS when adhering to and invading host cells, and then survives during the phagocytosis of macrophages and circulates throughout the body via the bloodstream, causing a systemic infection. Hence, Salmonella infection cannot proceed without the normal operation of TTSS. Salmonella pathogenicity island-1 (hereinafter referred to as "SPI-1") is a discrete region of the Salmonella chromosome encoding the type III secretion system and virulent effector proteins which are necessary for invasion into intestinal epithelial cells in the early stage of infection (Kimbrough T G et al., Microbes Infect, (2002);4 (1):75-82). Salmonella pathogenicity island-2 (hereinafter referred to as "SPI-2") is also a discrete region of the Salmonella chromosome encoding the type III secretion system and effector proteins which involved in survival and proliferation verts infected fowls into chronic carriers (See: Incidence and Prevention of Hen Salmonellosis, the National Veterinary Research & Quarantine Service, Korea).

[0010] Therefore, new Salmonella-controlling approaches that are better than conventional vaccines or antibiotics are being demanded. Many scientists have recently paid attention to bacteriophages, which infect and lyse bacteria specifically and are safe to humans, as a potent alternative to antibiotics. There are many reports concerning the use of bacteriophages being used in the prevention or therapy of Salmonella diseases (Atterbury R J et al., Appl Environ Microbiol, (2007); 73 (14):4543-4549) and as disinfectants or detergents to prevent the putrefaction of foods (PCT 1998-08944, PCT 1995-31562, EP 1990-202169, PCT 1990-03122), and concerning phage display techniques for diagnosis (Ripp S et al., J Appl Microbiol, (2006);100(3):488-499), Salmonella vaccines prepared by deleting or modifying one or two genes within SPI-2 gene cluster have recently been disclosed (U.S. Pat. No. 6,923,957, U.S. Pat. No. 7,211,264, U.S. Pat. No. 7,887,816). [0011] For industrial use, bacteriophages are produced by separating the phage progenies from the host cells lysed during the proliferation of bacteriophages which have been inoculated into the host cells cultured on a mass scale. As for bacteriophages specific for pathogenic bacteria, however, their lysates may contain the pathogenic host cells being not removed, and/or virulent materials such as pathogenic proteins of the host. This likelihood acts as a great risk factor to the safety of bacteriophages produced on the basis of pathogenic host cells.

[0012] Many bacteria have lysogenic phages on their chromosomes; however, most of the phages are cryptic and cannot produce progeny because of the accumulation of many mutations as ancestral remnants. Lysogenic phages, although inactive, may help the survival capacity of Salmonella upon host infection because they contain the genes necessary for lytic and lysogenic growth and some of the genes encode pathogenic factors. However, these genes are likely to undergo homologous recombination with the viral genome of other similar phages which newly infect animals, thus producing genetically modified phages. As for the typical Salmonella typhimurium, it has fels-1, fels-2, gifsy-1, and gifsy-2 prophages and two cryptic phages. In contrast, Salmonella Gallinarum could be used as a phage-producing host since Salmonella Gallinarum have neither prophages nor cryptic phages, and then are not genetically modified by recombination, (Edwards P A et al, Trends Microbiol, (2002); 10(2):94-99).

[0013] For the purpose of minimizing toxic remnants during progeny production and phage's opportunity for mutation, the present inventors designed the idea that the virulence gene clusters of *Salmonella Gallinarum* could be inactivated for producing bacteriophages. There have no precedent cases wherein avirulent bacteria, which had been converted from virulent bacteria by inactivating a virulence gene cluster, were used as a bacteriophage host cell.

[0014] In addition to the production of bacteriophages, the *Salmonella* deprived of virulence by inactivating virulence gene clusters are themselves used for developing attenuated live vaccines for controlling *Salmonella* or applied to the bioindustry, guaranteeing significant added values.

[0015] In the present invention, avirulent *Salmonella Gallinarum* variants obtained by inactivating at least one of the main *Salmonella* virulence gene clusters (SPI-1, SPI-2, spvRABCD and faeHI operons) are used as a bacteriophage-producing host cell and applied to various uses.

SUMMARY OF THE INVENTION

[0016] With the aim of solving the problems with the recombinational modification of progeny phages and the toxic bacterial remnants in the course of bacteriophage production on the basis of the above-described facts, the present inventors developed avirulent Salmonella Gallinarum variants as a host cell for bacteriophage-producing by inactivating at least one of the four main Salmonella. Gallinarum gene clusters (SPI-1, SPI-2, spvRABCD and faeHI operons). In addition, the present inventors primarily confirmed reduced virulence by measuring the efficiency of the invasion of Salmonella Gallinarum into avian epithelial cells, and reconfirmed by measuring the mortality of hens infected with avirulent Salmonella Gallinarum variants. On the other hand, the present inventors approve the use of bacteriophage-producing host, the use of the pharmaceutical compositions and feed additives for the prevention or treatment of avian salmonellosis through comparison of the productivity of bacteriophages between wild-type and the avirulent Salmonella Gallinarum variants.

[0017] It is therefore a primary object of the present invention to provide a *Salmonella Gallinarum* variant in which the SPI-2 gene cluster is inactivated, a *Salmonella Gallinarum* variant in which both SPI-1 and SPI-2 gene clusters are inactivated, and an avirulent *Salmonella Gallinarum* variant in which at least one of the four main virulence gene clusters (SPI-1, SPI-2, spvRABCD, and faeHI operon) has been inactivated.

[0018] It is another object of the present invention to provide the use of the avirulent *Salmonella Gallinarum* variant in the production of *Salmonella*-specific bacteriophages or a method for producing phages using the avirulent *Salmonella Gallinarum* variant. The avirulent *Salmonella Gallinarum* variants according to the present invention can be used for the mass-production of *Salmonella*-specific lytic bacteriophages free of remnant toxicity and applied to the development of a novel concept of antibiotic substitutes which have high industrial utility value and guarantee significant added value.

[0019] It is a further object of the present invention to provide a pharmaceutical composition comprising avirulent *Salmonella Gallinarum* variants as an active ingredient, preferably a live vaccine and a feed additive. The SPI-1 gene cluster encodes type III secretion system proteins which remain on cell surfaces, acting as an antigen while the SPI-2 gene cluster encodes proteins which are involved in survival in the phagosomes after passage across epithelial cells. Hence, the inactivation of the SPI-2 gene cluster alone, with SPI-1 gene cluster remaining intact, leaves the antigen necessary for the production of an antibody inducing an immune response, but does not allow the bacteria to survive during phagocytosis, which does not result in a systemic disease. Thus, the SPI-2 gene cluster-inactivated *Salmonella Gallinarum* variant might be used as a live vaccine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[0021] FIG. **1** is a schematic diagram showing virulence genes of avian *Salmonella* (Salmonella pathogenicity island-1, *Salmonella* pathogenicity island-2, spvRABCD, faeHI) and sites corresponding to primers for inactivating the virulence genes; and

[0022] FIG. **2** is a graph showing the efficiency of the in vitro invasion into avian epithelial cells of the virulence geneinactivated *Salmonella Gallinarum* variants (SG3-d1, SG3d2, SG3-d1d2, SG3-d4), together with controls wild-type *Salmonella Gallinarum* SG2293), *Salmonella Gallinarum* live vaccine (SG9R), and non-pathogenic *E. coli* (MG1655). Invasion efficiency is expressed as a percentage of the count of microorganisms within cells divided with the count of microorganisms within a culture medium. The microorganisms were used at a concentration of 8.0×10^7 cfu per well.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] In order to accomplish the above objects, an aspect of the present invention provides the avirulent *Salmonella Gallinarum* variants which are remarkably decreased in pathogenicity.

[0024] The *Salmonella Gallinarum* variants are rendered avirulent by inactivating at least one of the virulence gene clusters *Salmonella* pathogenicity island-1, *Salmonella* Pathogenicity Island-2, spvRABCDf and faeHI.

[0025] As used herein, the term "virulence gene clusters of *Salmonella*" refers to the four gene clusters involved in the virulence of *Salmonella Gallinarum*, including the *Salmonella* Pathogenicity Island-1 (hereinafter referred to as "SPI-1") operon coding for the structural proteins and toxic effector proteins of type III secretion system, the *Salmonella* Pathogenicity Island-2 (hereinafter referred to as "SPI-2") operon coding for the structural proteins and toxic effector proteins of type III secretion system, the *Salmonella* Pathogenicity Island-2 (hereinafter referred to as "SPI-2") operon coding for the structural proteins and toxic effector proteins of type III secretion system, the spvRABCD operon coding for pathogenically active proteins on avian *Salmonella*-specific virulent plasmids, and the faeHI operon coding for fimbriae. So long as it functionally works in *Salmonella Gallinarum*, any gene cluster may be used.

[0026] The term "gene cluster," as used herein, refers to a population of adjacent genes on a chromosome or a plasmid that are commonly responsible for the same products. The genes in one cluster are under the regulation of common regulatory genes.

[0027] The inactivation of genes in bacteria can be achieved using various methods. For example, single or multiple nucleotides of an active site within a gene may be modified to decrease the activity of the protein expressed. Alternatively, an antibiotic-resistant gene or other gene(s) may be inserted into the gene of interest to prevent the expression of intact proteins. The most reliable method is to delete the entire sequence of a gene from the genome (Russell C B et al., J. Bacteriol. (1989); 171:2609-2613, Hamilton C M et al., J. Bacteriol. (1989); 171:4617-4622, Link A J et al., J. Bacteriol. (1997); 179:6228-6237). In the present invention, entire sequences of the genes of interest are deleted to effectively promise the inactivation of the genes. For this, the one-step deletion method using lambda Red recombinase, known as a method of deleting gene clusters, developed by Datsenk KA et al., may be employed (Datsenko K A et al., PNAS, (2000); 97 (12):6640-6645).

[0028] With regard to the information of virulence genes to be deleted, nucleotide sequences of SPI-1 and SPI-2 were, obtained referring to the virulence gene sequences within the *Salmonella Gallinarum* chromosome (*Salmonella enterica* subsp. *enterica* serovar *Gallinarum* str. 287/91, NC 011274), disclosed by the NCBI. For the faeHI operon sequence, reference was made to the sequence of the *Salmonella Gallinarum* virulence plasmid gene (*Salmonella Gallinarum* viru

lence plasmid minor fimbrial subunit genes, AF005899). For the spvRABCD operon, the sequence of the same name gene of *Salmonella Typhimurium* LT2, which has highly homology with *Salmonella Gallinarum*, was consulted because its sequence is not disclosed in the NCBI. The sequencing of the spvRABCD operon of *Salmonella Gallinarum* was also performed with reference to the sequence of the corresponding gene of *Salmonella Typhimurium*.

[0029] Examples of the *Salmonella* virulence genes clusters include the SPI-1 gene cluster (SEQ ID NO: 1), the SPI-2 (SEQ ID NO: 2), the spvRABCD operon (SEQ ID NO: 3), and the faeHI operon (SEQ ID NO: 4) of *Salmonella Gallinarum* 287/91.

[0030] To prepare strains that, had definitely been rendered avirulent, all of the plural virulence gene clusters were deleted. To inactivate many gene clusters in one strain, the gene clusters may have been deleted sequentially.

[0031] In the present invention, a *Salmonella Gallinarum* strain in which only the SPI-2 gene cluster is inactivated (SG3-d2), a *Salmonella Gallinarum* strain in which both SPI-1 and SPI-2 gene clusters are integrally inactivated (SG3-d1d2) and a *Salmonella Gallinarum* strain in which all of the four virulence gene clusters (SPI-1, SPI-2, spvRABCD, faeHI) are integrally inactivated (SG3-d4). SG3-d2 is deposited under accession No. KCCM 1100P, and SG3-d4 under accession No. KCCM 11011P.

[0032] Studies on the independent deletion of individual genes of the gene clusters have been reported (Hapfelmeier S et al., J Immunol, (2005); 174(3): 1675-1685, Brumme S et al., Vet Microbiol, (2007); 124(3-4):274-285, Desin T S et al., Infect Immun, July (2009); 2866-2875), but avirulent *Salmonella* strains developed by integrally inactivating two or more entire gene clusters had not been disclosed prior to the study of the present inventors. The *Salmonella Gallinarum* strain was named *Salmonella Gallinarum* SG2293-d2 when only the SPI-2 gene cluster is inactivated, and SG2293-d1d2 when both SPI-1 and SPI-2 were integrally inactivated. Further, it was named SG2293-d4 upon the inactivation of all of SPI-1, SPI-2, spvRABCD, and faeHI.

[0033] To ascertain the avirulence thereof, the strains prepared by inactivating virulence gene clusters according to the present invention were assayed for the efficiency of invasion into avian epithelial cells and for disease outbreak and mortality (%) upon infection into poultry. Preferably, the *Salmonella Gallinarum* strains in which the virulence gene clusters had been inactivated by transformation were allowed to invade avian epithelial cells so that invasion efficiency could be measured. Also, the strains were injected into brown egg layers to measure mortality.

[0034] In accordance with another aspect thereof, the present invention provides an avirulent *Salmonella*, strain for use in producing *Salmonella*-specific lytic bacteriophages and a method for producing phages using the same.

[0035] Φ CJ1 (US 20100135962), a *Salmonella*-specific phage, was used to examine the bacteriophage productivity of the avirulent *Salmonella Gallinarum* variants. The phage shows a specific bactericidal activity against *Salmonella Gallinarum* and *Salmonella pullorum*, belongs to the morphotype group of the family Siphoviridae B1, characterised by isometric capsid and long non-contractile tail, and has a total genome size of 61 kb and major structural proteins with a size of 38 kDa and 49 kDa.

[0036] The method for producing a bacteriophage in accordance with the present invention comprises culturing the avirulent *Salmonella Gallinarum* variants in a medium, inoculating a bacteriophage into the medium, and recovering the bacteriophage. In this regard, the phage may be produced briefly using a plate or on a mass scale using broth. In the case of production using a plate, a bacteriophage is inoculated at a suitable ratio into bacteria when the bacteria enter a log phase, mixed with top agar, and poured onto a plate. When phage plaques appear, the top agar fractions are collected and centrifuged, followed by filtering the supernatant to afford a phage stock. For mass production as a broth, a mixture of phages and bacteria is prepared in the same manner as in plate production, and incubated for 5 hours in fresh broth, instead of in top agar.

[0037] In accordance with a further aspect thereof, the present invention provides a pharmaceutical composition for the prevention of fowl typhoid, comprising the avirulent *Salmonella*, strain as an active ingredient and optionally a pharmaceutically acceptable vehicle, and preferably a vaccine for the prevention of fowl typhoid, formulated with the avirulent *Salmonella* strain and optionally a pharmaceutically acceptable vehicle.

[0038] The term "pharmaceutically acceptable vehicle," as used herein, refers to a carrier or diluent which does not deteriorate the biological activity and property of the active ingredient and which does not irritate the subject. Preparations intended for oral administration may take the form of tablets, troches, lozenges, aqueous or oily suspensions, powders, granules, emulsions, hard or soft capsules, syrups, elixirs, etc. In regards to the oral forms such as tablets and capsules, the active ingredient may be formulated in combination with a binder such as lactose, saccharose, sorbitol, mannitol, starch, amylpectin, conjugate such as cellulose or gelatin, an excipient such as dicalcium phosphate, a disintegrant such as corn starch or sweet potato starch, or a lubricant such as magnesium stearate, calcium stearate, sodium stearylfumarate or polyethylene glycol wax. As for capsules, they may further comprise a liquid carrier such as fatty oil.

[0039] The composition of the present invention may be formulated into preparations for non-oral administration, such as subcutaneous injections, intravenous injections, or intradermal injections. For this, the composition of the present invention may be mixed with a stabilizer or buffer in water to give a solution or a suspension which is then formulated into unit doses such as ampules or vials.

[0040] As used herein, the term "vaccine" refers to a biological preparation that improves immunity to a particular disease by inducing the formation of an antibody upon injection into the body, a preparation containing an antigen, e.g., killed or attenuated forms of a disease-causing microorganism. Vaccines may be prepared from killed pathogens. There are also live vaccines, but with the virulence thereof attenuated. The *Salmonella Gallinarum* variants of the present invention have the same antigenic proteins as those of the wild-type, but are greatly decreased in virulence compared to the wild-type, so that they can be used as live vaccines prophylactic of fowl typhoid.

[0041] In accordance with still another aspect thereof, the present invention provides a feedstuff containing the avirulent *Salmonella Gallinarum*, and preferably a feed additive containing the avirulent *Salmonella Gallinarum*. When applied to poultry, the feed additive of the present invention serves as a live vaccine that prevents fowl typhoid.

[0042] The feedstuff of the present invention may foe prepared by mixing feedstuff with the *Salmonella Gallinarum* variant as it is or in the form of a feed additive. In the feedstuff, the *Salmonella Gallinarum* variant may be in a liquid or dry state. The dry state can be accomplished by various drying methods including, but not limited thereto, pneumatic drying, spontaneous drying, spray drying and freeze drying. In addition to the *Salmonella Gallinarum* variant of the present invention, the feedstuff of the present invention may further comprise a typical additive useful for improving the preservation of the feedstuff.

[0043] The feedstuff comprising the *Salmonella Gallinarum* variant of the present invention may be vegetable matter such as a cereal, nut, a by-product of food processing, millet, fiber, pharmaceutical by-product, a vegetable oil, starch, oil seed meals and cereal remnants, or animal matter such as proteins, minerals, fats, mineral oils, unicellular proteins, animal planktons and leftover food etc.

[0044] Examples of the feed additive comprising the *Salmonella Gallinarum* variant of the present invention include, but are not limited to, various agents for preventing quality deterioration and improving utility, such as binders, emulsifiers, preservatives, amino acids, vitamins, enzymes, probiotics, flavoring agents, non-protein nitrogen compounds, silicates, buffer, colorants, extracts, oligosaccharides, etc. Also, a mixing agent may be within the scope of the feed additive.

[0045] In accordance with still a further aspect thereof, the present invention provides a method for treating the *Salmo-nella Gallinarum* infectious disease fowl typhoid using the pharmaceutical composition.

[0046] The composition of the present invention may be administered to animals in the form of a pharmaceutical preparation to animals, or in the form of being mixed with feedstuff or water. Preferably, it is mixed in the form of a feed additive with feedstuff before administration.

[0047] So long as it allows the composition of the present invention to reach tissues or cells of interest, any administration route, such as non-oral, intraartery, intradermal, transdermal, intramuscular, intraperitoneal, intravenous, subcutaneous, oral or intranasal route, may be taken.

[0048] The treating method of the present invention comprises administering the composition of the present invention in a pharmaceutically effective amount. It will be apparent to those skilled in the art that the suitable, total daily dose may be determined by an attending physician within the scope of medical judgment. The specific therapeutically effective dose level for any particular patient may vary depending on a variety of factors, including the kind and degree of desired reaction, the specific composition, including the use of any other agents according to the intended use, the patient's age, weight, general health, gender, and diet, the time of administration, the route of administration, and rate of the excretion of the composition; the duration of the treatment; other drugs used in combination or coincidentally with the specific composition; and like factors well known in the medical arts. Typically, the composition may be administered at a daily dose of from 10⁴ to 10⁸ CFU once or in a divided dosage manner.

[0049] Hereinafter, the present invention will be described in more retail with reference to Examples. However, these Examples are for illustrative purposes only, and the invention is not intended to be limited by these Examples.

Example 1

Screening of Target Genes to be Inactivated through Comparison of *Salmonella Gallinarum* Virulence Genes

[0050] The first step of preparing avirulent avian Salmonella strains was the screening of target virulence genes to be inactivated. Salmonella Pathogenicity Island-1 (SPI-1), and Salmonella Pathogenicity Island-2 (SPI-2), both of which are type three secretion system gene clusters essential for the delivery of the pathogenicity of Salmonella, and spvRABCD and faeHI, both of which are genes on virulence plasmids, were determined as target genes, and the data base of the NCBI was searched for the nucleotide sequences of the target genes (Salmonella enterica subsp. enterica serovar Gallinarum str. 287/91, NC 011274). Because the nucleotide sequence of spvRABCD of Salmonella Gallinarum had not yet been disclosed, primers were synthesized with reference to the nucleotide sequence of the same name gene of Salmonella typhimurium (Salmonella typhimurium LT2 plasmid pSLT, NC 003277), which has high nucleotide sequence homology with Salmonella Gallinarum. As for the faeHI operon, the information of its nucleotide sequence was obtained from Salmonella Gallinarum virulence plasmid minor fimbrial subunit genes (AF005899).

Example 2

Preparation of Avirulent Variants by Inactivation of Virulence Genes of *Salmonella Gallinarum* and by Integration of the Inactivated Sites

[0051] 2-1. Inactivation of Virulence Genes of Salmonella Gallinarum

[0052] To delete TTSS-related virulence genes of the wildtype *Salmonella Gallinarum* (SGSC No. 2293) as determined in Example 1, the one-step deletion method using lambda Red recombinase, developed by Datsenko K A et al., (Datsenko K A et al, PNAS, (2000); 97(12):6640-6645), was employed.

[0053] A chloramphenicol resistant gene of pKD3 was used as an antibiotic marker for identifying insertion into a target site of chromosome. Using a pair of the primers SPI-1-P1 (SEQ ID NO: 5) and SPI-1-P2 (SEQ ID NO: 6) of Table 1, which correspond to 50 bp of 5' flanking region of the avrA and 50 bp of 3' flanking region of the invH gene, wherein SPI-1 comprising from avrA to invH is target for deletion, and a part of the chloramphenicol resistant gene of pKD3, respectively, a polymerase chain reaction (hereinafter referred to as "PCR") was performed [Sambrook et al, Molecular Cloning, a Laboratory Manual (1989), Cold Spring Harbor Laboratories], with pKD3 as a template. The obtained PCR product was gene fragment about 1100 bp long.

[0054] In this regard, a PCR EL premix kit (BIONEER) was used and 30 cycles of denaturation at 94° C. for 30 sec, annealing at 55 ° C. for 30 sec and elongation at 72° C. for 1 min was conducted. The PCR product was separated in 0.8% agarose gel by electrophoresis and eluted at a desired band size.

[0055] According to the method of Datsenko K A et al., the 1100 bp-long gene fragment was introduced into pKD46-transformed, competent wild-type *Salmonella Gallinarum*, which was then spread over LB plates containing chloramphenicol (30 mg/L), As for the resulting transformant, its gene was examined by PCR using a pair of the primers SPI-

1-P3 (SEQ ID NO: 7) and SPI-1-P4 (SEQ ID NO: 8), which correspond to regions about 1 kb distant from both ends of the deletion target gene, respectively. The PCR product thus obtained was 3100 bp long, indicating that the SPI-1 gene cluster was inactivated.

[0056] The resulting strain was cultured at 37° C., a condition of removing the pKD46 vector, to select a strain that could not grow on an LB plate containing ampicillin (100 mg/L).

[0057] Subsequently, the antibiotic marker inserted into the inactivated gene cluster was removed by transformation with pCP20. The removal of the antibiotic marker was identified by PCR using the primers SPI-1-P3 & SPI-1-P4. The resulting PCR product was 2000 bp long, also indicating the inactivation.

[0058] Afterwards, the strain which was now free of the antibiotic marker was cultured at 42° C. (a condition of removing pCP20) to select a strain that could not grow on an LB plate containing ampicillin. The SPI-1 gene cluster-inactivated strain thus obtained was named SG3-d1 (*Salmonella Gallinarum* SG2293:: Δ SPI-1).

[0059] SPI-2, spv, and fae gene clusters were also inactivated in the same manner as in the SPI-1 gene cluster. The resulting gene cluster-inactivated strains were named SG3-d2 (*Salmonella Gallinarum* SG2293::ΔSPI-2, Accession No. KCCM 11009P), SG3-ds (*Salmonella Gallinarum* SG2293::Δspv), and SG3-df (*Salmonella Gallinarum* SG2293::Δfae), respectively. Primers used for deleting genes and for identifying gene deletion are summarized in Table 2, below.

TABLE 2

Prim	ers for deletion of SPI-1 gene from chromosome
SPI-1-P1 (SEQ ID NO: 5)	TTAT6GCGCT6GAAGGATTTCCTCTGGCAGGCAACCT TATAATTTCATTAGTGTAGGCTGGAGCTGCTTC
SPI-1-P2 (SEQ ID NO: 6)	ATGCAAAATATGGTCTTAATTATATCATGATGAGTTC AGCCAACGGTGATCATATGAATATCCTCCTTAG
Prim	ers for Deletion of SPI-2 Gene from Chromosome
SPI-2-P1 (SEQ ID NO: 9)	ACCCTCTTAACCTTCGCAGTGGCCTGAAGAAGCATAC CAAAAGCATTTATGTGTAGGCTGGAGCTGCTTC
SPI-2-P2 (SEQ ID NO: 10)	ACTGCGTGGCGTAAGGCTCATCAAAATATGACCAATG CTTAATACCATCGCATATGAATATCCTCCTTAG
Prime	rs for Deletion of spvRABCD gene from virulence plasmid
spv-P1 (SEQ ID NO: 13)	GTGCAAAAACAGGTCACCGCCATCCTGTTTTTGCACA TCAAA ACATTTTTGTGTAGGCTGGAGCTGCTTC
spv-P2 (SEQ ID NO: 14)	TTACCCCAACAGCTTGCCGTGTTTGCGCTTGAACATA GGGAT GCGGGCTTCATATGAATATCCTCCTTAG
Prim	ers for Deletion of faeHI gene from virulence plasmid
fae-P1 (SEQ ID NO: 17)	TTACCGATATTCAATGCTCACCGCCAGGGAGGTATGC CAGCG GGACGGTAGTGTAGGCTGGAGCTGCTT C
fae-P2 (SEQ ID	ATGAAAATAACGCATCATTATAAATCTATTATTTCCG CC CTGGCCGCGCTCATATGAATATCCTCCTTAG

NO: 18)

TABLE 2-continued

Prime	ers for identificaion of SPI-1 gene deletion from chromosome
SPI-1-P3 (SEQ ID NO: 7)	ATGTTCTTAACAACGTTACTG
SPI-1-P4 (SEQ ID NO: 8)	AGGTAGTACGTTACTGACCAC
Prime	rs for identification of SPI-2 gene deletion from chromosome
SPI-2-P3 (SEQ ID NO: 11)	TGTTCGTACTGCCGATGTCGC
SPI-2-P4 (SEQ ID NO: 12)	AGTACGACGACTGACGCCAAT
Prime	ers for spvRABCD gene deletion from virulence plasmid
spv-P3 (SEQ ID NO: 15)	GACCATATCTGCCTGCCTCAG
NO: 15) spv-P4 (SEQ ID NO: 16)	CAGAGCCCGTTCTCTACCGAC
Pri	mers for faeHI gene deletion from virulence plasmid
fae-P3 (SEQ ID	CAGGCTCCCCTGCCACCGGCT
NO: 19) fae-P4 (SEQ ID	CAGGCCAACTATCTTTCCCTA

[0060] 2-2. Integration of Type III Secretion System-Related Virulence Genes Inactivation

NO: 20)

[0061] To integrally inactivate the gene clusters in one strain, the SG3d1 strain was sequentially subjected to the inactivation of SPI-2, spvRABCD, and faeHI gene clusters, using a method similar to that of Example 2-1.

[0062] To begin with, PCR was performed using the primers SPI-2-P1 (SEQ ID NO: 9) and SPI-2-P2 (SEQ ID NO.: 10) for the purpose of inactivating the SPI-2 cluster gene, with pKD4 serving as a template, resulting a 1600 bp gene fragment. This PCR product was introduced into the SG3-d1 strain in which pKD46 vector retrained (Example 1-2), followed by spreading the bacteria over an LB plate containing kanamycin (50 mg/L). As for the resulting transformant, its gene was examined by PCR using a pair of the primers SPI-2-P3 (SEQ ID NO: 11) and SPI-2-P4 (SEQ ID NO: 12), which correspond to both flanking regions of the deletion target gene. The PCR product thus obtained was 3600 bp long, indicating that the SPI-2 gene cluster was inactivated. [0063] The resulting strain was cultured at 37° C., a condition of removing the pKD46 vector, to select a strain that could not grow on an LB plate containing ampicillin (100 mg/L).

[0064] Subsequently, the antibiotic marker inserted into the inactivated gene cluster was removed by transformation with pCP20. The removal of the antibiotic marker was identified by PCR using the primers SPI-1-P3 & SPI-1-P4 in case of SPI-1 and the primers SPI-2-P3 & SPI-2-P4 in case of SPI-2. The resulting PCR product was 2000 bp long, also indicating that the inactivation had taken place.

[0065] Afterwards, the strain free of the antibiotic marker was cultured at 42° C. (a condition of removing pCP20) to select a strain that could not grow on an LB plate containing ampicillin. The SPI-1 and SPI-2 gene cluster-inactivated strain thus obtained was named SG3-d1d2 (*Salmonella Gallinarum* SG2293:: Δ SPI-1 Δ SPI-2, Accession No. KCCM 11010P).

[0066] In SG-d1d2 strain, spvRABCD and faeHI gene clusters were further inactivated. To this end, the spvRABCD gene cluster (the kanamycin-resistant gene of pKD4 was used as an antibiotic marker) was inactivated in the same manner as in the inactivation of SPI-1 in Example 1-2, while the inactivation of the faeHI gene cluster (the chloramphenicol-resistant gene of pKD3 was used as an antibiotic marker) was conducted in the same manner as in the inactivation of SPI-2 in the SPI-1-inactivated strain. As for the resulting transformants, their genes were examined by PCR using the primer set spv-P3 (SEQ ID NO: 15) and spv-P4 (SEQ ID NO: 16) for spvRABCD deletion, and the primer set fae-P3 (SEQ ID NO: 19) and fae-P4 (SEQ ID NO: 20) for faeHI deletion, which correspond to regions about 1 kb distant from both ends of the respective deletion target genes. The PCR products thus obtained were 3600 bp, 3100 bp long respectively, indicating that the spvRABCD and faeHI gene clusters were inactivated. The resulting strain was cultured at 37° C., a condition of removing the pKD46 vector, to select a strain that could not grow on an LB plate containing ampicillin (100 mg/L). The Salmonella Gallinarum strain in which all of the four gene clusters SPI-1, SPI-2, spvRABCD and faeHI were integrally inactivated was named SG3-d4 (Salmonella Gallinarum SG2293:: Δ SPI-1 Δ SPI-2 Δ spvRABCD Δ faeHI) and deposited under accession No. KCCM 11011P.

[0067] 2-3. Sequencing of *Salmonella Gallinarum* spvRABCD Operon

[0068] Nowhere has the genetic information on spvRABCD of *Salmonella Gallinarum* (SGSC No. 2293) been disclosed yet. Its nucleotide sequence was analyzed in the present invention. For this, primers were synthesized as summarized in Table 3, below.

TABLE 3

spv-S1 (SEQ ID NO: 21)	GGTCAATTAAATCCACTCAGAA
spv-S2 (SEQ ID NO: 22)	ACGGGAGACACCAGATTATC
spv-S3 (SEQ ID NO: 23)	TTCAGTAAAGTGGCGTGAGC
spv-S4 (SEQ ID NO: 24)	CCAGGTGGAGTTATCTCTGC
spv-S5 (SEQ ID NO: 25)	ACTGTCGGGCAAAGGTATTC
spv-S6 (SEQ ID NO: 26)	TTTCTGGTTACTGCATGACAG
spv-S7 (SEQ ID NO: 27)	TCCAGAGGTACAGATCGGC
spv-S8 (SEQ ID NO: 28)	GAAGGAATACACTACTATAGG
spv-S9 (SEQ ID NO: 29)	GTGTCAGCAGTTGCATCATC

spv-S10 (SEQ ID NO:	30)	AGTGACCGATATGGAGAAGG
spv-S11 (SEQ ID NO:	31)	AAGCCTGTCTCTGCATTTCG
spv-S12 (SEQ ID NO:	32)	AACCGTTATGACATTAAGAGG
spv-S13 (SEQ ID NO:	33)	TAAGGCTCTCTATTAACTTAC
spv-S14 (SEQ ID NO:	34)	AACCGCTTCTGGCTGTAGC
spv-S15 (SEQ ID NO:	35)	CCGTAACAATGACATTATCCTC

[0069] The analysis result is given in SEQ ID NO: 3.

Example 3

Assay of Virulence Gene-Inactivated Salmonella Gallinarum SG2-d4 for Avirulence by Measurement of Invasion Efficiency into Avian Epithelial Cell

[0070] Salmonella Gallinarum and Salmonella pullorum, which are unique Salmonella species due to the lack of a motile flagella, are specifically infected to avian cells and can invade other animal cells but at very low efficiency. In this example, an in vitro cell invasion assay was conducted (Henderson S C et al, Infect Immun, (1999); 67(7):3580-3586) on the avian epithelial cell line BAT (Budgerigar Abdominal Tumor), provided from M D. Lee, Georgia University. The avirulent Salmonella Gallinarum variants SG3-d1d2 and SG3-d4, developed by the above-described gene deletion method, were expected to invade the host cell with very low efficiency by reduced level of TTSS-related protein. A recent research review on the infection mechanisms of pathogenic microorganisms has it that even when only a specific gene of SPI-1 is deleted, the Salmonella strain shows a decrease in invasion efficiency into epithelial cells (Lostroh C P et al. Microbes Infect, (2001); 3(14-15):1281-1291).

[0071] In the present invention, TTSS-related gene deletion was proven to lead to a decrease in virulence by measuring the efficiency of the invasion of the avian *Salmonella* variants into the avian epithelial cell line BAT.

[0072] Invasion efficiency into avian epithelial cells was measured on 24-well plates in triplicate, and mean values of three measurements were given. The BAT cell line was cultured at 37° C. in DMEM supplemented with 10% fetal bovine serum, 1 mM glutamine, 100 IU/ml penicillin and 100 μ g/ml streptomycin under the condition of 5% CO₂. The BAT cell line was seeded at a density of 2.5×10^5 cells/well into 24-well plates and incubated at 37° C. for 1~2 days in a 5% CO₂ incubator to form monolayers of cells. After distribution of the cell and incubation for one day, the culture medium was changed out with antibiotic-free DMEM. For comparison of invasion efficiency, wild-type Salmonella Gallinarum SG3 (SGSC: 2293), the virulence gene-inactivated Salmonella Gallinarum variants SG3-d1, SG3-d2, SG3-d1d2 and SG3d4, and SG9R, which is a commercially available live vaccine, were employed, with the non-pathogenic E. coli MG1655 serving as a control.

[0073] After being primarily seed cultured, all of test bacteria were vigorously incubated for 4~5 hours in a main LB medium, and the cultures were diluted to $OD_{600}=1.0$. To 200 μ L of the animal cells incubated in the antibiotic-free

medium, 200 µL of each of the culture dilutions was added so that the bacteria were aliquoted at a concentration of 2.0×10^8 cfu/ml per well. The plates were incubated at 37° C. for one hour in a 5% CO2 atmosphere to allow the bacteria to penetrate into the epithelial cells. Thereafter, the medium was aspirated off and the plates were washed with 1×PBS to remove remaining microorganisms. Then, the epithelial cells were incubated at 37 ° C. for 2 hours in the presence of 50 μ g/ml gentamycin in a 5% CO₂ incubator to clear the microorganisms remaining outside the cells. The antibiotic was removed by washing with 1×PBS. To examine the microorganisms which succeeded in penetrating into the epithelial cells, the animal cells were lyzed for 15~30 min in 500 µl of 0.1% Triton X-100. The cell lysates were spread over LB plates and incubated overnight at 37° C. so that the microorganisms that had grown could be counted. To calculate the invasion efficiency, 200 µL of the microorganism culture with OD_{600} =1.0 was also incubated.

Invasion Efficiency(%)=Count of Microorganisms invaded to Cell/Count of Microorganisms within Culture Medium (OD_{600} =1.0)×100

[0074] The BAT cell invasion efficiencies of the four transformed *Salmonella Gallinarum* variants prepared by the inactivation of virulence gene clusters were calculated.

[0075] Of them, the variant in which only the SPI-1 gene, cluster, responsible for cell invasion mechanism, was inactivated, was decreased in invasion efficiency by 84% compared to the wild-type. The SG3-d1d2 variant with the deletion of both SPI-1 and SPI-2 and the SG3-d4 variant with the deletion of all the four gene clusters were found to decrease in cell invasion efficiency by approximately 89% and 91%, respectively, compared to the wild-type *Salmonella Gallinarum* (SG3). The variants of the present invention were also remarkably reduced in invasion ability, in comparison to that of the commercially available live vaccine Nobilis SG9R. These data demonstrated that the inactivation of TTSS-related gene clusters decreases the virulence of *Salmonella Gallinarum* (see Table 4 and FIG. **2**).

TABLE 4

	Strain	Property	Genotype	Index of Internalization (%)
Control	MG1655	Avirulent	Wild type	2%
Group	SG3	E. coli Virulent Salmonella Gallinarum (Wild-type, SGSC No. 2293)	Wild type	100%
	Nobilis SG9R	Salmonella Gallinarum Live vaccine (commercially available)	SG::∆recA	67%
Test Group (avirulent Salmonella Gallinarum)	SG3-d1	Virulence gene-deleted Salmonella Gallinarum	SG:: ∆SPI-1	16%
,	SG3-d2	Virulence gene-deleted Salmonella Gallinarum	SG::∆SPI-2	34%
	SG3- d1d2	Virulence gene-deleted Salmonella Gallinarum	SG:: ΔSPI-1/ ΔSPI-2	11%

TABLE 4-continued

Strain	Property	Genotype	Index of Internalization (%)
SG3-d4	Virulence gene-deleted Salmonella Gallinarum	SG:: ΔSPI-1/ ΔSPI-2/ Δspv/Δfae	9%

(SG3 100% = 0.36% invasion efficiency in practice)

[0076] The avirulence of *Salmonella Gallinarum* variant SG3-d4 was confirmed in vitro test which shows extremely low in invasion efficiency into avian epithelial cells, as was reconfirmed in animal tests and the results are given in Example 4.

Example 4

Assay of *Salmonella Gallinarum* SG3-d4 for Avirulence by Measuring Mortality of Chickens

[0077] The Research Institute of veterinary Science, Seoul National University, was entrusted with this assay. One-week-old brown egg layers (Hy-Line chicken) were employed in this assay, and they were divided into many groups of 10 which were separated in respective chicken houses before infection with pathogens. No vaccine programs were used on the experimental animals after they hatched.

[0078] Five avian *Salmonella* strains including the wildtype *Salmonella Gallinarum* SG3 (SGSC: 2293), the virulent gene cluster-inactivated *Salmonella Gallinarum* SG3-d2 and SG3-d4 (identified to decrease in virulence by in vitro invasion assay), the commercially available live vaccine Nobilis SG9R, and the non-pathogenic E, coli MG1655 were employed in the in vivo assay. **[0079]** After being primarily seed cultured, the five strains were vigorously incubated for 4-5 hours to $OD_{600}=1.0$ in a main LB medium, and the concentration of each of the cell cultures was adjusted to 1.0×10^8 cfu/ml. The bacteria was subcutaneously injected at an adjusted dose into the chickens which were the monitored for two weeks for mortality. Subsequently, the chickens which were alive were autopsied to examine lesions and to isolate bacteria.

[0080] For the two weeks after artificial, infection of the pathogens $(1.0 \times 10^8 \text{ cfu/mL})$, the chickens infected with *Salmonella*. Gallinarum (SG3) were observed and showed typical external syndromes such as low motility, blue diarrhea and low uptake of feedstuff, and looked to be dying. The mortality was not high, but an autopsy disclosed lesions in almost all the chickens.

[0081] In contrast, the chicken group infected with the Salmonella Gallinarum variant (SG3-d4) the avirulence of which was proven by in vitro invasion assay were observed to actively move and not die although some of them had diarrhea during the two weeks. Also, they were found to have almost no lesions in the autopsy. Therefore, the Salmonella Gallinarum variant of the present invention was again proven to have greatly decreased virulence. The chicken groups infected with the SG3-d2 variant in which the gene responsible for primary invasion into host cells remains intact while the SPI-2 gene involved in systemic infection and survival over phagocytosis is inactivated, or with the SG3-ds variant in which the spv gene known to participate in pathogenicity is inactivated, were observed to have low or no mortality (%). Thus, even the inactivation of single gene clusters had a great influence on the reduction of pathogenicity (see Table 5).

TABLE 5

	Strain	Property	Geno- type	Mortal- ity (%)	Frequency of lesions in live birds (%)
Control Group	MG1655	Avirulent E. coli	Wild-type	0%	20% (2/10)
·	SG3	Virulent Salmonella Gallinarum (Wild-type, SGSC No. 2293)	Wild-type	20%	88% (7/8)
	Nobilis SG9R	Salmonella Gallinarum Live vaccine (commercially available)	SG:: ΔrecA	0%	40% (4/10)
Test Group (avirulent <i>Salmonella</i>	SG3-d1	Virulence gene-deleted Salmonella Gallinarum	SG:: ΔSPI-1	40%	17% (1/6)
Gallinarum)	SG3-d2	Virulence gene-deleted Salmonella Gallinarum	SG:: ΔSPI-2	10%	0% (0/9)
	SG3-ds	Virulence gene-deleted Salmonella Gallinarum	SG:: Δspv	0%	20% (2/10)
	SG3-d4	Virulence gene-deleted Salmonella Gallinarum	SG:: ΔSPI-1/ΔSPI-2/ Δspv/Δfae	0%	10% (1/10)

[0082] According to autopsy findings, the liver and spleen were swollen and weakened, with the significant frequency of greenish brown or bluish green liver lesions, in the chicken group infected with the wild-type *Salmonella Gallinarum* (SG3). Like the commercially available live vaccine Nobilis SG9R or the non-pathogenic *E. coli* MG1655, however, the virulent gene cluster-inactivated variants of the present invention (SG3-d1d2 and SG3-d4) were found to produce almost no lesions, and were demonstrated to be harmless to chickens.

Example 5

Comparison of the Productivity of ΦCJ1 Bacteriophage Specific to Salmonella Gallinarum Variants

[0083] Ultimately, the development of avirulent *Salmo-nella* stains is to apply to the production of *Salmonella*-specific lytic bacteriophages. The *Salmonella* variants prepared in Example 2 were proven to have greatly attenuated virulence in Examples 3 and 4. Finally, Φ CJ1 (Korean Patent Application No. 10-2008-121500/US20100135962), which specifically infects avian *Salmonella*, was used to examine a difference in bacteriophage productivity between the wild-type and the avirulent *Salmonella Gallinarum* variants.

[0084] The avian-specific bacteriophage Φ CJ1 was cultured on a mass scale, with the wild-type *Salmonella Gallinarum* strain (SG3) or the variant serving as a host cell. For this, each bacterial strain was cultured to an OD₆₀₀ of 0.5 (2.5×10^{10} colony forming units (cfu)) in 50 ml of LB broth in a flask with agitation. Φ CJ1 was inoculated at 1.25×10^{9} pfu (plaque forming unit) to form an MOI (multiplicity of infection) of 0.05, and allowed to stand for 20 min at 37° C, followed by additional incubation at 37° C for 4 hours. Chloroform was added in an amount of 2% of the final volume and shakes for 20 min. After passage of the supernatant through a 0.2 µm filter, the titer of Φ CJ1 was counted.

[0085] Φ CJ1 was produced at a titer of 6×10^{11} pfu/ml from the wild-type strain (SG3) and at a titer of 8×10^{10} pfu/ml from the avirulent *Salmonella Gallinarum* variant (SG3-d4). These data demonstrated that the avirulent variants prepared by inactivating virulence gene clusters have no problems with infection with bacteriophages and can be used as host cells for

SEQUENCE LISTING

<160> NUMBER OF SEQ ID NOS: 35 <210> SEQ ID NO 1 <211> LENGTH: 34934 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: Salmonella pathogenicity island-1 <400> SEQUENCE: 1 ttacgattta agtaaagact tatattcagc tatccttttt ttatgagcgg atatagagag 60 ttttttatcg tttagcataa cggcattgtt atcgaatcgc tcataaagcg tttcattctt 120 tttgtttact atactgcttc ccgccgccgg attggcctcc acatattcat ttaatcgttg 180 tacqccttqa qtatqtttqt aaaaactcac cqqcaqataa cqqtctqctt tatcqqacqq 240 gagaaaaggt tetteaceae acagaegtte acaaatatta tetteatgaa tttttaetaa 300 360 qttcataaat tcaaqctqaa qttttttqqc qaqcqccaqq ctaaaaatac cqcattcaqa

producing bacteriophages (see Table 6). In addition, Φ CJ2 (US 20100158870) and Φ CJ3 (US 20100166709), which were both developed by the same applicant, were produced using the variant as a host cell. The host cell was found to allow the production of Φ CJ2 at a titer of approximately 2×10^{10} pfu/ml and Φ CJ3 at a titer of approximately 5×10^{9} pfu/ml. Like Φ CJ1, Φ CJ2 and Φ CJ3 were produced from the variant of the present invention, without significant difference from the wild-type.

TABLE 6

	Strain	Property	Genotype	Production Titer of ΦCJ1 (pfu/ml)
Control Group	SG3	Virulent Salmonella Gallinarum (Wild-type, SGSC No. 2293)	Wild type	6 × 10 ¹¹
Test Group (avirulent Salmonella Gallinarum)	SG3-d4	Virulence Gene-Deleted Salmonella Gallinarum	SG3:: ΔSPI-1/ΔSPI-2/ Δspv/Δfae	8 × 10 ¹⁰

[0086] As described hitherto, the avirulent *Salmonella Gallinarum* variants, prepared by inactivating virulence genes, according to the present invention are useful as host cells for effectively producing *Salmonella*-specific lytic bacteriophages on an industrial scale with the advantage of cost saving. The avirulent *Salmonella Gallinarum* variants simplify the purification process taken to remove toxicity after bacteriophage production, thus greatly reducing the products. In addition, the variants can be used as live vaccines that guarantee higher immunological effects and safety than do conventional vaccines.

[0087] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

agagettegt	tgaatgtcca	gctcgaccat	agcaaaataa	caatcaggca	gttgttcacg	420
ttcaagagct	gctttggtcc	tcaacgccag	taaagcaggt	ccaaaagcgc	tacacgctgc	480
tggttcgaac	aaaatcaccg	atgtctttcc	gtccataact	ctaaaatcga	cgactgaaat	540
atggatacct	gaacttccca	tatttacgag	aaatcgggca	gattcaacgc	cttccattct	600
ggteteettt	atagaggaaa	caagctcatg	gactgacata	acaaatttaa	gatttaactc	660
tggatacttc	ttattggcct	gtgcaacaag	aaaaggcatc	atttcgagat	cggtttcctc	720
gtaactgata	tgaatccagc	tgccatctat	aatttcactt	tccagacgct	caacaataca	780
ggtcaatgct	tcggtgttta	geteeceget	gacgtcaggc	tgaggcgata	aactcgcccc	840
catattacga	gtcgtaggac	ttagcatact	tttccctcca	catgatagct	cctgcaccga	900
aaatatcatc	tttaactttt	cagattcaat	atattgcctg	caaaaatatg	cctcaatgat	960
tgagccaggc	taccaaccac	ctccggatga	ttatatataa	gaattactac	tcaaaaaatc	1020
tttttataa	taaaagctca	acacatggtc	ataaatgata	aaaaatattt	taattcattc	1080
ctaccgcaat	cggtaacgcg	caattatcgt	caggtacagc	agggttatgt	gcaaaagcag	1140
tgcgctgtaa	atgcgcgtct	agtttcagtc	cccggaacag	cgatagcggt	gaagagtcca	1200
tccccaaacg	atacataacc	ttcttacgat	aaatactgac	ggtttttgtt	cccagaccaa	1260
atttttcgc	cagttcaatt	gccggatgtc	cggaggataa	taatatcagc	agcgcatatt	1320
tcgcctgcgt	gacaccggga	ggtagattcc	accaggcgta	ttgattgata	ttaaacaata	1380
cctcttccgg	cgtctcgccg	gcattaaaag	catacgtagc	agccacggtt	ttcttttgtg	1440
gcctgtggca	gaaacgcagc	caggetteeg	gaagacggag	cttctctcgc	tccgagcgga	1500
tagcgcagga	tagttcgtct	tttaaaacat	aatccataac	gccaaaatat	tgcagcacac	1560
agcgatcgat	ataatacaag	cgatctgcca	ctaccaaaac	tttacggttc	tgcaaccgcg	1620
tcagcaacgc	atgaaaaaga	taaacatgct	catgcgggtt	caaagctaaa	atcagcccgg	1680
cgtccggcat	atcggataga	gaatgcaaaa	gtgcggttaa	tgagttacac	gttttaacgc	1740
acttttccgg	atatttttgc	ttaaaaatag	actgaagggc	ataacaatta	gtccagttaa	1800
taccgtatat	aattacattt	ctcatttatt	tatccttttt	tgaaaactga	ccacagette	1860
ggtaatgatt	tttcttcctg	ggcgactact	gcgcaagtag	ataacgcctt	cttactacaa	1920
aggtaataag	accagatacg	ttattacatg	cgcaatgtcg	ttaccgaaat	gaattccttt	1980
tacaaatctg	ataatgatta	aatttactgt	tttactttac	tgtaatctct	tagagtacaa	2040
cgattgcccg	gcgcctggtg	gccatgtatg	tctgacaatg	aacgctttcg	attccctttc	2100
attaactaca	tatcactggt	gtagcgatac	tgaaatatac	actacgatta	aaaaaatatt	2160
tggtatctgt	aacgcaaaca	gatagtaacg	tttaaaataa	tttcacaaat	caatggttca	2220
tcgtacgcat	aaagctaagc	ggtgtaatct	taaaatgccg	tttaaaaata	gcgataaaat	2280
aagaaggcgt	atcatagcca	cacatcgtcg	cgacttgtga	aatatttcca	gcccccatac	2340
gtaataattt	tatagcctga	ttcatacgag	catctaggta	tattttgcta	aaactcacct	2400
cttcagcggc	cagttttcgc	ttcagacttg	atacgctcat	aaacagcttt	cccgccacct	2460
cagcctgtga	ccatttgcgg	gtgagatcgc	tgataataat	gttataaact	ttctcttttg	2520
tcgtaatttt	tattgctcgc	tcaaggaaat	caaacccacc	gggcttacgt	acaaatgccg	2580
atataagata	catcaatgag	aaatatgaat	aatcatgatc	atcaatactc	acattactac	2640

con	tin	lued

				-contir	nued	
aaacccgtgg	acatgccaca	ccatgcaaaa	tagagtcaaa	agtatcactc	atccctggca	2700
acaagtccgc	atgaaaaaaa	tactttggtt	tcgtttttaa	tgatagctct	cgatcattat	2760
agtttcttgt	actgtaaaaa	actttgtaga	atttttgcat	taagtcatag	gaaacttcca	2820
gtgaagaaaa	atcaatatgc	ccttctattt	cgctcatact	aagcgtgatt	gtttgatctt	2880
tttccaataa	aaataaacac	ggcgcagatt	gttcgatgaa	ctccccaaat	tcgttttcaa	2940
ttcgcaaact	gcctttatta	agtttaaaca	ataagcagtt	tgcgacataa	tagtctctta	3000
cgtcagctaa	tccatttatt	aatggaaatt	tgttcggctg	ttgaaggtga	ttattgctaa	3060
tggcctcaac	tgatttattc	attgaaggca	ataccatatt	ttatcctgtg	tgctataagg	3120
aactcaaaat	cgttatattc	ttataaacaa	ataattaaaa	ctcacagaga	tgatttaaat	3180
ccgatttttt	tattattata	gccaataatt	acattccaac	gcgcgttcat	ttcgtcacaa	3240
aaagataccc	ttacaaactt	tatgcacaat	tttgtaatga	aagcttacaa	tattaatata	3300
atcatttcag	aataaaacgg	ctggcagaca	tcttaataat	ccatatacat	caataagata	3360
gacacactgg	catggtgcat	tttctgcatt	atttgctgat	atatacacca	taccttatca	3420
caaatcgcca	gcaatggggg	ttcaccagtc	aattgcctct	ttgttttccc	cgcccgataa	3480
aataatctcc	tgcatccagg	aggtcatttg	tgactgtgcg	ttcattgtac	caactaatac	3540
cccgtttaaa	gcctcatata	aatgggtgcc	cggttcaact	tttgctaaca	tgttttgtag	3600
catageegtt	tgctgctcaa	aagaaacaaa	agccgaatca	ccactgttag	gatctttgaa	3660
ggcattcatc	tcttgataaa	tgctatcttt	aagcgtttca	gaagaggctg	actcaggaag	3720
cgccagaagt	cgttggtaga	atgcatcata	aagatcaacg	tcgccgccat	tgcttaaagg	3780
cgcgctatcc	acattattca	gcatagcggc	cctggcactc	aacgaaacca	cacccgtcgc	3840
ttcagtatct	gctgtcggga	ccaaataaga	agtcggaatc	gtacccggta	tcaccttata	3900
acctccgctt	gcgtttttgt	cttccattca	tcaataagtg	cgttaatggc	gttatcagaa	3960
attgtccggc	agtcttgtgg	aagttcatca	agatgatgct	taatgacgcc	tactgccgtt	4020
tcaacaaatt	gttcaggtga	aaattctgcg	atctgatcgc	cgcaactcat	gataaagcgc	4080
tgttcctgat	gatatttaag	attaaaagtg	cctggccagt	tctccataag	caacaccatc	4140
agtttttggt	gatcttttt	cgcattaact	ggcagtgtta	aaaaaagttg	cccctcaggc	4200
ttatcgaaat	cccttagcca	ctcatccagg	acggttaaaa	gcgtttcggg	atggtcgacc	4260
gcagctgaaa	ataactcgcg	ggcataaatc	tgtattttt	ccatccactt	ccaggccatt	4320
gtctgattat	cagtaagata	agcggcgacc	tgctgtaacg	cgtctatcat	tccctgctcg	4380
taaccttcct	gataggcgta	catccgcaag	gtctttgcct	cttcttccgc	ctctcgcaaa	4440
atacgcttag	cccgttgatg	cgcctgctgt	tctaatcttt	caatagagaa	ataacgttcc	4500
agcgttttac	gctttatcag	tatcccctca	acaggcgaaa	gcggggacgg	tattgggata	4560
tttttgagca	tattgtaagg	ccagtagcaa	aattgacatt	tctacagcat	cctgcttcaa	4620
tgcctcctca	ataaatggag	gaaaaagcaa	aggaaaacgc	tgtgctaaag	attcaggtaa	4680
aaattcattt	agggcattta	actgtgcata	cccgacgcta	agtaaaaacc	ggtgattcgg	4740
cgccttattg	cagacagata	aacttgttcc	ctgatgcatt	gccaaaaatg	cttgcgccca	4800
atccggcagg	ccaagcaagg	ctccctgcct	tgccagatcg	gctctcagtt	tatggcaacc	4860
gagtaaatac	gctacctgcg	gcagtcggcg	ccactgacgc	agccacagct	gcgtcagtga	4920
gttttgaata	cactcctttt	ctccgttctt	aagccgccat	gccgccagta	ttaactcatt	4980

-continued

tgccgccgcc	ctggcggcgg	gtctgacaat	catttccggc	gctatctgca	accgctgagg	5040
atggatatac	gataacggat	caaaaatgat	tctttgccag	ataatgggta	atggctgcct	5100
attcatttga	cgatttcgcc	ttatcatcag	ccgttatgcc	tttcttattg	cgggcataat	5160
ggtttttgta	ataccagacg	ccaaagcctg	ctgacatcac	ggataacaaa	ataatcaaca	5220
caatccaact	ggttgcaaaa	gaattacgtt	ttactggtgt	gccgggagcc	tgtaattggg	5280
catcagaacg	ttctgacaac	acaacagaaa	tgttgtcata	atccacatcg	gcaaaactat	5340
tctttaagaa	acgcttgata	tcgctgatct	gatgcgcaag	cggcgaacct	cgttcatata	5400
cggctaatgc	cgacagatga	acaggttttg	gcggacggcc	attttcacca	gcatcaatat	5460
cataactaat	atggaccctg	gcggagagca	cgccctccat	cgtctgtaat	gactgttcca	5520
gtcgctgttc	aatagccgaa	tataacctgg	ccttttcagc	tcgcggagac	gataccagcg	5580
aatccgccgg	gaacatctgc	gctatttcca	cccgtggccg	gggaggaagc	tgataagttt	5640
taatccagta	caccgcagcg	gtaaaatcag	gctcagcaac	ggtaatgcta	tagcccaatt	5700
ttccgctatc	aattttattc	gcctctatat	tgtgcatttg	cagaacggca	atgacctcat	5760
tagcctgttc	ctggtccagt	ccttttaaaa	gatccttatc	cttacageeg	gcaagggtca	5820
ttaccagcag	aaaggtatat	agatatcgac	gaatcatgag	cgtaatagcg	tttcaacagc	5880
cccgactcct	ttacgagtaa	gggtacttac	catagaaaca	tacaggttat	aatctgaaat	5940
catctcttgc	gaaatagcca	gctctttagg	atccgtcacc	agattagggt	cctcaatcct	6000
gttggtaatc	gtctgtttat	ccacagccgt	ggcaatcgcc	gaaccagaaa	aagcctggag	6060
tagccggtca	tccagcgaga	caatgtccgt	ctccatagac	ctgatattga	ccgcctgccc	6120
tataacggca	ttctctggga	caatagttgc	aatcgacata	atccacctta	taactgatta	6180
acggaagttc	tgaataatgg	cagcatcaat	atccttaaag	acttttaccg	tgttcgattg	6240
cgcgttacgg	tacaagttat	attccgagag	cttactctga	tacgccgcca	gtagegeegg	6300
atcggagggt	tttgctgcta	atttatccag	cgcctctgtt	acctgcgttt	gtagattatc	6360
aacgcccgta	tcaaattttg	ctgagacgtc	atccagatag	cctgaccaag	gtgttgccat	6420
aatgacttcc	ttatttacgt	taaattaaag	tgggcttggg	aaataccaat	ggcctgggct	6480
cattttgata	taaccttccg	ccccgtactg	aaatgagcgc	cccttgagcc	agtcatcttt	6540
taattcgatc	gcaaactgca	catagcgtcc	tccccatgtg	cggtaatagc	tatcgacaaa	6600
ttgacgggct	ctgagtattt	ctacatcatc	gagegeeeee	tgaataacaa	acgttacgcc	6660
ccccttatga	ttcctgcggg	aataaggtaa	cgcctgctgt	tttagccccg	cttccgcctg	6720
gcctgctgcg	gtaacatcgt	ccatcaacgt	gatgttaacc	gaatccgcgt	aaggcattag	6780
cgctctcagc	ttttgactta	acatctcgag	ctctttcttg	ctcatcgtgt	ttcgctggcg	6840
gcttagccag	aaaacgggtt	tacgcggctc	atcgaaatga	atccgataat	aagccagctg	6900
cggataatag	gtatccagcc	agatagagat	acgcttattt	tcttcgtttt	cgttaatcac	6960
tcgcgcattt	ttatcataat	cgcccctcgc	taaaacctga	cgagcccaca	gcgtatctct	7020
ttcattttgc	gcagcgacat	agagcatttt	gtcccggcct	ggcaacacct	gaaaacgctc	7080
cttctcctgc	cccaataacg	aatcgagctc	tgcggcctgc	cgctgcggcg	agttaagtat	7140
ccataacgtc	cccacagtcc	caattcccaa	tataaaaaac	ccggccagtg	ctgctacaat	7200
tccgttttta	aaacgcggct	cgttctttt	tgcagacgtt	tctaacttct	caggctgctc	7260

-continue	a

				-contin	nued	
gggcacco	ac ggctcgctt	t ccgggcgaat	caggataagc	aattcaccga	cctgtattgg	7320
cgtattta	at tgcaccgaa	c gagattcaga	atttccttct	ttcagctcat	ggagtataat	7380
ttcggtcg	ita teegtatee	a cctggatttc	aaaatttact	ccgccatggt	ccagcgggat	7440
aaaaaago	ta tcggcaggt:	a tatcagggag	ttggcctgaa	gcagtgagcg	catcactctg	7500
acctacca	ıca aagagtgtt	c ggcctgtcag	caatggaaac	tcacagccgt	tcagtgagct	7560
gttaagta	at cgaactatg	t atggcccagg	gcttgttatc	gtcttctctt	ttgatgtttc	7620
catatata	ict gttagcgat	g tetgtegtte	tcgatagcag	cagattaccg	cacaggacac	7680
agggatto	ct gatgaaaat	a gaatgaaaag	tgagaaataa	aatcaattta	ttctgtataa	7740
tgcgtcto	aa cacatatta	a aagaaccatc	atccccattg	gggcttaaac	tactgtagat	7800
aaattaco	ca aatttgggt	t cttttggtgt	aacaatcaga	ccattgccaa	cacacgctaa	7860
taaagago	at ttacaactc	a gattttttca	gtaggatacc	agtaaggaac	attaaaataa	7920
catcaaca	iaa gggataata	t ggaaaatgta	acctttgtaa	gtaatagtca	tcagcgtcct	7980
gccgcaga	ita acttacaga	a attaaaatca	cttttgacaa	atacccggca	gcaaattaaa	8040
agtcagad	tc agcaggtta:	c catcaaaaat	ctttatgtaa	gcagtttcac	tttagtttgc	8100
tttcggag	jcg gtaaactga	c gattagcaat	aatcacgata	cgatttactg	tgacgaacct	8160
gggatgtt	gg tgctcaaaa	a agagcaggta	gttaacgtga	cgcttgaaga	ggtcaatggc	8220
cacatgga	itt tcgatatac	t cgagataccg	acgcaacgac	ttggtgctct	ctatgcactt	8280
atcccaaa	icg agcagcaaa	c caaaatggcg	gtacccacag	agaaagcgca	gaaaatcttc	8340
tatacgco	tg actttcctg	c cagaagagag	gtatttgaac	atctgaaaac	ggcgttctcc	8400
tgtacgaa	ıgg atacaagca	a aggttgcagt	aactgtaaca	acaaaagttg	tattgaaaat	8460
gaagagtt	aa ttccttatt	t tctgctgttc	ctgcttactg	cttttctccg	actcccggag	8520
agttatga	ıga tcatcctta	g ctcggctcag	ataacgttaa	aggagcgcgt	ttacaacatt	8580
atatette	gt cacccagta	g acagtggaag	cttacggatg	ttgccgatca	tatatttatg	8640
agtacgto	aa cgctcaaac	g gaaacttgca	gaagaaggta	ccagctttag	cgacatctac	8700
ttatcggo	aa gaatgaatc	a ggcagcaaaa	cttttacgca	taggcaacca	taatgttaat	8760
gctgtago	at taaaatgtg	g ttatgatagc	acgtcctact	tcattcaatg	tttcaaaaaa	8820
tatttaa	aa ctacgccat	c gacattcata	aaaatggcga	accattaaca	ttttttgtat	8880
ctgtcact	ta agtaaagat	t tttattaaaa	ttgtaataat	ttaaaattca	gactgcgcat	8940
taacacgo	tc tatcaggat	g ggaggctatt	caatatcatt	gttctgtccg	gaagacagct	9000
tatactga	ita tctctggta	a tttaaagtaa	ggctgattat	ataacacgat	ttttgtgaac	9060
ttgtcato	gc tatgatgac	t ggtaaaacga	tattgcctta	ttcacagcgt	aagaattcgt	9120
ccagatga	ica ctatctcct	t ccggctttaa	ccctgtggat	taaggccggc	attttattca	9180
tatttata	ica tcatccgtt	c cctctgagaa	ctatttgcct	gaacggttta	taccgaaaca	9240
gtcacgct	tg ttagctttc	t gccaggcata	cctcctctct	tcctcctgat	atcgatataa	9300
tgeetgge	gc cageetgag	g atgatactgc	tcataaaccc	cctgcctttt	tgacgctata	9360
actgaago	ıga gtaaagaaa	a gacgatatca	ttattttgca	aaaaatata	aaaataagcg	9420
caccatta	aa aacagtctt	t catttatatt	ttggaaccta	agacaaatta	cactcttaaa	9480
ctttcaad	ga atggtcatt	t agtggaaatc	ttcgagaaaa	atggttctga	tggtgtaatt	9540
atcagaco	at taaccatga	a gatataataa	gcagcattta	caccccaaaa	aaatgcagta	9600

-continued

agatagetae aaaactaate tetattgeaa tgaggeeaag ttaaatatgt aaatatttag 9660 atgccaggcg ctgactctct ctgcaccagg atatacggca gcgtccattc gataatcacg 9720 gttagttata acaatattat taccaacatg tcagttattt aaagcacagg cataagctaa 9780 ataatcaaat gttaaaaaca tataaacccg agcccgtaga atatgacatt aagctcataa 9840 taaaagetea acetgacegt tagtactaac ageagaatta etgaaacagt agattetate 9900 9960 ctaacqactt qtattaqtta ttataacttt tcaccctqta aqaqaataca ctattatcat gccacatttt aatcctgttc ctgtatcgaa taaaaaattc gtctttgatg atttcatact 10020 caacatggac ggctccctgc tacgctcaga aaagaaagtc aatattccgc caaaagaata 10080 tgccqttctg gtcatcctgc tcgaagccgc cggcgagatt gtgagtaaaa acaccttact 10140 ggaccaggta tggggcgacg cggaagttaa cgaagaatct cttacccgct gtatttatgc 10200 cttacgacgt attctgtcgg aagataaaga gcatcgttac attgaaacac tgtacggaca 10260 gggctatcgg tttaatcgtc cggtcgtagt ggtgtctccg ccagcgccgc aacctacgac 10320 tcatacattg gcgatacttc cttttcagat gcaggatcag gttcaatccg agagtctgca 10380 ttactctatc gtgaagggat tatcgcagta tgcgcccttt ggcctgagcg tgctgccggt 10440 gaccattacg aagaactgcc gcagtgttaa ggatattctt gagctcatgg atcaattacg 10500 ccccgattat tatatctccg ggcagatgat acccgatggt aatgataata ttgtacagat 10560 tgagatagtt cgggttaaag gttatcacct gctgcaccag gaaagcatta agttgataga 10620 acaccaaccc gcttctctct tgcaaaacaa aattgcgaat cttttgctca gatgtattcc 10680 cggacttcgc tgggacacaa agcagattag cgagctaaat tcgattgaca gtactatggt 10740 ttacttacgc ggtaagcatg agttaaatca atacaccccc tatagcttac agcaagcgct 10800 taaattgctg actcaatgcg ttaacatgtc gccaaacagc attgcgcctt actgtgcgct 10860 ggcagaatgc tacctcagca tggcgcaaat ggggattttt gataaacaaa acgctatgat 10920 caaagctaaa gaacatgcga ttaaggcgac agagctggac cacaataatc cacaagcttt 10980 aggattactg gggctaatta atacgattca ctcagaatac atcgtcggga gtttgctatt 11040 caaacaaget aacttacttt egeceattte tgeagatatt aaatattatt atggetggaa 11100 tcttttcatg gctggtcagt tggaggaggc cttacaaacg attaacgagt gtttaaaatt 11160 qqacccaacq cqcqcaqccq caqqqatcac taaqctqtqq attacctatt atcataccqq 11220 tattgatgat getataegtt taggegatga attaegetea caacaeetge aggataatee 11280 aatattatta agtatgcagg ttatgtttct ttcgcttaaa ggtaaacatg aactggcacg 11340 aaaattaact aaaqaaatat ccacqcaqqa aataacaqqa cttattqctq ttaatcttct 11400 ttacgetgaa tattgteaga atagtgageg tgeettaceg aegataagag aatttetgga 11460 aagtgaacag cgtatagata ataatccggg attattaccg ttagtgctgg ttgcccacgg 11520 cgaagctatt gccgagaaaa tgtggaataa atttaaaaac gaagacaata tttggttcaa 11580 aagatggaaa caggatcccc gcttgattaa attacggtaa aatctgagag aggagatatg 11640 cattattttt ttatcatcgt aatctggttg cttagcataa atacggcatg ggctgattgc 11700 tggcttcagg ctgaaaaaat gttcaatatt gaatccgaac tactttacgc tatcgcccag 11760 caggaatcgg cgatgaaacc tggcgccatt ggtcataacc gagatggttc aaccgatctt 11820 ggcctgatgc aaattaacag cttccatatg aaaaggctga aaaaaatggg gattagtgaa 11880

awacagityi tacaggaco otgoattiot gtoattigtig goottocat titatoagat 1940 atgatgaaa totaoggita tagotgigg goottogog ottataatgo oggacgoog 12000 cogaacegat oggatatag gaacgitat gotaaaaaa titggiggaa tiacegaaaa 12060 titaaaggaa tgtoageag agagaaaac aaagactit ottacoogto aaacaataa 12100 titataaggaa tgtoageag agagaaaac aaagactit ottacoogto aaacaataa 12100 titataaggaa tgtoageag agagaaaac gaaagtat gotaaaatti titatoaget 12240 tocagotot taageaacig goottoogt ocutoto oggitotoo cactoogooo 12360 agacaatgaa tootagea aggoogoo gootogto oggitotoo cactoogooo 12360 agacaatgaa toatogea atgottaot gagactaa gootagoog goottoog 12400 titataatti tootaagta atgottaot gagaata cogtacoog goottoog 12400 titataatti toacootao oggoagtat totaatgat cogtagoog taaogoog 12400 titatatti toacootao oggoagtat totaatgat cogtagoog taaogoog 12400 titatatti toacootao oggoagtat totaatgat cogtagoog taaogoog 12600 tiggatagea cotogooga taoogoog atcoogoo attottoo coccesagao 12600 tiggatagea cotogooga taoogoog attotaatga cogaacog taagoota 12780 goottoogo taaogoog atcoogooga tittiggi aggacca tittigoo 12600 tiggatage cotogooga taoogoog gootoottit tocaogoo cagtoogo 12780 goottacog toaaagtaa ogtattoat goocaaace gigcaggoo cagtoogi 12800 cogottacog toaagata ogtattoa goocaaace gigcaggoo cagtoogo 12800 cogottacog togaagaa tiggoogoo goottatti tocaagte agottaaa 12960 titticagti cittageat agotgoog goottatti tocaagte agottaaa 12960 titticagti cittageat agotgaat tigtoacaaac gigcoogoo cagtoogo 13800 gootaccoga cogaatti gitaacata cattagaagaa gigaacegi 13800 gootaccog cogaatti gitaacgit gaacaaag cagoggoo gitacca 13200 goottoot gaagtitta coacaace tittocacea gigaagaa gigaaaga 13200 goottoot gaagtitta cogaattog ataagag tigticatti tagogaa 13200 goottoot gaagtitta cogaatag ataaggi gitaaggi gitactit titacgiga 13200 goottoot gaagtitta cogaatag ataaggi gitaaggi gitactit taaggaa 13200 goottoot gaagtitta cogaatag ataaggi gitaaggi gitactit taaggaa 13200 goottoot gaagtitta cogottoo coattitto cogaaa 13200 goottoot gaagtitta cogottoo coattitto cogaaga 13200 goottoot gaagtitag cogaatga gitaaggi gitaggi					-contir	nued	
ccgaaacgat cggatatag gaacgtat grtaanaa tttgggaga ttacagaa 12060 ttaaacgga tgtaacga agagaanac aaagactt ctataggta aacaata 12120 ttatacaga atagetact teagatag tetaaagta agetatgtt ttatacaget 1210 geogtegta taageaactg ggetggat gettegt gatetagtt ttatacaget 1210 teagaatt ettagtog tgaateegg aaacetgea gtacetgee cagatacta 1200 gagaatgaa teateggta atgettaet gatgaatae geeeggee geeatetgg 1240 teagaatgaa teateggta atgettaet gatgaatae geeeggee geeatetgg 1240 ttatatt teaceetae egeeggtt teaaagta egegtagg 1240 ttatatt teaceetae egeeggtt teaaagta egegtagg 1240 ttatatt teaceetae egeeggtt ettagt eeggatgee 1250 agttgee aattttea atgeatae gggatgga ateetgee geeattteg 1260 ttgatetgee aattttea atgeatae gggatgga ateettte eegeagge 1260 ttgatetgee eatetteae atgeatae ggaatgaa atgetteet eegeagge 1260 ttgatetgee etteggee taaceete eeggaatgag atgetgee attettte aagaageat 12720 tteatage ettegeegg taaceete egeaggee geeatette eegeagge 1260 ggettaege ettegeegge taaceete ggeeaggee attettte aagaegeat 1270 tteatage ettegeegge ateeggeega tteetaegee tagteegg 1280 eegeetaeg etgeeagge atgetgeeg etteetage agetgeeg 1290 ceeeteag tegeaggee tgeeagee egeaggee gatgeegg 1290 eegeeteeg tegeaggee tgeeagee teetagte agetgeeg 1290 ggettaeeg tegeaggee tgeeagee geeaggee gatgeegg 1300 gedaettae tegeaggee tgeeagee teetagte agetgaae 1300 gedaettae tegeaggee tgeeagee teetagte agetgaae 1300 gedaettae tegeaggee tegeagee geettee 1310 ggagetttae caaceeae tegeaggee getaeeteg 1310 gedaettet ttagateg egegatae gataagget getaettee tgeeagge 1300 eetaeceeg tetegeea ttegeagee gegatate getaaggee geadeeteg 1320 gedaettet tegeagatge tegeagee gegatgee attettee tgeeagaa 1320 gegaattee tegeagatge tettegee egeette tgeeagae ggeateeteg 1330 attaaegge gedeatee egegttee coattttee egeaggaa 1360 gegaaattee ttegeageetge taaegtge gataaggee geaageetge 1330 attaaegge gedeatee egetgttee coattttee egetagae 1360 gegegaaat atteetgee tteetgee tegegaat ettetegeagaage 1360 gegegaaat atteetgee tteetgee tegetgaa tetteetee taaegee 1370 acaecaaet tateetgee tteetgee taaegtge gedaaate tettegeag aagettee 1370 gegeatea	aaacagttgt	tacaggaccc	ctgcatttct	gtcattgtgg	gcgcttccat	tttatcagat	11940
ttaaaggaa tgtcagcaga aggaaaaac aaagactt clatcocgtc aacaataa 12120 ttatacagaa tagctact ttcagatagt tctaaaagta agctafgtt ttatcagogt 12180 gcogtogta taagcaactg ggettggat gotttagt gtacaactg tgaggogte 12240 tccagcatt clattgtoog tgaattoog gaattoga gtactgtoo cactoogoo 12360 agacaatgaa tootogtaa aggocogo gcoatogto cggtotoo cactoogoo 12360 agacaatgaa tootogtaa aggocogo gcoatogto cggtotoo cactoogoo 12360 agacaatgaa tootogtaa atgottact gatgaactac gocoggog gcoatttgg 12480 tgatotggoc aattttoo dgocaggta totaactgat cogtagog taacgogtg 12480 tgatotggoc aattttoo atgocataco gggattgtat acogottto cocogaagaa 12540 agtgoatat tgtattggt tatogotto coctgactgg ctgagctoa ttttggot 12600 ttggtatgoa cotogoca gggtagot coctogaat agggtggta ttgtttgoo 12600 ttggtatgoa cotogoca aggtgagot coctogaat agggtggta ttgtttgoo 12600 ttggtatgoa cotogocag toogooga ttottggog taacgoog taatgooa 12700 ggottacogt caaagtaa ogtatoat ggocaagga ttocatogt cagttaca 12700 ggottacogt caaagtaa ogtatoat ggocaagga ttocatogt cagttaca 12800 tgggttgot gataattgg atgotgot gaccogaaco gtgocaggo cagtgog 12800 cogotcatog totgtggaa tggoogoo gottotatt totcaagto agottgaa 12900 godottat caaccoact ctoaccot cococacagg ttoccattg tgagaacog 13000 gcatacoga cotgaaatt ggtagatt gtgacataa cattaagttg ttageoto 13140 ggaatttat ttaaatotg taaatogta ttottaca gcocggog cgtacotta 13200 gocactot ggaagttto togoagota ttotcatoo ttugtocag 13000 gotaccoca ciggaattt gtuaagt gtaaggt gctaattt cgocacaa 13200 gtottata gtocotta gocgatatog agtaaggt gctaattt cgocacaa 13200 gtottata agtocotta gocgatatog agtaaggt gtaattat taacgaga 13500 attaacagg ogtatat cgcogatat ggagaggt gtaattat 1340 caaccaact tatootgo chaacgt gg taaggt gtaattt cgatagaa 13500 gtottata attaoctgo ctaatagg gtaaggt gtaattto 13600 agcacaat tatootgo ctaatagg gtaaggt gtaattta 13600 agocacaat tatootgo cagtatta attacaga caaggtaa 13500 gtotgtaaa tottogo agaattto ttagaaat aagtogga aaatttoo 13600 agocacaat tatootgo cagtatta attatoa attotoo caattao 13600 agocacaat totoo gaagatt tutocaago cagtataa cattagaga 13500 gtotgtaaa tatoo gagaatttoo ttagaaat aagtogga aaattoo c	atgatgaaaa	tctacggtta	tagctgggag	gccgttggcg	cttataatgc	cgggacgtcg	12000
ttatacagaa atagottact ttoagatagt totaaagta agotatgtt ttatcaggt 12100 googtogtoa taagoaactg ggottgoat gootttagt gtacaaactg tgaggogtot 12240 tocagott tattgtucg tgaattogg aatotgoa gtacotgot cagattacta 12300 gagaatgaa toatoggaa atgottact gatgaacta goocgogog gooatttigg 12420 ttactattt toacootat cgocaggta totaactgat cogtagacgg taacggotgg 12400 tgatggoc attttcac atgocatact gggattgta cogottto coccagaga 12540 agttgota tgatatgt tatcgotta cottgaat gggtggga tatgtttig 12200 ttagtatgo cottgacagga tatcgoatac gggatggt acgggtgg 12400 ttggtatgo cottgocagg taccgocgt cottgaat gggtggga tigttoteo coccagaga 12540 agttgota tgatatgt tatcgotto cottgaat agggtgga tigttoteo 12200 ttggtatgo cottgocag gtatagot cottgaat agggtgga tigttoteo 12200 ttggtatgo cottgocag gtatagot cottgaat agggtgga tigttoteo 12200 ttggtatgo tgocagog atcoggot tittiggg agoagga ttoatgoca 12700 ggottacog taaagtta ogtatoat ggocagga ttotatog cagttoca 12700 cogotoatog toaaagta agotgotg acggoagga tocatogot cagtogga 12900 cogotoatog totgogaga tiggogog gottotatt totcaagto agotgaa 12900 titttoagt cittagoat agotgog gottotatt totcaagt agotgaa 12900 ggaggttta caacocac cotcaccac glocaggo cagtgog 13000 ggaatttat taaattog taaatogt gtacatat cattaagt fitagaacag 13000 gocatcoo ggaagttt totgoagga attotot googgog ggagogga 13000 gocatcoo ggaagttt totgoaggat tittaaaga goagoggo gtacotga 13200 gocatcoo ggaagttt totgoaggat tittaaaa cattaagt ggagata 13200 gocatcoo ggaagttt cogoaggatag gaaaggt gottactt tgocoaaa 13320 togttattt tittaaattog taaatagg gocatoga agottaa 13200 gocatcoo gaagttt cottaatagg tittaaaca cittgoag agottaa 13400 caccaaga tatcottgo citaatag gtaaaggt gottactt taaaggaa 13600 gtotgtaaa tottgo cogtatto cotaattti cogtagga adottaa 13400 caccaacat tatcotgo taaaggtg gtaagggt tgtcatat taaaggaa 13600 gtotgtaaa tottgo cogtatog agataggt tattato 13400 caccaacat tatoctgo caacgt aatttoco totaattti cogtaga agotgaa 13600 ggogcaacat atgoctaa cogtgtico coatattti cogtagga aatttoa 13600 ggogcaacat atgoctaa cogtgtato cocatatti cogtagaa aatttoco 13400 aacacaact titgaaacga agacacgt aatttoco tataata 138	ccgaaacgat	cggatataag	gaaacgttat	gctaaaaaaa	tttgggagaa	ttacagaaaa	12060
georgeorgeorge a taageaacty geortegaat genteraatty georgeorgeorge caatty georgeorge georatogte cagatteet a 12200 tyaggatta eettaagtae aaggeorgeo georatogte egyteteee cagataeeta 12200 tyaggatta eettaagtae aaggeorgeo georatogte egyteteee caatty 12200 taatattt teaceetate egoraagtat taaaetaga eegorggo georatityg 12400 tyategyace attettee atgeoratee gegaatget acegottee eegorgageorg 12400 tyategyace attettee atgeoratee egyaatget acegottee eegorgageorg 12400 tygtetgyace attettee atgeoratee egyaatget acegottee eegorgageorg 12400 tygtategoe attettee atgeoratee egyaatget acegottee eegorgageorg 12400 tygtategoe attettee atgeoratee egyaatget acegottee eegorgageorg 12400 tygtategoe etteegorge taaceecae aggeorgage etteettee aagaegeat 12720 tecatageorg egorageor ateegoegta tettetgeg egoraeeego taatgeorae 12780 geortaeegt eaaagtta egtateet georaegea tecateget eagtteae 12840 tyggettge gattaateg aatgetgety acegoraeee georgeorge etatgeorae 12840 tyggettaeegt eaaagtaa egtateet georaegea tecateget eagtteae 12840 tyggettae tetgeorge ateegoege gettetatt teteaagte ageorgea 12840 tyggettae ettegogaat tegeorgeorg gettetatt teteaagte ageorgeage 12840 tyggettae ettegoat tegeorgeorg gettetatt teteaagte gagaacegg 13080 getaaceega eetgaatt tettaaegt georgeorge etteaatt eataagteg 13200 gedatetta taaateetg taaateegt atteatgaa georgoggee getaeetgaa 13200 gecatecee ggaagttte tegeorgeorg etteetatt tegeorgeorg getaeetga 13200 getaeteet gagagttte tegeorgeorg etteetatt tegeorgea 13300 acaceaaeat taeetteg etaaatget gedeorgeorg etaettee 13300 attaaeegge geetataae egetgeget tegeorgea atgeorgea 13300 attaaeegge etettaae egetgetge taategea aggeorgea atgeorgea 1360 getgetataa teettege taaaegteg gtaaagget tegteaata taategegaa 1360 gedeoraeae tateeetge eegstatee eegstaaae ettegea aaggetgaa 1360 getgeoraeae tateeetge eegstatee eegstaata eetteege aaatteee 1360 gegeoraeae tateeetge eegstatee eegstaata eetteege aaatteee 1360 gegeoraeae tegeorgea tetteeege eegstaata eetteeet 13600 aggeatatee tegeorgeat aggeaeette taategea aaatteee 1360 gegoeraeae tegeorgea agaea	ttaaaaggaa	tgtcagcaga	agagaaaaac	aaaagacttt	ctatcgcgtc	aaacaaataa	12120
1230012303123041230412304123041230412304123041230412304123041230412304123041230512305123061230612307123071230812308123091230912301123011230212304123041230512305123061230612307123081230812309123091230112301123021230312304123041230512305123061230712308123081230912309123011230112302123031230412304123051230512306123071230812309123091230912301123011230212303123041230412305123051230612307123081230912309123091230012301123011230212303123041230412305<	ttatacagaa	atagcttact	ttcagatagt	tctaaaagta	agctatgttt	ttatcagcgt	12180
tgagattat cettagta agggegee geategte eggtetee eggeeggee geatette 12360 agacaatgaa teateggta atgettatet gatgaactae geeeggeeg geattteg 12480 ttactattt teaceeta egeeaggtat tetaactgat eegtagaeg taaeggetg 12480 tgatetggee aattteae atgeataee gggattgat acegettte eeggagga 12540 agttgeat tgattggte tacegette eeetgaat agggtggta ttgtttgee 1260 ttggatege eetgeegget taceaceae aggeatgag attettte agaageat 12720 tteatageg etgeeagget taceaceae aggeatgag attettte agaageat 12720 tteatageg etgeeagge aceggegga tttttgggt acgacegge cagtteget 12840 gggettaee gatagege aceggege getteatt tereaggee cagtteget 12840 tgggttget gataatgg aggetgee geteeaggee tereaggee aggetgag 12840 gggettaeeg etgeeaggee aceggege getteatt tereaggee cagtteget 12840 tgggttget gataatgg aggetgee geteeaggee geteeaggee aggetgage 12840 gggettaeeg tereageet tggeeaggee geteeatt tereaggee aggetgage gggettaeeg tergageat tggeeagge geteeatt tereaggee aggetgage gggettae cacecaee eccaecee eccaecae geeagggee gataeetgaa 13200 gegaettat eaacecaee tergaeeta tergaeae geeagggee gtaeetgaa 13200 geeateee ggaagttte tegeagget gteaatage geagggee gtaeetgaa 13200 geeateee ggaagttte tegeagget gteaagget getaeette gatagae 13260 gteetttaa gteeettag eggataee geageggee gtaeetgaa 13200 geetateet ggaagttee tergaget ttetaaege ergeggee gtaeetgaa 13200 geetateet ggaagttee tegeaget geetaette tegeteaaea 13200 gedattat tetegeeae tttgttee geetaatte tgtteaagae 13260 gteetttaa gteeettag eggataeeggeeggee gtaeetgaa 13200 geetatett tetegeeae tttgttee ergeaggeget gtaeetgaa 13200 geetatett tetegeeae tttgttee ergeaggegee daaggeeggee gtaeetgaa 13200 gegeaaat tacetteg etgaagteg eggataee ettegeaaa 2320 gtegtaaa tetegeae geeggeeggeeggeeggeeggeeggeeggeegge	gccgtcgtca	taagcaactg	ggcttgcatt	gcttttagtt	gtacaaactg	tgaggcgtct	12240
agacaatgaa teateggtaa atgettatet gatgaactae geeeeggeeg geeatttgg 12420 ttaeetattt teaceetae egeeagtat teaaetgaa eegetagaegg taaeggeegg 12480 tgatetggee aattttee atgeataee gggattgtat acegetttee eegeaggae 12480 ttggtateg eeteegaag gtgtagete eetetgaat agggtggtaa tigtttigee 12660 ttggtatgea eeteegaeg taaeaeeae aggeatgage attetttte aagaageat 12720 tteatatgee etgeeageg ateeggegat tittigggt aegaeeage taatgeeae 12780 ggettaeeg eigeeageg ateeggega tittigggt aegaeeaeg eigeeagge aatgeeae 12780 ggettaeeg eigeeageg ateeggega tittitteggt aegaeeaeg eigeeagge eagtgeegg 12900 eegeteateg tegeageg tiggegeeeg getteattt teraagte agetgaaea 12960 titticagte eigeiggeat tiggegeeeg getteattt teraagte agetgaaea 12960 titticagte eigeiggeat tiggegeeeg getteetatt teraagte agetgaaea 12960 titticagte eigeiggeat tiggegeeeg getteatt teraagte agetgaaea 12960 gegetaeeg tegeaggeat tigtaaeat eateaggetg taaeeaegga 13020 gaggetttat eaaeeeae eigeiggaat tittitaeg eeggegee gitaeea 13020 gaggettae eigeiggeat tigtaaeat eatagaag eeggeggee gitaeeea 13140 ggaatttat taaatteg taaattegt gaaeataa eatagaag gegaedeeg 13380 acaecaaeat taeettig eigeiggeg eigeigtaat titteeag eigeiggee gitaeeea 13320 tegttattt tittegee eigeagget tittaaaee eiteegagaaa 13200 geeatetee ggaagttite tegeaggeta titteeatee titgeteagaa 13200 geeatetee ggaagttite tegeagget gataagget gettaette tigeeggaaa 13200 geeatetee ggaagttite tegeagget gataaggef gettaette tigeeaaaa 13320 tegttattt tittegeea tittgatee eigeaggege tigteaaa 1340 eaceeaaeat taeeettig eigeagae gigtaaggef tigteaatat taaeggaa 13500 gitegtaaaa tegteettae eigetgig taagtgegt tigteaatat taaeggaa 13500 giegeaaeaa ateeettae agtaattee tiageaaaa aatteege aaaagteega 13400 acaecaaeat titteagea titteeegae eigetaata eittiteeg taigagaaat 13600 giegeaaeaa ateeettae agtaattee taagaegaaa aaagteega aaaagtee 13400 acaecaaett tigaaaeag agaeaegt aaatteee aaagteega eigeigea aaatteeaaagteegae 13400 acaecaaett tigaaaeaga agaecaaegae taedeettee diaaaageegae aaaagteegae aaaagtee 13400 acaecaaett tigaaaaega agaecaaegae teegaeaaeae aaaagtee 13920 tigggeeaaaa	tccagcattc	tattgttccg	tgaattccgg	aaatctgcac	gtacctgctc	cagattacta	12300
tactatttt teaceetae egeeaggat tetaaetga eegagaegg taaeggeegg 12480 tgatetggee aatttteae atgeaatae gggattgtat acegettte eegegaggae 1260 agttgeat tgattggee taeegeete eegegaggeeteeteeteeteeteeteeteeteeteeteeteetee	tgaggattat	ccttaagtac	aagggccgcc	gccatcgttc	cggttctccc	cactccgccc	12360
tgatctggoc aattttcaa atgoaatacc gggattgtat accgctttc cccqoagga 12540 agttgcatat tgtattggt tatogcttc ccctgaatg ctgagctoac ttttggotg 12600 ttggtatgoa octogocaa ggtgtagct octotgaaat agggtggtaa ttgtttgoc 12660 tggatctgat ottocgacgt taacaccac aggcatgag attotttte aagaagcat 12720 ttcatatgog otgocagog atcoggogta tttttgggt acgaacogge taatgocaa 12780 ggcttacogt caaagttaa cgtattcact ggcacaggca ttocatogt cagtttcace 12840 tgggttgot gataattgg aatgotgotg accgcaagce gtgccaggoe cagtgtoggt 12900 cogotcatog totgtggcat tggogogoog gettotatt totcaagtt agetgtaaca 12960 tttttcagt otttagoaat acgtgaatt tttttacag octgggttaa ttoatgagta 13020 gaggotttat caacccace otcaacete octocaacgg tocccattg tgagaacogg 13080 gotacacoga octgaatat tgttaaogtt gtaacataat cattaagttg ttagoctt 13140 ggaatttat ttaaattog taaattogto attaatgaac goagoggoo gtacotgaa 13200 gocatcoot ggaagtttt tgoaggtat gagaagagt gottacttt tgoccaaca 13200 gtottttaa gtocottag oggaattog agtaaaggt gottactt tgoccaaca 13200 gtotttta gtocottag oggaattg agtaaggt gottacttt tgoccaaca 13200 gtotttta gtocottag oggaatag ggaaaggt gottacttt tgoccaaca 13200 gtotttta gtocottag oggaatag ggaaaggt gottacttt tgoccaaca 13200 gtotttta gtocottag oggaatag ggaaaggt gottacttt tgoccaaca 13200 gtotttta ttoagoca tttgtacog taggagggt tgttcattt tagoggaa 13200 gtogtaatt tttotgoca ttttgtatog cogottta tgactaaga ggatactg 13800 acaccaacat tacottgc ottaatagg ttataaca cttogtcaga agettcaga 13440 cattacagtg gtotataa cgotgttce catatttt cogttagtg atggggaat 13500 attaacagtg gtotataa cgotgttto tgacaga tatttocg taggtagaat 13600 gtgggcaaca tagoctata ggattttoo ttagoaata aagtoggg atcattoga 13740 acaccaact tttgaaagga agacaagtt aaattatca atttotce ctoatattt 13800 agatattoo tgoagtag ttttgaage toctogotga tcaaagg acacgtoc 13920 tgoggcaaca atgoctata agatcgaac ggaattgca tgataagaa acacgotoc 13920 tgoggcaaca tagottat tggtagac ggtaattoga tgatagaa acacgotco 13920 tgoggcaaca tatagota tttgaageg ttoctgaa agatggaat acatagaa 13800 cataaccag atatactt tagottaa agaggaa acaggaa acaggaa acaggaa acaggaa acaggaa acagga acagga acagga acagga acagga acagga aca	agacaatgaa	tcatcggtaa	atgcttatct	gatgaactac	gccccggcgc	gccattttgg	12420
agttgcatat tgtattggt tatcgcttct coctgactgg ctgagctcac tttttggctg 12600 ttggtatgca octogocaa ggtgtggeto octotgaat agggtggta ttgtttgoo 12600 tgoatotga ottoogoca taoogocga ttttttgggt aggacocgg tattgottgoo 12780 ggottacogt caaagttaa ogtattcat ggocacggca ttootacogot cagttgood 12780 ggottacogt caaagttaa ogtattcat ggocacggoa ttootacogot cagttgood 12900 cogotcatog totgtggoat tggogocgo gottcattt totcaagto aggotggaa 12900 tttttcagt ottgggaat ggogocg gottcattt totcaagto aggotggaa 13000 ggagotttat caacocaco otcaacotot octocacag ttoocatgt tgggaacogg 13080 gotaccoga octgaatat tgttaacgt gtaacataat cattaagtg ttaagotad 13100 ggagotttat taaattog taattogt attaatgaa googgggoo gttactaga 13200 gocatotot ggaagtttto togoagota ttoocacag toccocatg togoggaa 13200 gocatotot ggaagtttto togoagota ttoocaca ttgttocag ttgooggaa 13200 gttottttaa gtoocttag ocggaatog agtaaaggt gottacttt tgotcaaca 13200 gtottttta gtoocttag ocggaatgg agtaaggt gottacttt tgotcoaca 13200 gtotttta gtoocttag ocggaatgg ggtaaggggt tgttcatt tatacggaa 13200 gtotttta gtoocttag ocggaatgg ggtaagggt tgttcatt tatacggaa 13200 gtotttta gtoocttag ocggaatgg agaagggt gottactto tgotcoaca 13200 togttattt ttoogoca tttgtaog cogottta tgacaaag ggaattoo 13380 acaccaacat tatcottgo ottaatagg tgtaagggt tgttcatt tatacggaa 13200 gtotgtaaa totttggt otgtactog taaaggtg gtaaggggt tgtcaatt tatacggaa 13600 gtoggaacat atgootat ggotgatcog cagttata cottggoagaa 13600 gtgggcaaca tagootat aggtttoo tgacaggg cagatggga tgtgtaat tatacggaa 13600 gtgggcaaca tagootata ggatttoo taaacgt g agagggt tgttcaat tatacggaa 13600 ggogcaaca tagootat aggatttoo taagaaggt attttoog taggtagaat 13600 ggogcaaca tagootata ggatttoo tagaagat aagtogga acattooga 13740 acaccaactt ttgaaagga agacacgt aaattatoa ttttooga aaatttoo 13800 agaatattoo tgoagtag agacaacgt aaattatoa atttooct cotaactt 13800 agaatattoo tgoagtag agacaacgt acattaga ocagatcao cataactgood 13800 cataaccag attacttt tagotcaa agacgaa acagga acagata toaacacodo 13920 tgoggoaa attagota ttgoogaa agacacgt aaattatoa 1390	ttactatttt	tcaccctatc	cgccaggtat	tctaactgat	ccgtagacgg	taacggctgg	12480
ttggtatgca cctogccaa ggtgtagcte eetetgaat agggtggta ttgtttge 1260 tggatetga ettecogaeg taacaccae aggeatgae attettte aagaageat 12720 tteatatgeg etgeeagee ateeggegta tttttgggt aegaacegge taatgeeae 12780 ggettaeegt eaaaagttaa egtatteaet ggeeagagea tteeateget eagteteae 12840 tgggtttget gattaatgg aatgetgetg aeegeaaae gtgeeaggee cagtgteggt 12900 eeegeteateg tetgtggeat tggegegeeg gettetatt teteaagte agetgtaaa 12960 tttteeagt ettageaat aeegtgaat ttttttaeag eetgggtaa tteeatgaga 13020 gaggettat eaaeeeaet eeedeat eeteeaag tteeeatgt gagaacegg 13080 getaeeega eetgaatat tgttaaegt gtaacataa eattagtg tttageete 13140 ggaatttat taaateeg taaategte attaetgea geageggee gtaeeega 13200 geeateeega eetgaatat tgttaaegt gtaacataa eattagtg tttageete 13140 ggaattttat ttaaateeg taaatege agtaaaggt gettaette tgeegaaa 13200 geeateeega eetgaatat egteaggeta tteeeate ttgtteeag ttgeegaaa 13200 geeateeega eetgaatat eettegeaggeta tteeeate ttgeeegaa 13200 geeateeega eetgaatee eetgeaggeta gtaaagget gettaeette tgeeeaaa 13200 geeateeega eetgaatat eettegeaggeta tteeeate ttgeeegaa 13320 tegttattt tteegeeae ttetgateg eegeette tgeeeaaa 13320 tegttattt tteegeeae ttetgateg eegeette tgeeeaaa 13200 acaceeaeat tateeetge ettaatagg ttataaace ettegeega agetteea 13400 acaceeaga eetgeateg eetgettee eeatttte eegtaage gegateee 13500 attaacagtg egeeataa eegeegte etteegaata ettetgaega aaatttee 13620 gtgegeaaaa teettegge etgeateeg agatattee tageegaaa aatteee 13620 gegegeaaa tageettae agaatttee ttageaaa aeattee eetae 13620 gegegeaaa tageettae agaacaegt aaattatea atteee eetaatee 13680 gegegeaaa atgeettae agaacgee teetgeega teeaaage aeaaettee 13800 acaeaaett tgaaaaega agaeaegt aeatgee teetgeega teeaaaga aeaettee 13920 tgeggeatea ataacgeta ttegeagae ggaaatgee acaacgee te 13920 tgeggeatea ataacgeta tegeagae ggaaaegga aeeggtaaa ceaaeget 13920 caaaaceag ataaceett tageteaa aacagegea aeeggaaa acaeggaa aeaggtaa eeaagete 13920 tgeggeatea ataacgeta tegeegaa aacaeggea aeeggaaa aeeggaaa aeaggea aeagtee 13920 caaaaceag ataaceett tageteaa aacagegea aeaeggaa aeaggaaa aeaggaaa aeeggaaa aea	tgatctggcc	aatttttcac	atgcaatacc	gggattgtat	accgcttttc	cccgcaggac	12540
tgcatctgat cttccgacgt taacaccacc aggcatgage attetttte aagaageatt 12720 tteatatgeg etgecagege atceggegta ttttttgggt acgaacegge taatgecaca 12780 ggettacegt caaaagttaa egtatteaet ggecaggee tteeateget eagteteaee 12840 tgggtttget gattaattgg aatgetgetg acegeaaace gtgecaggee cagtgeeggt 12900 eegeteateg tetgtggeat tggegegeeg gettetatt teteaagtte agetgtaaea 12960 ttttteagtt etttageaat aacgtgaatt ttttttacag eetgggtaa tteeatgagta 13020 gaggetttat eaaceeaeet etecaeeagg tteeeettg tgagaacegg 13080 getacaeeg eetgaatatt tgttaacgtt gtaacataat eattaagttg tttageetet 13140 ggaatttat ttaaatteg taaategte atteeatgae geagegggee gtacetgaa 13200 geeateete ggaagttte tegeaggeta tteeateae ttgtteeag ttgeggata 13200 gteetttta gteettag eeggatate geegetteet ttgeteaeg 1380 acaeceaeet tateettget ettaatagge eggeettta tgaetaage geageggee gtacetga 13200 gtetgtattt ttteegee tttgtateg eegeettta tgaetaaage ggeatteet 13140 caeteegga tetgeetge taaaegttgg gtaaggggt tgtteatatt tataeggae 13500 attaacagtg egteattae egetgttee eeatttte eegtagge atgggaaaat 13560 gtetgtaaaa tetttegte etgaacetg attatteeg tatgttttg eaceattee 13620 gtegttttta ataacgeet tttecaage eaggttaat ettttgaega aaattttee 13680 ggegeaeeat atgeettae agtatttee ttageaata aagteggge ateategea 13740 acaeceaeet ttgaaaega agacaaegtt aaattatee attteetee teetaattee 13800 ageatattee tgeagtat ttgeeaget teetegeta teaeaagte geeatetee 13920 teggtaaaa tetttegge etteetget aaattatee attteetee teetaattee 13800 ageatattee tgeagtat ttgeeaget taategee teaeaagtegge ateateega 13740 acaeceaeet ttgeaaaga agacaaegtt aaattatee attteetee teetaaette 13900 egataatate tgeagtat ttgeeaget gegaattee tgaaagae acaegetee 13920 tgeggeatea atateegeta ageteete ataategea geeagetee 13940 caataaceag ataceete tageteete ataategea aacagtee 13940 caataaceag ataceete tageteete ataategea acaegetee 13940 caataaceag ataceete ageteete ataategea acaegetee 13940 caataaceag ataceete ageteete ataategea acaegetee 13940 caataaceag ataceete tageteete ataategea acaegetee 13940 caataaceag ataceete tageteete ataacee ataegetee aaategea ataceget 14040 caata	agttgcatat	tgtattggtc	tatcgcttct	ccctgactgg	ctgagctcac	tttttggctg	12600
ttcatatgog etgecagege ateeggegta ttttttgggt acgaacegge taatgecaca 12780 ggettacegt eaaagtta egtatteaet ggecagagea tteeateget eagtteaee 12840 tgggtttget gattaattgg aatgetgetg acegeaaee gtgecaggee eagtgteggt 12900 eegeteateg tetgtggeat tggegegeeg gettetattt teteaagtte agetgtaaea 12960 ttttteagtt etttageaat aaegtgaatt ttttttaeag eetgggtaa tteeatgagta 13020 gaggetttat eaaeeeeet eeteggg gtaeetaat eattaagttg ttageetet 13140 ggaatttat ttaaattetg taaattegt gtaacataat eattaagttg ttageetet 13140 ggaatttat ttaaattetg taaattegte attaatgaae geagegggee gtaeetaga 13200 geeateete ggaagttte tegeaggeta tteeatee ttgtteeag ttgeggtaa 13200 gteetttaa gteeettag egegatateg agtaaaggtt gettaette tgeteeaaa 13200 gteetttta gteeettag egegatateg agtaaaggtt gettaette tgeteeaaa 13200 gteettttta gteeettag egegatateg agtaaaggtt gettaette tgeteeaaa 13200 tegttatttt tteetgeee tttgtateg eegeettta tgaeeaage ggeatteetg 13380 acaceaaeat tateettget ettaatagg tttataaaee ettegteage agetteetg 13380 ataaceagtg egteattae egetgttee eeatttt eegtagge at 13500 attaaeagtg egteataae egetgttee eeatttte egtagge aaggget 13500 attaaeagtg egteataae egetgttee eeatttte eegtagge at 13600 gtetgtaaaa tettteggte etgtaeetg ataattteeg tatgttttg eaeeattea 13620 gtegttttta ataaeggeat ttteeaage eaggttaat ettttgaega aaattttee 13680 ggegeaeaaa tettteggte etgtaeetg ataatttee tageataa aagtegge ateateega 13740 acaeceaaett ttgaaaaega agaeaegtt aaattatee attteeete teeaattee 13800 ageatattee tgeagtatg ttttgaege teeetgeag teaaagae acaagetee 13920 tgeggeaeaa atgeetate agtaettee dgtaattgea tgataagea acaagetee 13920 tgeggeataa tageagta ttgteegge ggtaattee tgataagea acaagetee 13920 tgeggeataa tageagtag ageaeeggt aaeggeaa acaggeaa acaageete 13920 tgeggeatea ataaegeta aegteecea aaeaggega aeeggtaaa caaaegeete 13920 tgeggeatea ataaegeta aegteecea aaeaggega aeeggtaaa caaaegetee 13920 tgeggeatea ataaegeta aegteecea aaeaggega aaeggtaaa teataeegt 14040 caataaeegg ataeetet tagetteaa agaeggaaa aaeggtaaa ataeegeta eaaaegtee 14040	ttggtatgca	cctcgccaaa	ggtgtagctc	cctctgaaat	agggtggtaa	ttgttttgcc	12660
ggettacegt caaagtta egtatteaet ggeaeggea tteetaeget eagtteaee 12840 tgggtttget gattaattgg atgetgetg acegeaagee gtgeeaggee cagtgteggt 12900 eegeteateg tetgtggeat tggeogege gettetatt teteaagtte agetgtaaea 12960 ttttteagt etttageaat aaegtgaatt ttttttacag eetgggtaa tteatgagta 13020 gaggetttat eaaceeaeet eeteaaeet eeteagtte gagaaeegg 13080 getaeaeega eetgaatat tgttaaegtt gtaacataat eattaagttg ttageeet 13140 ggaatttat ttaaattetg taaattegte attaatgaae geageggee gtaeetgaa 13200 geeateete ggaagttte tegeaggeta tteeetae ttgtteeag ttgeggtaa 13200 gteetttaa gteeettag egegatateg agtaaaggt gettaette tgeteeaae 13200 gteetttaa gteeettag egegatateg agtaaaggt gettaette tgeteeaae 13200 gteetttta tteetgeeet ttgtaeg egeettta tggeeaggege gtaeetga 13200 gteetttta tteetgeeae tttgtaeg egeettta tggeeaggeg geateetg 13380 acaeceaaet tateettge ettaatagg ttataaee ettegteage ageettee 13340 caeteegg egeateeg etaaeggtg gtaaggggt tgtteatatt taaeggaa 13600 gteetttaa ateeetge etaaagttgg gtaaggggt tgtteatatt tataeggaa 13600 gtgettttaa ataeetgee taaaegtgg gtaaggggt tgtteatatt tataeggaa 13600 gtgetgtaaaa tetttegge etgtaeeteg atattteeg taggttag atgagaaat 13600 gtgettttaa ataeetgee ttgeaeteg atattteeg taggttateg eacaette 13620 gtgettttaa ataeetgeet ttteeage eagttaata etttegeag aaatttee 13620 gtgettttaa ataeetgeet ttteeage eagttaata etttegeag aaatttee 13620 gtgettttaa ataeetgeet ttteeage eagttaata etttegeag aaatttee 13620 gegeaaeat atgeettae agaettee ttageaatat aaagtegge ateateega 13740 acaecaaett ttgaaaaega agaeaegtt aaattatee attteetee eetaeet 13800 ageatatae tgeaagtat ttgeeagte ggaattgea tgataagea acaaegtee 13920 tgeggeaea atategeta eegtaeette attatteega geeagteae eeaaegtee 13920 tgeggeaeaa tageeta eegtaeette attatteega geeagteae eeaaegtee 13920 tgeggeaeaa tageetat ttgeeagae ggaaaegga aaeggeataa teataeegte 13920 tgeggeaeaa tageeta eegtaeette attatteega geeagteae eeaaegtee 13920 tgeggeaeaa tageeta eegtaeette attatteega geeagteae eaaeggeeta aeaeggeeta 13920 eaataateege eeeagatag aaeeeeaaa aaeggeega aaeeggaaaaa ataeeeaaetee 13920 tgeggeaeaea ataaegeta a	tgcatctgat	cttccgacgt	taacaccacc	aggcatgagc	attctttttc	aagaagcatt	12720
tgggtttget gattaattgg aatgetgetg acegeaaace gtgeeaggee cagtgteggt 12900 cegeteateg tetgtggeat tggegegeeg gettetatt teteaagtte agetgtaaea 12960 ttttteagtt etttageaat aaegtgaatt ttttttaeag eetgggtaa tteatgagta 13020 gaggetttat eaaceeaeet eteaacete eeteaaggt teeeeattg tgagaacegg 13080 getaeaeega eetgaatatt tgttaaegtt gtaacataat eattaagttg tttageette 13140 ggaattttat ttaaattetg taaattegte attaatgaae geagegggee gtaeeetgaa 13200 gecateteet ggaagttte tegeaggeta tteeeatte ttgtteeag ttgeggtaa 13200 gteetttaa gteeettag egegatateg agtaaaggtt gettaette tgeteeaae 13200 gteettttaa gteeettag egegatateg agtaaaggtt gettaette tgeteeaae 13200 tegttattt tttetgeeae tttgtateg eegeetta tgaeaagge ggeatteet 13380 acaeceaaeat tateettge taaaegtgg gtaaggggtt tgtteatatt taaegggaa 13500 attaaeagtg egteattae egetgttee eeatttte eegtagge agettteae 13440 caeteegga tetgeeaege taaaegtgg gtaaggggtt tgtteatatt tataeggaa 13500 gtgettttaa ataaeggeat ttteeaae egetgttee eeatttte eegtagge ateggagaaat 13500 attaaeagtg egteattae egetgttee eeatttte egetagge ataggagaaa 1360 gtgetgtaaaa tettttggte etgtaeetg atattteeg tatgttttg eaceaette 13620 gtgegeaeaa ateetttggte etgtaeetg atattteeg tatgttttg eaceaette 13620 gtgegeaeaa tatgeettate agtatttee ttageaata aaagtegge ateatteega 13740 acaeceaaett ttgaaaaega agacaaegtt aaattatea attteete eteataette 13800 ageedaaat tggtaagtat ttgteagee tteetgetga tteaeaaatg aceaagete 13920 tgeggeatea ataeggta ttgteagee tteetgetga tteaeaaatg aceaagete 13920 tgeggeaeaa tagetata tggtaagtat tgteagate ggtaattee agtataagea acaaegtee 13920 tgeggeatea ataaeggea agacaeegt aaattatee attteetee eeataatee 13920 tgeggeatea ataaeggea aggeaeaegt aaattatee attaeegta 13920 tgeggeaea ataaeggea aggeaeaegt aaattatee attaeegea acaaegtee 13920 tgeggeatea ataaegea agacaeegt aaattatee attaeegea acaaegtee 13920 tgeggeaeae ataaegea agacaeegt aaattateea attaeegea acaaegtee 13920 tgeggeaeae ataaegea aggeaeaegt aaeggaaaa ataeegtaaa teataeegt 14040 caataaeegg ataeaette tagetteaaa agaeggaaaa ataeegeataa teataeegt 140040	ttcatatgcg	ctgccagcgc	atccggcgta	tttttgggt	acgaaccggc	taatgccaca	12780
ccgctcatcg tctgtggcat tggcgcgccg gcttctatt tctcaagttc agctgtaaca 12960 tttttcagtt ctttagcaat aacgtgaatt ttttttacag cctgggttaa ttcatgagta 13020 gaggctttat caacccacct ctcaacctc cctccacagg ttccccattg tgagaaccgg 13080 gctacaccga cctgaatatt tgttaacgtt gtaacataat cattaagttg tttagcctct 13140 ggaattttat ttaaattctg taaattcgtc attaatgaac gcagcgggcc gttacctgaa 13200 gccatctcct ggaagttttc tcgcaggta tttccatcca ttgttccag ttgcggtaat 13260 gttctttaa gtccctttag cgcgatatcg agtaaaggtt gcttactttc tgcccacaa 13320 tcgttattt tttctgccac tttgtatcg ccgccttta tgactaaagc ggcattcctg 13380 acaccaacat tatcctgct cttaatagg tttataaacc cttcgtcagc agctttaca 13440 cactccgtga tctgcactgc taaacgttgg gtaaggggtt tgttcatatt tatacgggaa 13560 gtcgttataa ataacggca tgttcc ccatatttt ccgttagtg atggagaaat 13560 gtcgttataa atacetge ctgtactctg attttccg tatgttttg caccacttca 13620 gtcgttataa ataceggca ttttccagc caggttaata ctttgacga aaattttca 13680 ggcgcaacat atgccttate agtatttcc ttagcaata aaagtcgggc atcattcga 13740 acaccaacat tggctatta ggagacgtt aaattatca attttcctc ctcatacttt 13800 agcatattcc tgcagtatg ttttgaacg ttcctgctga ttcacaaatg accaagctg 13920 tgcggcaaca tatgccttat agtatttcc ttagcaata aaagtcggc atcattcgac 13920 tgcggcaaca tatgcctat agtatttcc ttagcaata acagtcgg accaactgct 13920 tgcggcaaca tatgcctat aggtactct attattcga gccagttcac cattaatca 13920 tgcggcaaca tataccgcta acgtacctc attattcga gccagttcac cattaatcac 13980 cgatataat tggtaagta ttgtcagat ggtaattgca tgtataagca acaacgtct 13920 tgcggcatca attaccgcta acgtacctc attattcga gccagttcac cattaatcac 13980 cataatccg gccagtag aatcgccaca aacaggcgat aacggtataa tcataccgt 14040 caataaccag attacatctt tagctccaat agacgtaaa ataccgcta cgagtaata 14100	ggcttaccgt	caaaagttaa	cgtattcact	ggcacaggca	ttccatcgct	cagtttcacc	12840
tttttcagtt ctttagcaat aacgtgaatt ttttttacag cctgggttaa ttcatgagta 13020 gaggctttat caacccacct ctcaacctet cctccacagg ttccccattg tgagaaccgg 13080 gctacaccga cctgaatatt tgttaacgtt gtaacataat cattaagttg tttagcctet 13140 ggaattttat ttaaattetg taaattegte attaatgaac gcagegggee gttacetgaa 13200 gccatcteet ggaagttte tegeaggeta tttccateca tttgttecag ttgeggtaat 13260 gttetttaa gteeetttag egegatateg agtaaaggtt gettaettte tgeeteaaca 13320 tegttattt tttetgeeae ttttgtateg eegeettta tgaetaaage ggeatteetg 13380 acaccaacat tateettget etaataagg ttataaace ettegteage agettteet 13440 caeteegtg etgeettae egeggttee ceatattte egtagge aggaggat 13500 attaacagtg egteattae egetgttee ceatattte egtagge atggagaat 13560 gtegttatta ataacggea ttttccaage caggttaat ettttgaega aaattttee 13680 ggegeaacat atgeettae agtatttee ttageatat aaagtegge ateattega 13740 acaccaacat tgeagtagt ttttgaege tteetgetga tteacaatg actaatege 13800 ageetatee tgeagtagt ttttgaege tteetgetga tteacaatg acteaaget 13800 ageetattee tgeagtagt ttgteagte ggtaattgea tgtataagea acaacgtee 13800 ageatattee tgeagtagt ttttgaege tteetgetga tteacaatg accaagetg 13800 cgatataata tggtaagtat ttgteagate ggtaattgea tgtataagea acaacgtee 13920 tgeggeatea atategeta agtacette attattege geeagtee cattaatea 13980 cgatataata tggtaagtat ttgteagate ggtaattgea tgtataagea acaacgtee 13920 tgeggeatea atataegeta aegtaeette attattegea geeagtee cattaatea 13980 cgatataata tggtaagtat ttgteagate ggtaattgea tgtataagea acaacgtee 13920 tgeggeatea atataegeta aegtaeette attattegea geeagteae cattaateae 13980 cataateege egeeagatag aategeeaa aacaggegat aaeggtaaa teataeegtt 14000 caataaceag atateatett tagetteaat agaegtaaa atategetat egagtaata 14100 taageactag ttgttgtegt caaaagtgag eggtaaacee aatttee caatattage 14100	tgggtttgct	gattaattgg	aatgctgctg	accgcaaacc	gtgccaggcc	cagtgtcggt	12900
gaggetttat caacecacet eteaacetet eeteaacgt teeceatg tgagaacegg 13080 getacaeega eetgaatat tgttaaegtt gtaacataat eattaagttg tttageetet 13140 ggaattttat ttaaattetg taaattegte attaatgaae geagegggee gttaeetgaa 13200 gecateteet ggaagttte tegeaggeta ttteeateea tttgtteeag ttgeggtaat 13260 gttetttaa gteeetttag egegatateg agtaaaggtt gettaettet tgeeteaaea 13320 tegttattt tttetgeeae tttgtateg eegeetta tgaetaaage ggeatteetg 13380 acaeeaacat tateettget ettaataagg ttgataaaget ggetaettaea 13440 caeteegga tetgeaetge taaaegttgg gtaaggggtt tgtteatatt tataegggae 13560 gtegtaaaa tetttegte ettaataagg ttaetee eettegteage agetttaea 13620 gtgttttaa ataaeggeat ttteeaaege eaggtaata ettetegae aaatttteea 13620 gtggegeaaeat atgeettae agtatttee ttageaata aagteggge ateattega 13600 agegegaaeat atgeettae agtatttee ttageaata aagteggge ateattega 13640 eaeceaaett ttgaaaaega agacaaegtt aaattatea tetttgaega aaatttteea 13640 ggegeaaeat atgeettae agtatttee ttageaata aagteggge ateattegae 13740 acaeceaaett ttgaaaaega agacaaegtt aaattatea attteetee teetaatta 13800 ageatatee tgeagtatg ttttgaege tteetgetga tteaaeaatg acteaagetg 13860 egatataata tggtaagtat ttgeeagate ggtaattgea tgtataagea acaaegtee 13920 tgeggeatea atataegeta aegtaeett attateega geeagtteae caataateae 13920 tgeggeatea atataegeta aegtaeett attateega geeagtteae caataateae 13920 tgeggeatea atataegeta aegtaeette attateega geeagtteae caataaea 13920 taeaeetag eegeagaag aateegeeaa aaeaggegat aaeggtaaa teaaeegtte 13920 taeageaetga tateatett tagetteat agaegtaaaa atategetat egagtaata 14100 caataaeeegg atateatett tagetteat agaegtaaaa atateeetat egagtaataa 14100	ccgctcatcg	tctgtggcat	tggcgcgccg	gcttctattt	tctcaagttc	agctgtaaca	12960
gctacaccga cctgaatatt tgttaacgtt gtaacataat cattaagttg tttagcctt 13140 ggaattttat ttaaattctg taaattcgtc attaatgaac gcagcgggcc gttacctgaa 13200 gccatctcct ggaagttttc tcgcaggcta tttccatca tttgttccag ttgcggtaat 13260 gttettttaa gtocetttag egegatateg agtaaaggtt gettaettte tgeecacaa 13320 tegttattt tttetgecae ttttgtaeg eegeettta tgaetaaage ggeatteet 13380 acaccaacat tateettget ettaataagg tttataaace ettegteage agetttaea 13440 cacteegtga tetgeaetge taaaegttgg gtaaggggtt tgtteatatt tataegggae 13500 attaacagtg egteattae egetgttee ecatatttt eegttagtge atggagaaat 13560 gtegttataa ataeegea tetteette attatteeg tatgttttg eaceaette 13620 gtggegeaacat atgeettate agatttee tageaata eetttegea aaatttee 13680 ggegeaacat atgeettate agatttee ttageaata aaagteggge ateattegae 13740 acacceaaett ttgaaaaega agacaaegtt aaattatea attteetete eteataette 13800 ageatattee tgeagtagt ttttgagee tteetgetga teetaaaat aaagteggge ateattegae 13920 tgeggeatea atategeta aegtaette ggtaattgea tgtataagea acaaegteg 13800 cgatataata tggtaagtat ttgteagate ggtaattgea tgtataagea acaaegteg 13920 tgeggeatea atataegeta aegtaeette attattegea gecagtteae eataateae 13980 cataatetge egecagatag aategeeaa aacaggega aaegtaaa teataeegt 14040 caataaecag atteatett tagetteaat agaegtaaa atategeta egataataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaece aatteeea eatattae 14100	tttttcagtt	ctttagcaat	aacgtgaatt	tttttacag	cctgggttaa	ttcatgagta	13020
ggaattttat ttaaattetg taaattegte attaatgaac geagegggee gttaeetgaa 13200 gcoateteet ggaagttte tegeaggeta tteeetaeea ttegteedag ttgeeggataat 13220 gtettttaa gteeettag egegatateg agtaaaggtt gettaeette tgeteeaaea 13320 tegttattt tteetgeeae ttetgtaeg eegeettta tgaetaaage ggeatteeg 13380 acaceaaeat tateeettgee ettaataagg tteataaaee ettegteage ageetttaea 13440 cacteegtga tetgeaetge taaaegttgg gtaaggggtt tgtteatatt tataegggae 13500 attaaeagtg egteattaae egeettee eestattee ettegteage ageetteea 13620 gtetgttaaa tettetggte etgaaegtgg gtaaggggtt tgtteatatt tataegggae 13500 gtetgtaaaa tettteggte etgaaege eaggttaata ettetgaega aaattettee 13620 ggegeaaeat atgeettae agtatttee ttageaaat aaagteggge ateatteegae 13740 acaceaaett ttgaaaaega agaeaaegtt aaattatea attteetete eteaaegte 13800 ageatattee tgeagtatg ttetgaage tteetgetga tteacaaatg aceaagetg 13800 ageatattee tgeagtatg ttetgagee tteetgetga tteacaaatg aceaaegte 13920 tigeggeatea atataegeta acgtaeette attateega geeagtteae eatatee 13920 tigeggeatea atataegeta acgtaeette attateega geeagtteae eatateee 13920 tigeggeatea atataegeta acgtaeette attateega geeagtteae eatateeette 13920 tigeggeatea attateega acgtaeette attateega geeagtteae eatateeea 13920 tigeggeatea attateega aaetgeeeaa aaeggegat aaeeggtaaa teataeeette 13920 tigeggeatea attateegata ttegeteaaa agaeggata acegteaae eataeeette 14040 caataaceag atacaette tagetteaat agaegtaaaa atategetat egagtaata 14100 taageactga ttgttege eaaagtgag eg	gaggctttat	caacccacct	ctcaacctct	cctccacagg	ttccccattg	tgagaaccgg	13080
gccatcteet ggaagtttee tegeaggeta titeeateea titgeteeag tigeeggtaat 13260 gttetttaa gteeetttag egegatateg agtaaaggtt gettaettee tgeeegaaa 13320 tegttattte titeetgeeae tittgtateg eegeettta tgaeetaaage ggeatteetg 13380 acaeceaaeat tateettgee ettaataagg titataaaee ettegetegeage ageetttaea 13440 caeteegtga tetgeeaetge taaaegttgg gtaaggggtt tgteeatatt tataeegggae 13500 attaaeagtg egteattaae egeegttee eeatattte eegttagtge atggagaaat 13660 gtegttattaa ataaeggeat titteeaage eaggttaata ettetgaega aaattettea 13620 gtegttaaaa tettetggte etgaaeteg agattatee tageeggaaaa atgeetae 13680 ggegeaaeat atgeettate agtatttee tageaataa eetttegaega aaattettea 13680 ageetaatee tigeagateg tittegaege teeetgega aaattettea 13800 ageatattee tgeagtatgt tittgagege teeetgega teeaaagteg 13800 egatataata tggtaagtat titteeage eggtaattgea tgataagea aeaeegtee 13920 tgeggeatea atataegeta aegtaeeetge ageaattee ageagtaaa teatteegea 13980 cataatetge egeeagatag aategeeaea aaeaggega aaeggtaaa teataeee 13980 cataatetge egeeagatag aategeeaea aaeaggega aaeeggtaaa teataeee 13980 cataatetge egeeagatag aategeeaea aaeaggega aaeggtaaaa teataeee 1400 caataaceag atateatet tagetteea agaegtaaaa atategetat egagtaataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaacee aatteee eaattaee 14100	gctacaccga	cctgaatatt	tgttaacgtt	gtaacataat	cattaagttg	tttagcctct	13140
gttetttaa gteeettag egegatateg agtaaaggtt gettaettee tgeteeaaa 13320 tegttattt ttteetgeeae ttttgtateg eegeettta tgaetaaage ggeatteetg 13380 acaeceaaeat tateettget ettaataagg tttataaaee ettegteage agetttaea 13440 caeteegtga tetgeaetge taaaegttgg gtaaggggtt tgtteatatt tataegggae 13500 attaaeagtg egteattaae egetgttee eeatatttt eegttagtge atggagaaat 13560 gtetgtaaaa tettttggte etgtaetetg atattteeg tatgttetg eaceaettea 13620 gtgttttaa ataaeggeat tttteeaage eaggttaata ettttgaega aaattttee 13680 ggegeaaeat atgeettate agtatttee ttageaatat aaagteggge ateattegae 13740 acaeceaaett ttgaaaaega agaeaaegtt aaattatea attteetet eteataett 13800 ageatattee tgeagtatgt ttttgagege tteetgetag tetaeaaatg aeteaagetg 13860 egatataata tggtaagtat ttgteagate ggtaattgea tgtataagea aeaaegtee 13920 tgeggeetea atataegeta acgtaeette attatteega geeagtteae eataetete 13980 cataatetge egeeagatag aategeeaea aaeaggegat aaeggtataa teataeegtt 14040 caataaeeag atateatett tagetteeat agaegtaaaa atategeta egagataaa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaeee aatteee eatattage 14160	ggaattttat	ttaaattctg	taaattcgtc	attaatgaac	gcagcgggcc	gttacctgaa	13200
tegttattt tttetgecae ttttgtateg eegeettta tgaetaage ggeatteetg 13380 acaecaacat tateettget ettaataagg tttataaace ettegteage agetttaca 13440 caeteegtga tetgeaetge taaaegttgg gtaaggggtt tgtteatatt tataegggae 13560 attaaeagtg egteattaae egetgttee eeatatttt eegttagtge atggagaaat 13560 gtetgtaaaa tettteggte etgtaetetg atattteeg tatgttettg eaceaettea 13680 ggegeaacat atgeettate agtatttee tageaatat etttegaega aaattttee 13680 ggegeaacat atgeettate agtatttee tageaatat aaagteggge ateattegae 13740 acaeceaaett ttgaaaaega agaeaaegtt aaattattea attteetete eteaaett 13800 ageatattee tgeagtatg ttttgagege tteetgeag teaaaatgae acaaegteg 13860 egatataata tggtaagtat ttgteagate ggtaattgea tgtataagea acaaegtete 13920 tgeggeatea atataegeta acgtaeette attatteega geeagtteae cattaatea 13980 cataatetge egeeagatag aategeeaea aaeaggegat aaeggtataa teataecgtt 14040 caataaeeag atateatett tagetteaat agaegtaaaa atategetat egagtaataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaeee aatteeteae eaattage 14160	gccatctcct	ggaagttttc	tcgcaggcta	tttccatcca	tttgttccag	ttgcggtaat	13260
acaccaacat tateettget ettaataagg tttataaace ettegteage agettttaca 13440 caeteegtga tetgeaetge taaacgttgg gtaaggggtt tgtteatatt tataegggae 13500 attaacagtg egteattaae egetgttee eetatttt eegttagtge atggagaaat 13660 gtetgtaaaa tettttggte etgtaetetg atattteeg tatgttttg eaecaettea 13620 gtgtttttaa ataaeggeat tttteeaage eaggttaata ettttgaega aaatttteea 13680 ggegeaacat atgeettate agtatttee ttageaatat aaagteggge ateattegae 13740 acaeceaaett ttgaaaaega agaeaaegtt aaattattea attteetete eteaaette 13800 ageatattee tgeagtatgt ttttgagege tteetgetga tteacaaatg aeteaagetg 13860 eggtataaat tggtaagtat ttgteagate ggtaattgea tgtataagea acaaegtete 13920 tgeggeatea atataegeta aegtaeette attattegea geeagtteae eataatee 13980 cataatetge egeeagatag aategeeaea aacaggegat aaeggtataa teataeegt 13980 cataatetge egeeagatag aategeeaea aaeaggegat aaeggtataa teataeegt 14040 eaataaeeag atateatett tagetteaat agaegtaaaa atategetat egagtaataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaeee aatteee eaatattage 14160	gttcttttaa	gtccctttag	cgcgatatcg	agtaaaggtt	gcttactttc	tgctccaaca	13320
cacteegtga tetgeaetge taaaegttgg gtaaggggtt tgtteatatt tataegggae 13500 attaaeagtg egteattaae egetgttee eeatatttt eegttagtge atggagaaat 13560 gtetgtaaaa tetttegte etgtaetetg atattteeg tatgttttg eaceaettea 13620 gtgttttaa ataaeggeat ttteeaage eaggttaata etttegaega aaatttteea 13680 ggegeaaeat atgeettate agtatttee ttageaatat aaagteggge ateattegae 13740 aeaeeaaett ttgaaaaega agaeaaegtt aaattatea attteetet eetaaett 13800 ageatattee tgeagtatgt ttttgagege tteetgetga tteaeaaatg aeteaagetg 13860 eggtaataata tggtaagtat ttgteagate ggtaattgea tgtataagea aeaaegtete 13920 tgeggeatea atateegeta aegtaeette attatteegea geeagtteae eattaetee 13980 eataaetege egeeagatag aategeeaea aaeaggegat aaeggtataa teataeegtt 14040 eaataaeeag atateett tagetteaat agaegtaaaa atategetat egagtaataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaeee aatteeteae eaatattae 14160	tcgttatttt	tttctgccac	ttttgtatcg	ccgcctttta	tgactaaagc	ggcattcctg	13380
attaacagtg cgtcattaac cgctgtttcc ccatatttt ccgttagtgc atggagaaat 13560 gtctgtaaaa tettttggte etgtaetetg atattteeg tatgttttg eaceaettea 13620 gtgtttttaa ataacggeat ttttecaage eaggttaata ettttgaega aaatttteea 13680 ggegeaacat atgeettate agtatttee ttageaatat aaagteggge ateattegae 13740 acaecaaett ttgaaaaega agaeaaegtt aaattattea attteetete eteataette 13800 ageatattee tgeagtatgt ttttgagege tteetgetga tteaeaaatg aeteaagetg 13860 eggtataaat tggtaagtat ttgteagate ggtaattgea tgtataagea acaaegtete 13920 tgeggeatea atataegeta aegtaeette attattegea geeagtteae eataateae 13980 cataatetge egeeagatag aategeeaea aaeaggegat aaeggtataa teataeegtt 14040 eaataaeeag atateatett tagetteaat agaegtaaaa atategetat egagtaataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaeee aatteeteae eaatattage 14160	acaccaacat	tatccttgct	cttaataagg	tttataaacc	cttcgtcagc	agcttttaca	13440
gtetgtaaaa tetttegte etgtaetetg atattteeg tatgttttg eaceaettea 13620 gtgttttaa ataaeggeat tetteeaage eaggttaata ettetgaega aaattettea 13680 ggegeaacat atgeettate agtatttee ttageaatat aaagteggge ateattegae 13740 acaecaaett tegaaaaega agacaaegtt aaattattea attteetete eteataette 13800 ageatattee tgeagtaegt tettegaege teeetgeega teeaeaatg aeteaagetg 13860 egatataata tegetaagtat tegeegee ggtaattgea tgataagea acaaegtete 13920 tgeggeatea atataegeta aegtaeette attattegea geeagtteae eattaateae 13980 eataaetege egeeagatag aategeeaea aaeaggegat aaeggetaaa teataeegt 14040 eaataaeeag atateatett tagetteaat agaegtaaaa atategetat egagtaataa 14100 taageaetga tegetgeegt eaaaagtgag eggtaaaeee aatteeteae eattattage 14160	cactccgtga	tctgcactgc	taaacgttgg	gtaaggggtt	tgttcatatt	tatacgggac	13500
gtgtttttaa ataacggcat ttttccaage caggttaata ettttgaega aaattttea 13680 ggegeaacat atgeettate agtatttee ttageaatat aaagteggge ateattegae 13740 acaecaactt ttgaaaaega agacaaegtt aaattattea attteetete eteataettt 13800 ageatattee tgeagtatgt ttttgagege tteetgetga tteacaaatg aeteaagetg 13860 egatataata tggtaagtat ttgteagate ggtaattgea tgtataagea acaaegtete 13920 tgeggeatea atataegeta aegtaeette attattegea geeagtteae eataateae 13980 eataatetge egeeagatag aategeeaeaa aaeaggegat aaeggtataa teataeegtt 14040 eaataaeceag atateatett tagetteaat agaegtaaaa atategetat egagtaataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaece aatteeteae eatattage 14160	attaacagtg	cgtcattaac	cgctgtttcc	ccatatttt	ccgttagtgc	atggagaaat	13560
ggcgcaacat atgccttatc agtattttcc ttagcaatat aaagtcgggc atcattcgac 13740 acaccaactt ttgaaaacga agacaacgtt aaattattca attttctctc ctcatacttt 13800 agcatattcc tgcagtatgt ttttgagcgc ttcctgctga ttcacaaatg actcaagctg 13860 cgatataata tggtaagtat ttgtcagatc ggtaattgca tgtataagca acaacgtctc 13920 tgcggcatca atatacgcta acgtaccttc attattcgca gccagttcac cattaatcac 13980 cataatctgc cgccagatag aatcgccaca aacaggcgat aacggtataa tcataccgtt 14040 caataaccag atatcatctt tagcttcaat agacgtaaaa atatcgctat cgagtaataa 14100 taagcactga ttgttgtcgt caaaagtgag cggtaaaccc aatttctcac caatattagc 14160	gtctgtaaaa	tcttttggtc	ctgtactctg	atattttccg	tatgtttttg	caccacttca	13620
acaccaactt ttgaaaacga agacaacgtt aaattattca attttctctc ctcatacttt 13800 agcatattee tgeagtatgt ttttgagege tteetgetga tteacaaatg acteaagetg 13860 egatataata tggtaagtat ttgteagate ggtaattgea tgtataagea acaacgtete 13920 tgeggeatea atataegeta acgtaeette attattegea geeagtteae cattaateae 13980 eataatetge egeeagatag aategeeaea aacaggegat aaeggtataa teataeegtt 14040 eaataaeeag atateatett tagetteaat agaegtaaaa atategetat egagtaataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaeee aatteeteae eaattage 14160	gtgttttaa	ataacggcat	ttttccaagc	caggttaata	cttttgacga	aaatttttca	13680
agcatattee tgeagtatgt ttttgagege tteetgetga tteacaaatg acteaagetg 13860 egatataata tggtaagtat ttgteagate ggtaattgea tgtataagea acaaegtete 13920 tgeggeatea atataegeta aegtaeette attattegea geeagtteae eattaateae 13980 eataatetge egeeagatag aategeeaca aaeaggegat aaeggtataa teataeegtt 14040 eaataaeeag atateatett tagetteaat agaegtaaaa atategetat egagtaataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaeee aatteeteae eattattage 14160	ggcgcaacat	atgccttatc	agtattttcc	ttagcaatat	aaagtcgggc	atcattcgac	13740
cgatataata tggtaagtat ttgtcagatc ggtaattgca tgtataagca acaacgtctc 13920 tgcggcatca atatacgcta acgtaccttc attattcgca gccagttcac cattaatcac 13980 cataatctgc cgccagatag aatcgccaca aacaggcgat aacggtataa tcataccgtt 14040 caataaccag atatcatctt tagcttcaat agacgtaaaa atatcgctat cgagtaataa 14100 taagcactga ttgttgtcgt caaaagtgag cggtaaaccc aatttctcac caatattagc 14160	acaccaactt	ttgaaaacga	agacaacgtt	aaattattca	attttctctc	ctcatacttt	13800
tgeggeatea atataegeta aegtaeette attattegea geeagtteae cattaateae 13980 cataatetge egeeagatag aategeeaea aacaggegat aaeggtataa teataeegtt 14040 caataaeeag atateatett tagetteaat agaegtaaaa atategetat egagtaataa 14100 taageaetga ttgttgtegt eaaaagtgag eggtaaaeee aatteeteae caatattage 14160	agcatattcc	tgcagtatgt	ttttgagcgc	ttcctgctga	ttcacaaatg	actcaagctg	13860
cataatctgc cgccagatag aatcgccaca aacaggcgat aacggtataa tcataccgtt 14040 caataaccag atatcatctt tagcttcaat agacgtaaaa atatcgctat cgagtaataa 14100 taagcactga ttgttgtcgt caaaagtgag cggtaaaccc aatttctcac caatattagc 14160	cgatataata	tggtaagtat	ttgtcagatc	ggtaattgca	tgtataagca	acaacgtctc	13920
caataaccag atatcatctt tagcttcaat agacgtaaaa atatcgctat cgagtaataa 14100 taagcactga ttgttgtcgt caaaagtgag cggtaaaccc aatttctcac caatattagc 14160	tgcggcatca	atatacgcta	acgtaccttc	attattcgca	gccagttcac	cattaatcac	13980
taagcactga ttgttgtcgt caaaagtgag cggtaaaccc aatttctcac caatattagc 14160	cataatctgc	cgccagatag	aatcgccaca	aacaggcgat	aacggtataa	tcataccgtt	14040
	caataaccag	atatcatctt	tagcttcaat	agacgtaaaa	atatcgctat	cgagtaataa	14100
gataatatee tggtgtgeett geaatttaet tteetettga attatatett ttataagatt 14220	taagcactga	ttgttgtcgt	caaaagtgag	cggtaaaccc	aatttctcac	caatattagc	14160
	gataatatcc	tggtgtgctt	gcaatttact	ttcctcttga	attatatctt	ttataagatt	14220

-continued

gcttcttcaa atttaatctg gttacacaat gtcttgatac tttttcgcgc ccatcgccgg 14280 gcgcaatatt tctctccttt aatccagtag aatagccatt cactacgcat cggaacacat 14340 atcagcaget cetteggate attiteaaca tgaegtaaet tgeetttaat aacaaaaege 14400 gaactgtcag caatatcatc atatattgca gccatacctg aaccgggtac tacatgtgtg 14460 atgattttca taacaattaa tottattcaa ttgttgtcaa gogagagaaa aatactacac 14520 cctqqactca aqactttttt taacaacacq qcatatatcc qcaaaqqtcq tcatatcaqq 14580 aagategttt teattgeaae taatgteaaa eteeteacta agaecaaata caatateaat 14640 taaatccaat gagtcagcgt aaagatcctc aaccagattg gtctgaccat tgatactatc 14700 aacatcaacq qcaatacaqq aqqtqatcac ttttttqact cttqcttcaa tatccatatt 14760 categeatet tteeeggtta attaaegetg catgtgeaag ceateaaegg tagtaataae 14820 ccgatccacg ccaggtttat tcaggtatga ctcgtaagcc gggccagctc gccagctacc 14880 gtctccgata aggccgtcca gcacattact taacacatag tcagtttccc cttttagcct 14940 ggtcagcccc gcctctctgg caaactgcag tgcaatctca gccagttttt ctttttgtgg 15000 atgatgagta atgacetett tgagagtete eattteget tteaattetg ggtgettgte 15060 aatatcgcta cattgcgctt tcaacgctgc actctttatc gtgtcattgg gtaatatttc 15120 cgcacgcaag ccgtcaaacg ctctgcgtac agggaacggt gtggaggtat ctggctccag 15180 ggctttacgt atcacaccca aaaacgtctc acgggcgtcg aaatgcattg aatgcatatt 15240 cgtaacgctc ggtactgttg agaggaaact attttgctta aacttcaaac cagaaaatgg 15300 gccagtetta tetgtetgae tattateatt ateggtegta eeggetttat taeetgtaat 15360 taccgtcgtg tctgattgta aggtatcggt tttaacattc tcgacgccag ccagttgact 15420 ggcaagegge tteacattea caatetetge egtetggett tgetgtttat tateateaae 15480 gccgtgcacc gtggcctgta ccggcttgcc gataatgctc ttgctggtta cgccatcgac 15540 ttcatcaaaa gaggttgttt cacccatagt gcccttttct gacgtgacca cctttccatc 15600 tttactttcg gatgaagegt tggtcacage etetgeegte geatgageeg tgaegteaat 15660 tttacccgcg atgccatggt caattgcccc tgtgctggcg ctgtgtgccg tctccgtttg 15720 atgcatagte gaatecacae gegaatgaet atgaettaeg ttgetgetgt tagtegaatg 15780 gtgtgactcg ccattgcgtt ggctgttatc aataaatgtt cggctattat caatcgtctt 15840 ccggctatta tcatggttgc tattatcgat atggcgctgg ctattatcga catggcttcg 15900 gctattgtta atatgcttac tgttatccac gctatggtta ctgctatcaa tattaatatt 15960 qatattaata ceeqtaqqtt ctqctttttt ceeaccatca qqtactqqtc caqeeqcaqq 16020 ctccggaatt ttagggtcag gcagtttatc tgcaggaatt tttgcaaaaa cattacgtag 16080 cagcaggggt atcaacgttt gcatttcaag gtgccgggct tcccgtccta cgctggtacc 16140 ctgctcttgc gttaattttt ggtggcacat atcaagcgcc tcaaccgcct tcgccgccgc 16200 tttgtcaaca aggtgcgtaa gattgctgcg ggttaacgga tctaacgtac agccaaagtt 16260 atgttcaatg cagetggcaa tatagggeat eaceteetge ataacaagat tegtegataa 16320 tttacttaat tcaccaccag tgttattttt gataatatct aacagctgct tttccaggtt 16380 ttccagette getteegett tetttgttte tggeageeat ggeecaaaag etgaetttte 16440 tttcaggcca tcttttatga tttgctcggt atactctgcc cccaccttca tcagtagcgt 16500

-cont	inued
00110	111000

				-contir	nued	
cttcgcctca	ggagaatcac	tggtggcgtt	gagcgctgaa	cgaaagagcc	cggcaaactc	16560
cattatcgct	ttcttaccgg	cgacattatt	tgaattggta	aaaacttctt	ttaacgcctc	16620
agcgtctttc	ccgcatttaa	acaatgcatc	cagactcgcc	tgtttgatca	gcgcgggaaa	16680
atcttccagt	tgcgggcctt	taatttcccc	tgacagcgtc	gttgtggcac	tttctctgac	16740
tgcggaaaga	ttcgccgcaa	gattcgtggc	ctgcgttttg	atctcggtct	gcatacctgg	16800
tattatgacg	ggggggctgag	tccttacact	tgtaaccatt	attaatatcc	tcttctgtta	16860
tccttgcagg	aagcttttgg	cggtttccag	gctgctactt	atcgtactgc	tcagcacttt	16920
taccaggttg	tcgtacaatg	aattggcatt	gctatattt	tgcgtcagcg	tctgtaatgt	16980
ggttttcata	ttttcttcct	gcgctttaaa	acccgactgc	caggcttgat	atttggcgtt	17040
atccatttcg	agttttgagt	cttttcccgg	cgcgcctaaa	ccatcaatat	cctgaaccat	17100
tttttgtaat	ggcgtcagat	caacggtgac	gacataaccg	gatccataag	atttcaggca	17160
gctattcggt	aaattcaatt	cactgagcca	ctgtctcgct	tccgcttcag	tggctacttt	17220
aacgccgctg	cctgactgag	ctggaaataa	aacggtatta	ctgtttattt	gattatattt	17280
attgactaaa	ctgtttaaat	catttttgag	tgaggtaaca	tctagcttaa	cggtattacc	17340
gtccttacct	ggtaataacc	agcctcccat	tttggaaaga	atatcactga	aggcctgata	17400
aaaatcggta	tagactgcga	caacgttttc	ataaacgccc	agatagctgt	cacctatcgc	17460
cgatatattt	tgggaaacca	tatcccaaat	ctcagcatca	gaaatggttg	ttctcggctg	17520
cgccataggc	gaagcgctaa	ataaggccga	cgtcggcgca	gaaaacgcgc	tccgcaggtt	17580
ctcattttgt	tctgcggata	atgacacgcc	agacttcgcc	agagcattca	ggctgctggt	17640
caactgctgg	cgcgccagcg	tgcgctcgtc	attattctct	tcagagatcg	gtggcgttga	17700
ctgcagcgtc	tgctgtgcct	gctggatttt	agtagccgcc	tgcgataatg	aaatgatatc	17760
tgtaccgcga	tgttctgtgg	tagacggtac	cacggcagtc	tcgacgtgct	cgctcgccga	17820
gggagtctgc	ggccgttcgg	caacgatccc	cggatgagga	gaagcggaat	aattttgaat	17880
attaagcata	atatccccag	ttcgccatca	ggagcgcgat	taaatcacac	ccatgatggc	17940
gtatagatga	cctttcagat	taagcgcgaa	tattgcctgc	gatagcagca	agtgcggatg	18000
ctttcgactg	gttaatgctc	tccattgttt	tcagcatttc	ctgaatcagg	ctggtcgatt	18060
tacgtgaact	ttcacgggct	tcgtccgatg	cggtgctggc	aacacggtta	ttcacctggc	18120
taatttgctg	ctcggaacgt	tcctgagtag	cggcgtactg	cccggacgcc	cctgcaatac	18180
caccgaccgt	gaccgagttc	ttcataatca	gatcgcccgt	catctgcatc	ttgcgcgcat	18240
caattcgggt	catatccatg	gtattctgct	caagacgaat	atcggattcg	acagactcaa	18300
gacgtttcga	cagaatagcc	tgatgttcag	gggagatttg	tttattactg	tctttaatac	18360
ccagactttc	cgtggcgctg	gttccggcat	tagatttaag	cgtcgcatca	ttaagatttt	18420
ttgtcgcatc	ggtaccggtt	ttcttcatat	ttaacgattt	cagagaatcg	acgccttcag	18480
caccgagttt	gacgctattc	tgcccgttca	gcacgttttt	aatactgtgg	ctttcagtgg	18540
tcagtttatc	gatettegeg	gcattatgtt	taagcgcgcc	tctttcattc	tgcagcccct	18600
tatattccag	tttggcgccc	acgccagtga	tccccaactg	aagcgcgctc	tgggaaatac	18660
taccggacaa	cgcattcatc	ccttcgcgca	tcatggagct	tgctgtcgtt	ttagctgcat	18720
caaagctgac	taatgacaac	ttaccagaca	gtttgctatc	agcctggttc	aacgtcagca	18780
ttaacgtatt	cgcggcagcc	aacagcgcaa	cggcactgga	agacattccg	ctaatatcaa	18840

-	cont	ın	ued

aaaactttcc gacttctgcc tgctgctcgc gtaactgggt ttgcacaacc tcattcgctt 18900 tagtcgtgac attatttgcc agagcattca aatcctgatt catgtcggta ttttgaatac 18960 tggcttttaa aaaggacgtg atcgttccgg gggtttgcgt taatacccct ggcgcaggcg 19020 cgctcagtgt aggactcaac cccaggtcac tgactttact gctgctaata ccaatactat 19080 tcagaatate tttagegeta acggattgeg aagetgtetg tgaactatte tcaacagaat 19140 gattatttaa ataagcqqcq qqatttattc ccacattact aattaacata tttttctccc 19200 tttattttgg cagtttttat gegegaetet ggegeagaat aaaaegegaa geateegeat 19260 tttgctgtac cgcagaagac atggcttttt gcagttccgc cgttaccttc tggttttcac 19320 caaatatttc tacqqattqt ttaaqccact qctqaatctq atccatqqca aaacqqqcqa 19380 gcataaaatc agcaagcgcc tcgctggcat ttttaataaa tacgccctcg gcaacaaccac 19440 cggctgactg ggctgcggta ttcgtgactt ccatgcccaa cgccacttta tttagggtat 19500 tacctaccag ctctttactt aaggcattcg tttgcaggcc catcttgcta cctacattac 19560 ccagaccgct agtaatacgt tgcatcccct gggtaaagag tttgctgccg ttttgcgcca 19620 actgtttcag cacgttaggc accaacttct taatcgtttc gcccatcatt ttgctcagcg 19680 cgttacccag tttcgccgcc gcgcctttcc cgacaactgc gaccaccaca atgaccgcca 19740 ccatggcaat ageggegaca ategcaecaa caatgetgee ggecatetet geegttttet 19800 tategatgee taateettee agegettigg taategeett gecaateage teeattaaeg 19860 getteageae atgeteeata ategggttta gegeetgetg aataaaegae acceeegteg 19920 ccgccttcac aatttcatcg gccaccatta ccgcaagtcc caccgcagcc agcgccagac 19980 tcgccccacc ggtaaaaaca gcggccacaa cgctgacaat ggttagcagc gcgccgagga 20040 ctttcccgat acateceata atgeggtteg ttteetegge tttgegegte tetteetgga 20100 attcageega tttettttee ateteegeet gaegeeette etgeaaggeg ttgaaaageg 20160 caagatcgtt ttgcaggctt tcttccgtat ttttgccccac aatctcaata aacatggcca 20220 tgagcatagt gaggcgggcg acatttgaca gattatcctg ctcaccctgg gaaacctgat 20280 totgagagge ggcattagee gttccctgga atttggtcag aatgttatee getttetegg 20340 ctttcgcttt ggcgtctgtg cctgctttaa ccgtcgcatc cgtggcctta tctaaggcct 20400 etttegeete tgtegettet ttteeggeet gttetaeege ggetteaget tgtgeatage 20460 cggggtcagc cgggtccagc gattgcaatt tattttgcgc ctgcgtcagt tttttggtcg 20520 cagegteata aacaetettg geggtateeg tetttttgat aetggettea tagagateeg 20580 tegeeteetg ageeteteee agageegtet ggaattettt egataeetga ateeeeatet 20640 ctttttqtqa ctcaatcatc qcctqccata ccqccaqacq aqactccaqt tqaqacaqcq 20700 aaacatcacc cagtagcgtc attaacttgc caagcagtaa tgtcaattgc ccttcgctgg 20760 agagtttttc ccgggcggcg tccgtaggcg gcttcagacc caccgtatta atagcgctct 20820 cgccggactt tgttccggct ttaaggtcgc ccgctttcgt tgccaccaca tctttaaaag 20880 ctttatccgc cgcttttaaa aagtccgtgt tcttacgaac gccttcaaaa gccgcctcag 20940 cgaggegegg attttgggta tatcegetac ggetaatget acttgegtea tttaceataa 21000 ttatteettt tettgtteae tgtgetgete tgteteegee gtttttageg eeteeagata 21060 gaccaacget tttgcccgca gagacteate ttcagtacgt teattgacaa gtteaaaaca 21120

				-contir	nued	
ctgtctggct	tttgctgcct	tacgcattaa	taattgacac	tgcccggtaa	aaaaacggg	21180
gcgataatca	tttttaagta	acgtaaacgc	tactgcataa	aggtcacatg	ctttctgaaa	21240
ttgtttttc	agttggcata	ccgccgccag	tcccatggtg	taatcgggat	tgtaaaaatc	21300
ataaatgcat	aagaaacgaa	agaatgtctc	agcttcatcc	agtcgtccct	ggttataaaa	21360
ctcataagca	tgagcatata	aaccgtccat	catatcttga	gggatcccat	gaacgtcttt	21420
tagcgtggcg	ccttcactaa	cggcatccca	aatcatttcc	gcaacacgtt	cttcgctgac	21480
attattttga	taatccatta	cttactcctg	ttatctgtca	ccgactttgt	agaacttaac	21540
gactgcgttt	atctgatgca	gttattaaac	cccgacggtg	gttagtgaac	attcaaaaaa	21600
cgcccaatga	atacatcgct	actgctttac	gcggctcaat	gccgtacctc	gttttcttgt	21660
ggctgaataa	cgtctttgcc	cgcgttttct	acctcttcca	gccaaaccag	aagacgtaaa	21720
acttcatcaa	tttcttccag	actcaccaga	tcataacggc	gatgggtttt	gaaaagactg	21780
cgcgccagtt	tgatatcgac	gatcacaggt	acgccaacct	tctccgcata	ggcgcggacg	21840
gccagtgcgc	gctgattcgt	ttcatacacc	gagatcatcg	gaatcggcat	caattcgggt	21900
ttaaaataaa	tcccgatcgt	aatatgcgtg	gggttggcaa	caatcaggcg	tgagttttca	21960
atatcagatt	tcacctgttc	agacagaatt	tccatatgaa	cttcacgtct	tttagattta	22020
acctctgggt	tcccttcctg	ctccttcatt	tcacgcttca	cttcttcctt	atccattttc	22080
atatctttca	tggtcaggaa	atattccgca	atagcatcca	ataataagac	aatcaatgcg	22140
caagcaaggc	aagttaatac	caatgcgagg	agaagttcac	gccaaatgac	ggcaatacct	22200
acaatattgc	catttagctg	agaaaagatt	tcaaccttat	atttcttcca	gcaaatgatg	22260
gcggccacca	caaaggatga	gagatacagt	agggttttga	ccgtatcttt	aaccgtgcgc	22320
atactaaaaa	gttttttgc	cccttctacc	gggtttaacg	ccgataaatt	aggctttaat	22380
gcttctgtcg	ccagcacaaa	accggcctgt	aataacgccg	gtaatgcgga	acacactaag	22440
cagagcagca	taaatggaat	cagatattt	aaccctatcc	caaaaacggc	caaactgtag	22500
tcagccatgc	tctgatcaaa	attatccgca	ataatgatct	taattatccc	cataaactca	22560
ttaaatgagc	catacgacac	cagataggca	attcctccca	gcgtcaggca	ggcgataatg	22620
agatctttac	ttttaaatga	ctggcctttt	ttagcggagt	cttccagccg	ttttttagtc	22680
ggtttttctg	ttttattcga	ggacatgcgt	cgcccctcgc	tcgtaaaacc	aactgcttaa	22740
ccctgtggcc	tggaaagaga	gtcgcagtac	attgtccggt	agtaccggag	agaaataaag	22800
cagcataatt	aaaacggcaa	taccgctttt	taccgtcagt	gaaatcgcaa	aagcgttcat	22860
ttgcggagca	aagcgcgaca	ataaacccag	gaatacttct	gacagcaaca	gcactaatac	22920
caccggactg	gccagaacca	aggcgttttg	agccacctga	ttaataaacg	ttaatagcgg	22980
cggtaatgaa	ggcgtgcact	cgttcatcgg	atcgcatagc	tgatagcttt	tatttaacac	23040
gtcaaccatc	gtgaccagac	cgccgttttg	taaataaacg	acagcggcaa	acatattcag	23100
gaaattagcc	atttccgagg	tatcaatacc	gtttgccgga	tcgatactgc	tacttagcgt	23160
tgeccetege	tggttatcga	taatacaacc	cagegeatge	ataacccaaa	aaggccatga	23220
tagcagacag	cccagcatga	cgcctaccgc	cgcttcttgc	agaactaacg	ggatcatcgc	23280
caccgataaa	aacggcggcg	cctcgttcaa	tgcatgcggc	catactccca	atgccaccag	23340
gatgataatg	gcgtttctcg	gcgcgccgct	taataccccg	ctattcaaaa	acggcaggaa	23400
gaaaaaaatc	ggcgctacgc	gagcaaaccc	tagtgccgca	gacgcaacca	ggtgatgaat	23460

-continued

ttcaaagtac aacgcgtaaa gcattttta ccccttagcc aacgccagga atatcacctg 23520 acgcccgtaa gagagtaaaa cttcgccata ccagccagac agtaaaaaca agcataaaca 23580 cacgccaagt aatttaatgc caaaaggcag cgtctgttcc tgtaattgcg ttaccgtctg 23640 gaataaccet accaggagge egataategt tgegacaate gteggeeace etgacaggat 23700 caaaacaaga tagagggggt tattacctgg aaacactaaa tcatccattt aactatcccg 23760 teteqtaatq atqtcatqtt qcaatqtcca tatactqtaa tatcaateee ttaqacaqta 23820 aggtccagcc atcaagcgcg acaaaaagca ccaacttaat aggtgtagat atcgtcaccg 23880 gactcatcat catcatcccc agegecagta geacgetgga taceaceagg tegaegaeaa 23940 caaaqqqqcaa ataqaqataa aaaccaattt taaacqcqct ttttatttcq ctcaqcqcat 24000 aagcaggtaa taacgcaaat attgatggtt tttcaatttc atctttgtca cgctttaccg 24060 teteggtete ttetecatae tgaegettea gttgegegtt tteaaaaaae tgaactaaet 24120 cgcgatctga atatttgatc agataatcgc gataaccatc cagaccttca tcaacgtgtt 24180 tacttaatga cgaaatatca ttaaaggtga catcttcgtc ctcaaaatag acgtaggcat 24240 catgcattat tggccacata acaaacatag aaagcagcaa tgcgacgccg ttaagcgtca 24300 tatttgaagg tatctgctgc aatcccaggg cgttacgcac catgacaaat acaatagaaa 24360 atttaacgaa acaggtteet gaegeaataa taaatggeaa cagggtggaa aatgeeagta 24420 aggcaattaa tgagatatca ttcccccatta ccagactcgc tcagccattc atggatctca 24480 acgectaagg tgtcattcat ctgtaccagt tegecattac ccagcaaaac accattegee 24540 ataatttcaa cgttaagttc agcattggtc ggcagtgata atagctgttg ctgccccatg 24600 gcttcgagtt cggcgagggt aacgttctta cgatacaaaa caaattccag tttgacgggc 24660 aattgattca agccaggcag agtttctgca gtttcagttg tattattttc ttcttcgata 24720 tgttgaatat ctaacgtttc cacaataatt cccccttcaa cacggttgaa atgacctaac 24780 tttttcgcgt agcaataaac ttccgcacgg gaagtacgaa tcaggagtac atctccgatc 24840 ccgattcggc ccagcaacga acgctgcgta tcactgctac cgattacaaa gcgcaacggc 24900 caacgcagca ttttcggcct gccgcccccg actgcaggca gttcaggaag atattcaaac 24960 cacaggeege eccgateget cataatgtge aacaatttee etteeggeag egegetteee 25020 qqcacqqqqt tetetacqca taaacqccqa caqqacaaat qcqqcacqqq caaetcaaac 25080 ggtcgctctg tcgcagcaag ccagggaacg accaggtgct cagcgccagc agaaaccgcc 25140 gcccccgcca gagcgggaga gacatgctca agccagtccc caggttgaat ccacgccgac 25200 caccqttttt ctqcatcqct caaccqaacc cacatteett qtcqcqtcqq atattecaqc 25260 gtagetteet ggeeatggeg etggeattet gtegeggttt gegeeaatag eeattegega 25320 cgatcaatct gtctcacacg caatgacatc aggcgtcatc ctcctcgcca gattgctgtc 25380 tgtgctgttg ctgctgcgga ttttgttgat cgtctcgcgt caggtgccag cgctggggat 25440 taccgttttg ccattgatca tgcaaacgat gttcaacctg cgtatttgac ggtattaacg 25500 aaaactcccc tgcttgccgc gcctgaatat tgacggaata gtcatttccc cagcgctgaa 25560 aacggtaagt cagcgagcta teeteett teacgecate ggeagtegga aaaatagtea 25620 tcatcggett tgattgegee getaaaggea tttttteate geegeeggtt aattggetaa 25680 gatcggcgat agtggttggt tgcagcggaa gctgagaaac atctttaacc tttttatgat 25740

			-contir	nued	
ctttatcgtc aggcttaccg	gtattggctg	cggccattcg	ggcaggtgcg	acatcccgcg	25800
ccagcggcgc gccctcttta	cgaacgcctt	cgcccgcgat	ggctttatta	tccccaggca	25860
atgeettgat attategtea	gagattcccg	tggcgttatc	ggctacttca	ctaacggact	25920
ccacggcttt taaatcagca	gataatttt	taccgcttac	gctttctaac	ggcctatttt	25980
tagacgatag caacgctgcg	gatttatcta	ctttggcctc	cgcagaaatc	aaaccgacag	26040
atttttcagc agtgactttc	aacagttttt	cagcaatcct	gagttcgcct	tttccgttat	26100
gatgcagacc agaaacgttg	ccattgtgat	gttctgattt	cgctggcgcg	ccatgtcgcc	26160
atgeegeeag taataeeggt	aaagccgttt	ctttatgcat	tacgaaagca	tcgccatagt	26220
cgcgatcttt tttatcaccg	gaatattctg	tcttatgttt	ttccaccgct	tttttaatg	26280
cttctgataa accgccaacc	tcatcctgct	gcggcagtaa	aatgttcccg	gatgaactga	26340
cagetgacae ategeceatt	aaattatctc	ctctgactcg	gcctcttcct	gctgtatctc	26400
tcgctggata tagaatcttt	tctgacggat	tatccagcgt	tgatagttcc	cttctttgcg	26460
caaccaatat ttacttttt	tctgaaactc	ttcccttttc	ttttccagct	cgctccgttt	26520
tteetgaatt tgtataatet	ggagttctaa	atcttttatc	tgccggcgaa	caatagactg	26580
cttacgtaat aacgtataaa	tttcctcacg	actgagctgt	ctgttttctg	cacgcagcgt	26640
atctaataac aatttcagac	ccgctatttg	ttcaaggatc	gcctcctcct	cggcctgcag	26700
cccgcggtcc tcatcctgat	agcgaagtaa	tatcgactca	cactgtgaat	gaaataccgt	26760
acagcgccgc tgcaatactt	taattctggt	cagcgaatgc	attcataccg	ctcaacgtgt	26820
catcaaagga tgaatactgc	gctaccggct	ggcataacca	ggctttcagg	ctatcccgca	26880
tctgcatcgc ccgatcgtta	tcgatattt	cgccaggacg	atattctccc	aagtcaatga	26940
aaagctggag ctcttccaaa	cgcgtcatta	atttacgcac	ggcagatgcc	tgttcagcat	27000
gtgtcggcgt cgtgacttgt	ccaaaaacgc	ggcttacgct	tttcagtaca	tcgattgccg	27060
ggtaatgtcc ctgcccggcc	agctttctgc	tcagatacag	gtgaccgtca	aggatagagc	27120
gaatttcatc cgccatcggg	tccgcctctt	cctcgctttc	cagcagtacc	gtataaaagg	27180
cagtaatgct teeetegetg	gtcgcccctg	ggcgttccag	caagcgggggc	aaattatcga	27240
atacggaggc gggataacct	cgacgggccg	gacgetetee	cgacgccagt	gccacgtctc	27300
gcaaagcacg cgcataacgg	gtcatggaat	cgataaaaag	cacgacccgt	tttccctggt	27360
cgcgaaaata ttccgctacg	gttgtcgcca	gttgcgccgc	attgcagcga	tcgaccgagg	27420
ggaaatcgga agtggcaaaa	accagcacgc	atttttcttt	cttatgcgaa	gcgcgcaaca	27480
tatccacgaa ttcagtgacc	tcacggcctc	gttcaccgat	aagaccgata	acaaagacat	27540
ccgcctccgt ttgctcgatc	agcatatgca	tcagcatggt	cttaccgcat	cctgcggagg	27600
caaaaatgcc cattcgctgg	cctacgccac	aggtcaataa	cccgtcaatc	gcgcgcacac	27660
cggtaatcag cggttcacgg	acgccaacgc	gtgaagcgta	agacggcggt	gcgacatcaa	27720
taacgcgttc ttcgctaatc	ggcgccactt	caggggtaaa	acgctcaacg	attttccctg	27780
tcggatccaa caccgcgcct	aataccgagt	atcccaccca	cgccgataac	gcacgtccag	27840
tgggataaag cacgacatcg	cggctcagcc	cctgggcatt	gccgataagg	ctcagcacgg	27900
tgcgttcccg ctgtaagcca	accacctgcg	cacgtgcaac	aacctgtttt	tggtgccagc	27960
cacggcgtat ttcacacagt	tcgccaatgg	ccacatcgcg	caattccgcc	tcaataattg	28020
ggccggttat tttttgtggg	taggccagat	attgcagtaa	acgaggtgtt	ttcatctcat	28080

-continued

tagcgaccga ctaaaaactt ccagatagtt gtaaaaccca ttcaaggcag tagagaactt 28140 ttcaccgtca gataaaaaat ccggatgcac taaggcttta agcattagct ccccattctg 28200 ctcccccagt agtaattgcc cgccgcgggc aaaatggcat ccttccatga tggtcattaa 28260 gatttcataa gcccgctgtt gtaataccac catgctgtca gcacccaatt gcgcccagat 28320 ccatacatca tegteettga egetgataca gatacttgge aatgeaaata aateeagaac 28380 aattqttqaa tqqctatcta ttcctccqat qaqtqaaqqa tcqcaaccac ttacttccaq 28440 tgcggaacga actaattcag cgatatccaa atgttgcata gatcttttcc ttaattaagc 28500 ccttatattg tttttataac attcactgac ttgctatctg ctatctcacc gaaagataaa 28560 acctccaqat ccqqaaaacq accttcaatc attttcttaa taaatcqacq qacatcqaca 28620 gacgtaagga ggacaagatc tttatgtgca atcaataaat catccaactt aagtgtaatg 28680 agatccatca aattagegga ggetteeggg teaaggetga ggaaggtaet geeagaggte 28740 tgacggatcc ctttgcgaat aacateetea aetteageag ataceattae tgetegtaat 28800 tegeegeeat tggegaattt atgacaaata taacgegeea ttgeteeaeg aatatgetet 28860 acaaggttaa tgacatettt ttetettgge geecacaatg egagegette cataattaat 28920 ttcatattac gcacggaaac acgttcgctt aataaacgct gcaaaacttc agatatacgt 28980 tgtaccgtgg catgtctgag cacttcttta agtaaatcag gaaatttcgc ttccagttgg 29040 tccagcatat gttttgtttc ctgaataccg aaatattcat tgacgttgcg cgccagcgtc 29100 accgccagac agtggtaaag ctcatcaagc gcgttccgca acacatagcc aagctcccgg 29160 agtttctccc cctcttcatg cgttacccag aaatactgac tgctaccttg ctgatggatt 29220 gttggattaa taccaaagga cacgacttca tcggaataat ttaccactcg catcaaatca 29280 aaatagaccg taaattgttc aacacggatc tcattaatca acaatacgat gctgttatcg 29340 tccaggccct cgccatcgcg taacaatact tccggcaggc gcacgccata atcaataaag 29400 aactgactac gtagacgete egeaagttga gettttteea gatetteaeg eeggetette 29460 ggcacaagta atatcaacgg tacggtetet gtagagaett tatcgagate gecaateagt 29520 cccaacgacg ccccttcttt ttcctcaata ctaagegget gctcgccttt gctggtttta 29580 ggtttggcgg cgctacgttt tgcttcacgg aatttaaaat agaagagtac gcttaaaacc 29640 accqataaaa taacaaatac cqqcaqcqqq aatcccqqca qaqttcccat tqaaatqqtc 29700 aaaatageeg taacaaccaa tacaaatggg ttgttcaaca getgegteat gatatteege 29760 cccatattat cgctatcgcc atttacgcga gtcacgataa aaccggcact aatcgcaatc 29820 aacaatqcqq qqatctqqqc qacaaqacca tcaccaatqq tcaqcatqqt ataaqtaqac 29880 agageggagg acaaateeat accatggegg gteateeeca eegaaataee geeaataaag 29940 ttcacaaaga taataatgat gccggcaata gcgtcacctt tgataaactt catcgcaccg 30000 tcaaaggaac cgtaaagctg gctttccctt tccagtacgc ttcgccgttc gcgcgcagca 30060 teegeateaa taataeegge etteaaateg geateaatae teatetgttt aeegggeata 30120 ccatccagag aaaatcgggc cgcgacttcc gcgacgcgtt ctgaaccttt ggtaataacg 30180 ataaactgga ccacggtgac aatagagaag acaacaaaac ccaccgccag gctatcgcca 30240 ataacgaatt geeegaacgt ggegataatt teaceggeat eggetteaat eaagataaga 30300 cggctggtac tgatcgataa tgccagacga aagagcgtgg taattaacag taccgcagga 30360

				-contir	nued	
aacgttgaaa	aactgaggat	tctgtcaatg	tagaacgacc	ccataaacac	caatatcgcc	30420
agtacgatat	tcagtgcgat	caggaaatca	accagatagg	taggtaatgg	aatgacgaac	30480
atagaaatga	tcatcaccat	tagtaccaga	atcagtaatt	caggtcgtaa	acgagcactg	30540
ttaagtagag	aaagcagcac	tataggtatc	ctgttaatat	taaattaaga	cagcttttca	30600
atagtacgac	gctgttctgc	catttcatgc	ttgtaggcaa	tatcggtcat	actacgtaac	30660
gccattaaca	attcttcctg	ccaatattct	tcataaaaga	gtgaagaggg	tatggcttta	30720
catacttgat	aaaatatctg	caaaaaggat	gcatgttctt	tatgactaag	caataacgca	30780
ttcaaaccta	taatatcggc	taacagcgaa	tccacttcat	gtggctgttg	caatagcgaa	30840
agcatcagta	gtagccacga	cgactcctcc	gcattaaacg	ctttggtaaa	cgaatacgac	30900
aacaatgtac	tcacaaacag	taggtcagcg	gagcgcaaca	ttttaagttg	cgtcaggcgt	30960
cgtaaaagct	ggccaaactc	caggcgcgaa	caactggcgt	cattcgcgtc	aatatcggtt	31020
aatagcgaac	cctcaataaa	atccagtacc	accagtcgac	gttgatagcc	ataactggct	31080
atccagtcag	agtaaatctc	cacttcatgt	gattcactct	ggataaattg	ccgatagctg	31140
gcgcgcaata	agcctggttt	taacgataat	gttttcccaa	aaagccgggc	cttcaacgca	31200
caattaatcc	ctgccttgag	ggtcttcgga	tcggtttgct	cttcaacgtg	cttaagtaac	31260
gactccagct	ttttccgcac	gatctcttcc	aggtctttac	gacgaagcaa	ttcgcgtaac	31320
acaaggacta	aatcactggg	gtcaggaaat	aagctacgcg	cctgacgtaa	aaaatcttct	31380
aacgcgccgc	catgtacgct	aattagcttt	aagatttgct	tcgccttcgg	taaagcctca	31440
tcttccagca	cgcgttcaaa	actgttagat	aaattactgg	atttttttc	ataatcgcga	31500
cggttacgaa	attgcgccag	cgccgctgac	atttcgtccg	tcgactggac	aaatttttgt	31560
acttccgccc	ctggagacga	atcctctgcg	gcctgttgta	tttccgcctg	ttgcgcatca	31620
gtatgctggg	tcgcatcctg	atgagatgtc	tgccgggaca	atattctgga	aaatgaaata	31680
ccggaggttg	agccaggaat	catttaattg	cctcctgacc	tctatccaga	taaacacgaa	31740
cccatttctg	taacttatcg	tccccactcc	aggcaccgct	ttgcttcaga	atattgttta	31800
ccgattcgct	ggcatccggc	gttaacgggt	cgacaatttc	ttttggttca	atcatgaaca	31860
cacgaacaac	attactttta	ttcttactgg	aatagcggaa	caggctacca	ataagcggta	31920
atttgcctaa	aaacggaata	ctttggacag	tatcggtatt	tgcatcccgt	gtataaccac	31980
cgaccagcaa	actttttccg	tgcggcactc	tcgcaatagt	gctaattaac	gttcgcccga	32040
cttcgggtaa	cgcatctacg	gaggtggtag	tatcggattg	cggcgtctta	tcgttgccat	32100
cttcaatgtc	cagcgacatt	tctatctgac	catctgcgga	aaaacggggc	agcactcgga	32160
tcattgttcc	gtatgttaca	tgctcaagcg	ccacattacg	ttccccaatc	agcttggtgt	32220
aaaacgttct	gttgttatca	aaaatagcgg	gaacattttc	ctgggtcagt	aataccgggc	32280
gtgaaaccac	cgtcgcctgt	ttcttctctt	ctaacgcatt	gaccgcggcg	atgaatcgac	32340
tgccatcgag	ggtacttatt	gaagactggt	ttaatgacac	gccaagtttg	tccccaatag	32400
taatgctgcc	gctccatgaa	gtgcccaaac	gctccagatc	gcttttatta	agatcgacaa	32460
tccacaggga	taattctacg	tgacgtttgg	cgacatccag	cgctttaacc	agcatttcga	32520
taaaattcac	ctgctcagcc	gttcccttta	ctaacaaact	gttggtatcc	ggataggcca	32580
cgattttaat	attgcccgcc	gcggcatttt	gctttaaagc	ttcctgcaga	ctcatgccac	32640
cggcataatt	tgctgcttta	cctttttctc	cattcgctga	aaacgctggc	atcgccgggg	32700

-continued

gttcgctact gacaatatta cctaaaggtt gctcttctcc ctgcaacaac ctttcaatgg 32760 ccgtggcaat accggggata accattttct gatcgcgcag attataggta cgatcgccca 32820 cgaaggtatt gttcagacgc atcaccccta ttttctgacg tcccagctca ataccatcgt 32880 tttgcttgtc catcatggtg gcggcgttga ccaccatatc aacatagacg ggtggccctg 32940 aaacatagaa tgttccttta cggttatcgc cacgtagcgg gtaatttttg ttatataaac 33000 ctqaqcqttt taqaaaattq ttqaactcat tqaqtqaqac qttqcqtaaa qaaaccacqq 33060 cattgegeat tteactggeg teataaatat agatageetg eecategaaa taecaaatea 33120 gccccagttg tagggaaagc ttctccagta atgcgttagg atcgtgaaac tcaaagttgc 33180 ccqtaatttt ttttcqtqcc qccattttqc taacaatqac aqqctccttt aqctqtaqcq 33240 ccatggcatc gaaaaatgtc cgcaggctat cgtctttcgc aacaaaccca cttcccgtta 33300 caggtatttt ttcactagaa taaccaggtg taaccagaac aagcgcggca catgccagca 33360 ctctggccaa aagaatatgt gtcttcattt gtctgccaat tgaataatat ttgataattt 33420 ccgcggcgaa acgccgatca gctctttgat ctcactagaa aaatgtgaag gcgatgagta 33480 accatgatta acggctaatt gggtgatgtt ctcgtggcct tctacactat tcagcagcga 33540 ttgcgccata cgccagtttc gtaattcact cttcgctttt ccgcccaacg ctctgctgca 33600 caaacgacga aaatgggtat aagaaacgcc atagtettet eccageatte teategtgtt 33660 gccgctggtt gactgagcga gtaaatagcc aaccaaccag taactctcgc tttttcgtaa 33720 cagagecagt accttattga aggeeggaga aggtgtaata atttgetgea aaaaccagta 33780 ctcgcagcgt ttacgatctt gccaaatagc gcgaaactca ggactcagca aaacccattt 33840 atcggattca gcatatgtcg tgtccactaa tcctgcgcca tcgataaatg ccagtaattt 33900 gctgagtact tcaattttta acggtcgaaa aaccaggtct cctgatactg gtgcgacaac 33960 ggcctgctcg caaaaaagca gcgcgccttc ctgaatcagg caattttcat tgtgtcggct 34020 ttcagaaaat gacatatgca gcttttgcgc ggaacacgtc tgtataaacc atgcttccgg 34080 gctgcggatt ttccgcttct ctccttcttt aagtacttcc tgcgtattta gcatagttgt 34140 cagcaccagt taaaaatcat tttaatatgt aaacaatacc gggagcgggt ggcaaaatcc 34200 tgatgcaatc attatgaaac tgatgccgcc cgctaattaa attggccaac ttgcacagtg 34260 cttqctqatt taaaataqaa aattaqctca taqtqtataa attctqqctt attqttctqc 34320 agcagcaaaa attcagatat tgtcatctgg atggagaatt aattatttat atcaggagtt 34380 ttttttgcta gcattcctga aacgcattcg cctcttatca ctattgtcag ataacattct 34440 gacqqttqtq taaaaacatt qcqcctcatt cttctqtaqt tqqaqttaat atqaaaaaat 34500 tttatagetg tetteetgte tttttaetga teggetgtge eeaggtgeee etecetteet 34560 ccgtgagcaa accggtacag caacctggcg ctcagaaaga gcaactggcc aacgcaaata 34620 gtattgatga gtgtcagtct cttccgtatg tgccgtcaga ccttgcgaag aataaatcat 34680 tatcaaacca gaacgctgat aattccgcat caaaaaatag cgcaatcagc tcaagcattt 34740 tttgcgaaaa atataaacaa accaaagagc aggcgctcac cttcttccag gaacatccac 34800 aatacatgcg ttcgaaagag gatgaagagc aactcatgac cgaatttaaa aaagttcttc 34860 ttgaaccegg aagtaagaat ttaagcatat atcagacgtt acttgetgee catgaaagae 34920 ttcaaqcctt ataa 34934

```
-continued
```

<210> SEQ ID NO 2 <211> LENGTH: 25262 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: Salmonella pathogenicity island-2 <400> SEQUENCE: 2 ttatggtgtt tcggtagaat gcgcataatc tatcttcatc accatacgta acaaggctgc 60 120 aacqqqttca aataacqttt caqqaatttt atctccqcqt tccacttcaa aaaataatqa 180 gcgqgccaqc tcaacatttt caacaacqqq qatqcaqttq cqttcaqcqa tqttaacaat atagttaget tgageateae tgeetttte caggaegegt ggtattggea tateggtggg 240 atgatagcca agacaaaccg caatatgcgt tggattacgc actaccgcaa cagattgttt 300 aacaqattga getaaactee caetttgtat tteactetge attteeegae geegtgtett 360 catttgagga tegeceteca gatetttatg eteetgtttt acgteatett taeteatttt 420 tagatetttt etaatettat aatattgaaa agaatagtee agtatgeeaa egaegatata 480 aaaagccatc accccaaccc ataaccattt tattaaagaa gaaaccacaa gcaggccaca 540 ggctaaccca cagtacggta gcgcccgaaa agtactggca taataataaa agaaaaaagc 600 aaagataaga gatagcatga taactttcag gctggattta cataattcta ctacgctatg 660 taaagagaat atctgcttaa aattacttac cggatttata tgctcgcttt taaaacctat 720 ggccttgctg gcaataacca cccccacctg aagaaacacg ctacccacag tagcaactat 780 taccccagcg cccagaaaca gcagtgcaga agtcagtgac tctattaaag catgactcaa 840 ttgcgttaat gcataagaaa atggtttatt tactaattgt aatgtgaaag ttattgactc 900 aatcagtatc aaaatcatct tttcagtaaa gaaatgaaaa tacaaataaa gcgcaatcag 960 ctgaaataat gatgttattt caatactttt gacaacctgc ccttccttac ggccatcacg 1020 taatttettt tetgtagget gttetgtttt etegeteata eagatggaaa eeagtetttt 1080 agataaatat aaaatttatc gctttcaacc aaatagtgat gaagagcata agggaatgag 1140 atcaggagcg tcagtagaac cgatatactt ttgagcggca ttgagaggaa aaacacattc 1200 aattgttgtg ccgaccgatt taaaagacct aaagccagat cggctaatac catacatatt 1260 1320 atggcaggaa gagagaagct gatacataat tgataaagcg ttctccactc tgcctggata 1380 tattttaaaa attgctggtc aaataataaa gtacgccctg gtggtaaata ttgatatgac tcatacagaa tgtttaatat aaactccatg ccgccgctta taaagaaaat aacacacaag 1440 aactggctga aaagcaagcc aaaaagtgag gtttcagctt ctattgtaga attgaatatc 1500 gtacccattg tcgcgccacg taaagtatca agcagaaacc ccgccatatc aacggcccaa 1560 1620 aaqqqaaccq ccqcacaaaa cccaattaaa aaaccaataa tcacctctcc qqtqactaac cctaaccage tgtaatettt accaatatge ateataatet tetgetggta aatgattggt 1680 1740 aatatgggaa aggtaagtga cataagcacg ccattacgta aaatcgcgga ccctaaactg ccacttttta ataggggaag taataaagag aggctcaatg gtcgaataaa agccacagcc 1800 aatgcaataa gccactcatt tacctgttgt gccattcaac catgctctcc aactcgtaac 1860 attatctgcc gggtataatt caacaggata ccgctaagcc atgggtagct gaccattaag 1920 gttattgcaa ttgccaataa tttaatcatg aactgtagcg tttggtcctg tatttgagtc 1980 aaggeetgaa caaggettae gatgacacea actaeegatg ceaceaacae caeeggeata 2040

gacgtaaaaa	ggacgatcca	taaaagttgc	gttacaaatt	gcgtcaattc	agaatcattc	2100
atgaaaagct	ctgtaccaat	tgcgccagtg	tcagatccca	accgcctgcc	agtaaaaata	2160
ttagcagctt	aaacggtaat	gaaatggtca	ttggcgatac	catcatcatc	cccatagcca	2220
gcagtatatt	tgaaataagc	aggtcaatag	ccagaaaggg	aagataaata	agtaatccaa	2280
tccgaaatgc	ctgcgtcaac	tgactcaccg	taaatgccgg	aattaatatg	agcaaagaat	2340
caggttttat	ctttctttt	atgtcttcag	gccaggttcg	ttttatcaaa	ctccgaaaat	2400
aattggcttc	cttctcttca	gagtttttt	gcaaaaactg	tcgataaggc	gctaatgctt	2460
tactgtccca	ctcagacgtc	cagaaaggag	cgccagcgac	ctgaaccgga	tgccagcgct	2520
cttttacagc	taatagcgtc	ggccccataa	tgaataagga	aagtacaagc	gcgaggccat	2580
acagtgcgat	atttggggga	acttgttgaa	tacccagagc	atttcgtaaa	atcgaaaata	2640
ccaccgccag	tttaaggaaa	gaggttccca	tgacgataat	gagaggcagt	attgaaagca	2700
gaaacaatat	accaatcagt	tgcaaaggcg	aatcgggtaa	agacatactg	tatctctcat	2760
gacacgacct	agaacgctat	tatattgttc	gcatattatt	tttcttatca	ggtttacgct	2820
gtatttttgc	aaagatacca	acgtgtaata	cgcaccataa	attcattgcc	acaggcaatc	2880
aactcacctt	gcccaataat	acggtcattt	actcttatcg	tcacctctgg	cgcaaaacat	2940
ccacctacag	gcaaaacgtc	ccccgtttta	agttgtcgta	attgtccaat	ttccagactc	3000
gcacgtccga	tctcaaagag	cacctgttgt	ggtatctgct	caagttctac	tgaagatgtt	3060
ccgtcactct	ttgacattgg	actccctgac	gcaagtagcg	tttcgatatc	ctggactaat	3120
tcatcaaatt	tcatcgtgtt	atcctctgtc	agcaacaccc	tcgcgtagat	ccccccaggt	3180
agttgaatag	caaaaaaacc	gagtctgatg	tcgccaaagc	aatgaatccg	aacgcccatg	3240
ccgatttcga	tagactcaag	ttcaattaac	gtaagetgge	accagcctaa	atatacaggg	3300
actactacag	gaggggcagg	ataaatctgt	tgtcgcgcag	cagaaagctc	tccgactata	3360
ttgcgcaaaa	aacccgttgg	ccatgtaaaa	ataatgctat	ggaactcatg	ttcttcaact	3420
gtccatttaa	tatgcaacgc	tagctgatgt	ggtagattac	tgcaggatgt	tggcggttcg	3480
ttctgacaga	gggttgcatc	actggcttgc	aataacggcg	ccagccccca	ttcagctatt	3540
ccatatagca	attcaggatc	gatagccgat	cgattagcgg	tgccaattaa	cccttcacac	3600
cagegetgee	agcattette	tgcaatccac	accctaccca	gctcattatg	ataatttatg	3660
gtaaataatg	tcccttgctg	tactggatat	tgttgcatac	tcaatgtcag	ctcaccaatg	3720
gtagcgcctt	gcgttggaag	catctccatc	cacggacgct	cttcattcgc	tattcttaac	3780
atagaatatc	tccagggaaa	ttatataccc	catatgcagc	aactgagact	ccagccactg	3840
ctttagcgct	ttcatcgaac	ggtaaatttc	atgatgaggg	acattgattc	ttaactgaat	3900
tagcccccct	gattcacaga	cttcacactc	tacaccgtca	agataaccgc	cactaacacg	3960
ataacgttgc	gtaaaaacca	cgttcttatt	caatgctgca	ggaggattat	tctcaccaat	4020
gggtaatgcc	tggtgcatga	gttgttcaaa	gtccatacgt	tccgcctccg	cctcgttatc	4080
atcctgataa	gactggcatg	gcaacccaag	acttccctca	actttggtaa	tacgcatcgc	4140
ttaataccat	agtaatttt	tctttcttt	tcataagcgc	attaaaattc	ttctgtaatt	4200
cgcttcgccg	ggagacaagc	tgctgatact	gattctctaa	ctgctgccgt	tgcgtcaaaa	4260
agctctgcgc	ctgagtgaat	aacccggcca	tttgttgttt	cttatccaac	aataaatgac	4320

			-
-con	t.	1 m	ned

				-contir	nued	
aagataacgt	accttgccag	cccattaatt	ctttcagtct	ggtagacact	gctaaagcgc	4380
gcgtctggca	aatctgctgt	tccgtaataa	tcgcctgttg	ctgctgatca	agtacggtaa	4440
gettgeegeg	taattgcttt	tcacgccgcg	cgattatctc	cagcaaagtt	tccatgatca	4500
ctcggtgagt a	atttggtgta	atttttctat	aagtagctcg	ggtccgcata	cttcatcctt	4560
actttgtcgc	aaaaatgtgc	aaatatccgg	ataggtatca	atggctttgt	cagtatcagt	4620
atcaactcct	cgctggtatt	ccccaatgcg	tattaacagt	tcaacctcct	ggtaaagcgc	4680
caggegeege	cgcaatatcg	ccgccagttg	acgatgctca	tggctggtaa	cgactggaaa	4740
aacgcggctg	agcgttgcca	gcacgtcaat	ggcaggataa	tgccccctct	ctgcaagccg	4800
ccgggatagc a	acaatatgtc	catcaagtag	tgaacggact	tcatccgcca	acggctcatt	4860
catatcatcg	ccttccacca	gtaccgtata	aaatgcggta	atactgcctt	tttcccccat	4920
tcctgtacgt	tctaaaagtc	gtggcaatgc	actaaatacg	cctggcggat	attctccaga	4980
aactgcggtc	tctccggcgg	ccagagcgat	ttetegtgeg	gccctggcat	aacgcgtcag	5040
tgagtcggca	agcaagacga	ctcgctttcc	attatcgcga	aaaaattctg	ctatcgtggt	5100
agccacaaac	agcgccctca	cgcgctctaa	ggcgggtctg	tcagaggttg	cgacaacaat	5160
gacacagegt	tttcgggtct	cttcagacag	tgtaaaatcg	atgaattcgc	ggactteteg	5220
tccacgttca	ccaattaaca	ccagaacatt	gctgtctgcg	tctggcgcat	tacacagcat	5280
cgccagaagc	gtgcttttcc	ccacgccagg	agcagaaaaa	atacccactc	gttgcccttc	5340
gccacaggtt	gcaacgctat	caatagcgcg	aatccccgtc	attaatggtt	gagtgatagg	5400
ctgtcgaacc a	attgcgggag	gaggcattgc	atcatagtct	ttccagcaga	cgtcgggcag	5460
ttcgcggcca	tcaagggggac	gaccaaaacc	atcaatgact	cgccctaata	acgcttcgcc	5520
cacgggaacc	tgatggette	gccttaaggc	catcacttgc	tgcccgcagt	gaagtccgat	5580
tgtactcgta a	aaaggagata	gcaaagcttt	gctgccatta	atccccacga	cttcagcaag	5640
ttetteteea g	ggctttatac	agcacaactc	acccataaat	accccaggca	accacgcatt	5700
taacaacgtt	gcgctgacat	cctgaattcg	gccccatcga	caataaccat	cddddddcdd	5760
atatttcagc (ctcagacgtt	gcatcaattc	attcttcatt	gtccgccaac	teetettege	5820
taaggtcaat	actttctacc	acttgtataa	ggctctcctc	tcctaattcc	tgccatgaca	5880
aaatcggtac g	gtcgaacaag	gtggcttctg	taatttttcg	caagaaacgt	cgggtgtcga	5940
cagaagtgac a	aatgaataat	ttggctgact	gcttcagcgc	ctgctcgata	agttgcagga	6000
tctgcgtctt	atgacgagac	gacagcgcag	tataggtccc	cattaccgtc	tggcgaatgg	6060
attcacgcac g	gaggttctca	ataccttcgc	cgatccgcaa	aatcggcagc	ggttttcctt	6120
ccggattaag	acgacgcaga	atatgacggc	gaagcgcgat	acggacatat	tctgtcaaca	6180
tcaggacatc	tttttcacgt	ggcgcccagt	caattaaggt	gccgaaaata	agacgtaaat	6240
ctctaataga a	aacccgttct	gatacaagcc	gttgcaaagt	ttcagcgatt	ttattaatgg	6300
gtaactggcg	ttgaagetet	ttcaccagct	cagagtagtt	tttttccatc	gcattcatta	6360
gataacgcgt	ttcctgaaca	ccaataaact	ctcccatatg	ccgaagcagg	acacatttta	6420
ataaggcaga g	gatacgttgg	ctgcccgcga	aaacgtccag	tccaaaacct	tgcgccttat	6480
gggccatgtc	ttttgtaagc	caacagatct	gccccatccc	gttcggtaac	gtctggctgt	6540
cacccaccac	actagcgtcc	gcgcctatca	ataaataatc	cgcctgagcg	ggaatagata	6600
aactaaatac 🤉	gggttcctga	tatagcagta	ccgtcaattt	ttcggtgggt	tcaggcaaaa	6660

-continued

cctcaatatt	cacctcaggg	agagggacgc	cggtatcctc	aaataaaaac	catctcatgg	6720
cgtcaatatc	acgaatcagg	tcggcagaat	gtaacgtcgg	gctaagacgt	aagattagag	6780
gacatgcgcc	gggaaccata	ctatctttt	ccggtgcttc	gacgccattt	gcggaaacca	6840
cagactttt	gcggcgaatg	aggataattg	gcaatgctaa	caacgctgaa	aagaaagcga	6900
gagtgataaa	aggaaagcca	ggaattaaag	cgaggagcat	taaaaccaca	gcggttaata	6960
tgagcgactg	aggttgtctg	gcaatttgag	aactcaactc	tgtcgccagg	ttctggcgtt	7020
tctcacccgg	gacacgggtg	acaataattc	ccgcgctaag	ggaaatcagc	agcgatggaa	7080
tttgcccaca	taaaccatct	ccgattgaca	gtacgctata	agtgtgaaca	gcctcactca	7140
tcgacatatc	atattgtacg	atagcgataa	tgataccgcc	gataatgttc	accagaacaa	7200
caataatacc	ggcaatcgta	tcgcctttaa	caaatttcat	cgcaccgtcc	atcgcaccga	7260
gaaagcggct	ttcctgctgg	acatgctgtc	ttaatgtacg	ggcatggtct	gcatcgataa	7320
ctccggcacg	caaatcgcca	tcgatactca	tttgtttgcc	tggcatccca	tcaagcgaga	7380
aacgtgcgct	aacttccgcc	accctctcga	taccttttgt	aatgacaata	aattgcacga	7440
tagtaatgat	ggtaaatacg	accaacccaa	cggtgagatt	tcctcctacg	acaaacttac	7500
cgaaagcatc	cacaatatta	ccggcattat	gttgtaacag	taccagccgt	gatgtgctga	7560
ttgtgagtga	caaacgatat	aatgtagtaa	taagtaataa	agacggaaat	accgataaat	7620
cgagagggtc	actaagataa	atagcaatta	agagcaggat	cactgaaaac	ataaggttga	7680
tagtaatcag	gatatcaacc	atccaggtcg	gcaaaggtaa	cagcatcatc	acaatagcga	7740
ttaataacac	cgtcgccaga	accatatcct	gccgacccgc	gcatacactg	agccactgtt	7800
gcgccctgac	tccctcacct	aaccatgaac	gcattgcgac	tccagaaatt	ttatttgtcg	7860
atgatgtaat	cgtaaccaga	gctcggcgga	gctggaaaga	ggtggagaac	aactcattgc	7920
aagcccatcg	cgcaacaaaa	ataatcgttg	aggaataccc	tggaacgctg	cgggtttcca	7980
gttagccaac	gctttaaaaa	gcagttcttc	gtctaagaag	gtttgcttga	gtatctgaca	8040
taagtgaata	cgacagttat	gatagtttag	ataggtttca	tattgtcctt	gccgccagaa	8100
catattggtc	gctaaaggcc	gttcagctaa	tcctgctaat	tgaataaaaa	gctgaatatt	8160
acgttcagta	atgagatccc	aatccatcct	gacgcctcat	gatgagccag	aaagccaatt	8220
tacctaaata	ttgaaagcca	ggtatcagaa	taaaacctga	tttatcttta	cttcacgaag	8280
cgtttcgaga	atttgttcac	gttgatcttc	gtcgttaaaa	cagttatcgg	gtatcagcat	8340
aaactgcgca	tcaagttgtt	ggagtaaccg	attgaacatc	ttcgatgaag	aaactatagc	8400
ggtaagtcta	tcaagcaacc	aatcactgaa	aagccagcgc	tcacaaataa	tatcgagtag	8460
tagcggcagt	aatgtattag	gcggcaactg	gcaaatccac	tcctcacgct	ggcactcttt	8520
ttcaaggcca	aggaataaca	gcaaacgacg	caaacgtact	aatgctgcgg	ccaaacgact	8580
ttgctccgag	ggttcgatgc	atatgctaag	ttcaaaggct	attgctctta	gcaaaatacg	8640
gacccgttca	cagcgatccg	gccagtctgc	cacgcgtctg	aaccactgcg	ataagggcat	8700
ttcatcgttg	tctatcgcct	gttgcataaa	acgetteage	gaggacagcg	tagcggtatc	8760
cacttcgcca	agttccagta	aactaaaaac	ggcaagttcc	catccctcct	ccgctgtaag	8820
cgtatccagt	tgcgattgca	aatcgcgttt	tttcttttt	gacaacccgc	cggcagtaag	8880
cgccattgca	agagcgataa	tttgatacgc	attctgtaaa	tcaggatcac	tattctcttc	8940
	cgtcaatatc gacatgcgcc cagacttttt gagtgataaa tgagcgactg tctcacccgg tttgcccaca tcgacatatc caataatacc gaaagcggct tagtaatgat cgaaagcatc ttgtgagtga ttagtaatcag ttagtaatcag gttagccatcg ggtagcctgac aacgtgcctgac atgatgtaat aagcccatcg gttagcaata catattggtc acgttcgaga gtagtgaata tagtgaata tagtgaata catattggtc acgttcgaga ggtaagtcta tagcggcagt ttgccqag ggtaagtcta	cgtcaatatc acgaatcagg gacatgcgcc gggaaccata cagactttt gcggcgaatg gagtgataaa aggaaagcca tgagcgactg aggttgtctg tctcacccgg gacacgggtg tttgoccaca taaaccatct tcgacatatc atattgtacg caataatacc ggcaatcgta gaaagcggct ttcctgctgg ctccggcacg caaatcgcca aacgtgcgct actaagata tugtgagtga caaacgatat cggaagggtc actaagataa tagtaatcag gatatcaacc ttaataacc ggcaacaga gcgccctgac tccctcacct atgatgtaat cgtaaccaga aacgtgcdt actaagataa tagtagtaat cgtaccaga gcgccctgac gcaaacaga tagtagtaat cgtaaccaga aagcccatcg cgcaacaaaa gttagccaac gcttaaaaa tagtgata tcgaaggtc aaagtgaata tgaagatca catattggt gcaacaaaa taagtgaata cgacagtat catattggt gcaacaaaa tagtgata tcgaaccaga aagcccatcg cgcaacaaaa taagtgaata cgacagtat catattggt gaagatcc tacctaaata ttgaaagcca cgttccgag attgatcac tagcagcag tcaagtgtgt ggaagtca tcaagtagt ttgcccag ggttcgatgc tacctaata ttgaaagcca tcactaggca tcaagtagt ttgcccag ggttcgatgc aactggcag aatgtataca tagggagtca caagtagtgt	cgtcaatatc acgaatcagg tcggcagaat gacatgcgcc gggaaccata ctatctttt cagacttttt gcggcgaatg aggataatg gagtgataaa aggaaagcca ggaattaaag tgagcgactg aggttgtctg gcaatttgag tctcacccgg gacacgggtg acaataattc tttgcccaca taaaccatc ccgattgaca tcgacatatc atattgtacg atagcgataa caataatacc ggcaatcgta tcgccttaa gaaagcggct ttcctgctg acatgctgc ctccggcacg caaatcgcca tcgatactca aacgtgcgct acctacga acccacaa cgaaagcatc cacaatatta ccggcattat ttgtgagtga caaacgata atagtagtaa cagatatca ggtaaatacg accaaccaa cggagaggtc actaagtaa atagtagtaa cgaaagcatc cacaatatta ccggcattat ttgtgagtga caaacgata atagtagtaa cgagagggtc ccacacca acccaggtcg ttaataacac cgtcgcaga accatatct gcgccctgac tccctcacct aaccatgaac atgatgtaat cgtaaccaa ataatcgttg gttagcaaca gcttaacaa ataatcgttg gttagcaata cgacagtat gatagttag caatgtggat cgaacaaa ataatcgttg gttagcaaca gcttaaaaa gcagttcttc tacgtaatg at gagatcc aatccatcct cacgtcaga attgatgta cgacagtat gatagttag catattggta cgacagtat gatagttag catattggta cgacagtat gatagttag catattggt gctaaagcc gttcagcaga aagcccatcg cgcaacaaa ataatcgttg gttagcaat atgaagtcc aatccatcct tacctaata ttgaagtcc aatccatcct tacctaata ttgaagtcc aatccatcct tacctaata ttgaagtcc aatccatcct tacctaata tgaagtcc aatcactca ttcaaggcag actgatta ggagtaaccg ggtaagtct tcaagtaac gcaaccaga tggtaggcag aatgattag cgaacacga ttgctccgag ggttcgatgc atatgctaag gacccgttc cagcgatcg caacacaga tagcggcag aggataaca gcaaacgacg ttgctccgag agtcgatcg atatgctaag cacttcgca aggaataaca gcaacacacac cgtatcagt atgcgatcg atatgctaag	cgtcaatatc acgaatcagg teggeagaat gtaacgtegg gacatgegee gggaaccata ctatetttt eeggtegtete cagaettttt geggegaatg aggataatg geaatgetaa gagtgataaa aggaaageea ggaattaaag egaggagat tugaegaetg aggttgtetg geaatttgag acateacte teteaceegg gacaegggtg acaataatte eeggetaa ttggeeata taaaccatet eegattgaca gtaegetaa teggaatate atattgtaeg atagegata tgataeege caataataee ggeaategta tegeettaa eaattteat gaaagegget tteetgetg acatgetgte ttaatgtaeg eteeggaatg ggtaaataeg acaaceeaa eggtagatt egaaagegget acateegea tegataeta gttgtaeeg aaegtgeget acateegea aceeteega tegetaet tuggaatga ggtaaataeg aceaaceeaa eggtgagatt egaaageate cacaatatta eeggeatta gttgtaacag ttgtgagtga caaaegata atagtagta taagtaataa egagagggte actaagata atagtagta taagtaataa egagagggte acetaeed aceatgee geeaaggta ttaataacae egtegeeaga aceataete geegaeege gegeeetgae teeeteaa aceatgae geetgeaga aageeeaga gettaaaa ataategttg aggaatae egatagtata egaaagee gtteagetaa teetgetaat acgataggat egeaatae gatagtta gatagtaa aageeeate geetaaage geteggeaga teeetaa aagtagata egeaaggee gtteagetaa teetgetaat aegtteagta atgagatee ateeteet gaeegeetea taatagaa egettaaaa geagttette gtetaagaag taagtgata tegaagee gtteagetaa teetgetaat aegtteagta atgagatee gatteagea daegeteeta etaattggte getaaaggee gtteagetaa teetgetaat aegtteagta atgagatee gtteagetaa teetgetaat aegtteagaa attgttee gtgatette gtegtaaaa aaactgeega teaagteg gtateaga ataaeetg ggtaagteta teaagatae geagtaette gtegtaaaa aaactgeega teaagteg geagaaceg attgaeaete ggtaagtet teaageae ataaeetga geageteet tteaaggea attgttee gaagtaeetg atagaeteet geaaatee ggtaataaa geagteetga atageetee tteaaggea aggaataae geaaacgaeg caaaegaet ttaaeaggea ggttegatee ataeetgaa aceeteete ttgeteegag ggttegatee gtegataaa aceetteege aacettegee aggaataae geaaacgaee caaeetgee tteaaggee aggaataae geaaacgaee caaeetgee tteaaggee aggaataae geaaacgaee caaeetgee tteaeggea agteecagae geaaacgaee caaeetgee tteaeggea agteecagae aactaeaeae geaaacgaee teaaeggee aggaataae geaaacgaee caaeetgee tteaeggee aggaataee geaaacgaee caaeetgee tteaeggee aggaataee geaaacgaee caaeetgee tteaeggee agg	cgtcaatate acgaateagg teggeagaat gtaacgtegg getaagaegt gacatgegee gggaaceata etatetttt eeggtgette gaegeeatt cagaettttt geggegaatg aggataatag geaggageat taaaaceaca tgagegaetg aggttgteg geaattgag aacteaaete tgtegeeagg teteaceegg gaeaegggtg acaatatte eeggetaag ggaaateage tttgeeeaea taaaceatee eeggetaa tgaaceae ggeaatgee ggaaagegge teeetgeeg aaatgeggeet gaeaeggt teegeettaa eaaattee eggeaeggee teteaceegg gaeaeggt teegeettaa eaaattee eggeaeggee tetegeeaea ggeaategea tegeettaa eaaattee eggeaeggee aaatgegee teeetgeegee acaeteege tegeeaeag ggeaagege tetgegaage gaeaeggae teegeettaa eaaattee eggeaeggee aaaegtgegee aaetteegee aceeteega taeettetge aggeaegge egaaagegge eaaatgee tegeettaa etagtaatag aggeagaet eggaagegee eaaatgee teggeatta gttgtaacag taeeageegt teggagage gaaatgaea aaggeagaa taegtaata tagtaatga ggtaaataeg aceaaecaa eggtgagatt teeteetae eggaagegte acetaegae aceateeta geegaeggee teeetae eggaagget eaaaegata aatgeaata agaegagat caetgaaae tagtaateag gatateaee aceaatte geegaeegge geaaagega tagtaateag gatateaee aceatgae geatgegae teegaaage ggeeeetga eetaaegaa ataegetg geegaegge geaaagetg gegeeetga eetaaegaa geeggeegg getggaaag ggtggagaae aageeeate egeaaagae geteggeeg getggaaag ggtggagaac aageeeate egeaagta gaegttete geegaeagg getggaagae gagegeat eetaaaa geegtette geedaaaa eggteegg gttageeaa egeaagtat gatagttag ataagettea tatgteettg ataatgaat egaeagtat gatagttag ataagettea tatgteett eatattggt getaaaggee getaegaa taaaeeegg gttageeag aaeetgegea teaagtee getaegaa taaaeeega tttaetetta egtteegaa attgtee gggataeeg atgaacaet teegaagag ggtaagtet teaagaee ggataeeg atgaacaet teegaagag ggtaagtet teaagaee getaeaga aaeeegge teaaaaaa aggeeagte acaagtae geaageeg atgaacaet teegaagag ggaagtet teaagaee geaaaeeg atgaacaet teetaaaaa aggeegge aaeegge aatgetee geegaeeg eaaaeegge teaaaataa tageggeag aatgeteg agaataee geaaaeegge caaaeetgeg teaaeegge aggaataee geaaaeegge caaaeetgee teeeaaataa tagegeag aatgeteg geaaaeeg eaaaeetge aaeetgee teaaegee aggaataee geaaaeegge caaaeetgee aaeetgee teaaegee aggeataee geeaaeetge eaaaeetge aaeetege teaeegte	cotoaatatt cacotoaggy agagggaogo oggtatooto aaataaaaa catotoatgg ogtoaatato acgaatoagg toggoagaat gtaaogtog gotaagaog aagattaga gacatgogoo gggaaccaa otatotttt coggtgott gaogocatt goggaaacca cagactttt goggogaatg aggatatag goagggocat taaaaccaca goggttaata tgaoggaotg aggtgotog ggaattaag oggggagcat taaaaccaca goggttaata tgaoggaotg aggtgotog goaattaga googgacat taaaaccaca goggtaata tugocoaca taaaccato cogattgaca gtaogota ggaaatcago agogatgga attigocoaca taaaccato cogattgaca gtaogota aggaagogo atocactoa togacatato atattgtaog atagogata tgatacogo gataatgtto accagaacaa caataataco ggoaatogta togoctta caatttoat ogocoogo atogocoga gaagoggot tocotgotga acattota tigttigo tgoacogto atogocoga aacgtogot acottocoo accottoga tacottigt aatgacaat aatgocaga aacgtogot aactocoo accottoga tacottigt aatgacaat aatgocaga aacgtogot aactocoo accottoga tacottigt atgacaata aatgocaga aacgtogot aactocoo accottoga tacottigt aatgacaat aatgocaga aacgtagaga caacagata aggacata tagataca goggaagat tocotcacy acaaactac cogaaagcato cacaatata coggcattat gtigtaacag taccagcocg gatggoctga tagtaatga ggaatcaac atcoaggoo goaaaggta cactgaaac acaatagog atagaagag cacogaga accaatcot googacoogo goacaagat accaatago gaaggogtt coctaacaga gotogooga cogacogo goataaaat taaggttga tagtaatcag gattcaacc atcoaggoog gotggaaga giggaagaa aaccattgo gagcocago gocaaaaa ataatogt gogaaagag giggaagaa aaccattgo aggocatog ogcaaaaaa abacgttg goaaagag gitggaagac aactcattgo aggocatog ogcaaaaaa abacgttg gogaataco tigaacogt goggtttoca gtaagcaat caagatat gatagttaa tacogactaa tigaacatat aagttaat cgacagtat gatagttaa tocogcaa gitugotga gaaccaatt tactaatat tigaaagco gittaagaa taaacciga gitugotga aaaccaag gitaggoca tocaataata goagttotto gocgacaag gitugatgaa aactaago gitaggaat atgatta googgaaca gacacacca tocacaata tigaagcaat tacotaga attigtoca gicaacaga gicagaca citocacce tococacga gaaccaat aaatgogoca tocaagtag accactoga aagccaatt tacctaata tigaagco gicaagaca gicaacacca tocacaata tacoagaca gitaggocai aagtataa gocagtot gocaaccac tocacaata tacoagaa gigaggoga ataaggo gaataac goaaacgac ciaaccaca tocacaa

continued

				-contir	nued		
ggtaagcgga c	gcaacgctg	ccccattatc	ctcctgtatt	tgttttatca	aacgcagcaa	9000	
agcctgctgc c	tgcgctcca	gtttctcagc	atcagtgaat	ttattacttt	cgcgcagttt	9060	
accactcagc g	jccattccta	tttcttccat	cgtctcatag	agcgctgccc	ccgtcgtttc	9120	
ctgtaactcc t	ggagagcta	acattgaagg	cgaaataacc	tcttgttcct	ctataacctg	9180	
gccaggggta a	atgctgtag	ggggcgtcat	ttttatctca	ttaattttaa	tattcatcgc	9240	
tacctctttt a	atcttcacca	ttacgtaacc	atttcagtaa	cgcgttgaaa	tgacgagaaa	9300	
gtgaaaactc a	acggcatat	cgtgttgagg	aaagttcagc	ctgatcggga	gagaaaccag	9360	
gctcgataat c	aacgtaaac	cgcttgccaa	aagtttcacg	catcaatgcc	tctttttcag	9420	
gatgaatacg c	aaataaagc	gctccctctt	ccgccatagc	cgtggcctgg	cgtgccagac	9480	
gatggcacat a	acactgtct	accgactgtt	ggtcgaacca	ggccaacaga	acctgttcta	9540	
tactatttt a	atatgatgc	gctgcgtgat	cgaccaatga	acgaaattga	ttttcatctt	9600	
cttgtaaatg t	tttacatgc	tgttccagcc	attccacttc	cattttttcc	agcgtatttt	9660	
tacgcaagca c	gctagttct	tgttgctgct	caactttctg	ttcacgctga	taacgatagg	9720	
cgtctcggat g	gattttttca	gccttacggt	aagcggagct	cacaatagca	tgtgaaactc	9780	
tcttagcttg t	tgetettge	gcaaataaag	ttaattgtaa	tgttatccac	tgtgactcaa	9840	
taatatttcg a	igcgggtagc	ttatggttaa	tttccgtcag	aggaagtgaa	gtaaaactca	9900	
tagcaaatgc t	ccatgaaga	taatctcggt	aagagaagtc	ttcggccaaa	gtatacgctg	9960	
cggagggggt a	ataatacta	atagcgcatg	taaaaccgca	tcgtcatgcg	cttcccgatt	10020	
aagaatggcg g	gtaccgatct	gcaatgcagt	ttgttgcatc	acttgcggag	gaagtattt	10080	
gccatctctt t	gccccaacc	aaccatatag	ctgccagatc	tcatcctcgc	taaaccactg	10140	
tagaagcaat t	gccgatact	ctggtagcat	aaaatagtca	ctacacctga	gtttgaataa	10200	
tcccagccca a	aggcaaatg	ccgatatacg	cggcgcaaga	cgaacctgcc	gcttttgcct	10260	
gtcatttaaa c	aggetggaa	taacagagct	tcctcttagt	ctatttaacg	ctctgtcaag	10320	
aagacgatcc a	actcgggcc	gatcgccata	acgccagcag	tttgaaagat	gaaagcccag	10380	
cttatccagc c	attccggta	cagcgtaacg	agcaggttgc	cagaaataac	gataaagttg	10440	
caacacctcg g	ygatcaggtc	ggctcaaaaa	cggcgtctca	ggcaaaaata	gccgatcagg	10500	
atgcccactc c	taataacag	tcctgtcaac	gataacatca	actgataagg	gtatttcatc	10560	
aaccacttca c	caccttccc	tttattggcg	ttgataacgt	ccataatcca	gaatgtttgt	10620	
ctcgcgggta c	gtcagctac	cattctgaat	tcagcaggct	gcatcaagag	actaatctta	10680	
ctgtattgca a	acccagggat	tgacatctct	attaaatcct	taatttttac	ccgaaaggcc	10740	
tccatattga c	ctgtggtga	atattttata	aatacggcaa	ctgagctcgg	agaagcgtta	10800	
cttccctcat c	ataagtegg	tagcgcaatg	gtcacttttg	cattaatcac	gccctccatc	10860	
tgactcagca t	tccttcaat	tctttgttct	tttaaaaaat	taatcttctg	ctgttcttcc	10920	
tggggtgata c	cactaactg	attagccgga	aacatcttat	ccgccgttgt	aaactgacga	10980	
tgcggataac c	gttaagtct	aagtagctca	accgcattaa	taaactgcga	ctgctcgaca	11040	
cgtaaggtaa c	accgtcctc	ttcctgtttt	ttttccgcat	caatatgatg	ctgcataagt	11100	
aatgccagca t	ttgattcgc	ctcatcctct	ggcaatgagc	gataaagatc	cacatcacat	11160	
gccgtaagaa a	igaacgtaag	gacagtaaga	aatactatac	gatgagcett	catgccatgt	11220	
tatccagctt a	attaagcgct	tgcgatgctg	cgcctgatat	tctggcaaga	taatcgacgc	11280	

-continued

ctaccgttaa ctgcatataa tccatttgtc tggtcaacat aacctgcggt aataaagcac 11340 tggcgttact ggtggatgct tcatctttca gcaattgttc aaaaaaatta atttgctcct 11400 ggctcggttc tgcagaggac tttacataag attgagtgct tacaggcact acgctcatat 11460 cagaaatatt caattttcaa accecteatt tggtgeagga aataacagae geagegeeat 11520 ageetetgge aaatetatat eegataaaat tttegegget tttagegget catttaaace 11580 cqccaacaat aatqccaqac ataccaactq taatttttta tccqqaacaa taaccqttaq 11640 cgctggtaac atcgcatgta cctgggaaat caggctatgg ttaacgcccg caaacatgat 11700 ttccagcagc aaccgtcgaa catcgtcgct aataacttca gattttagca atgattccac 11760 taaqcatatc cttqatcatt ttqatcaqtq aactttcqta attaataaat qtaqaatact 11820 gctgtaaggc aaattgcgct ttaatcatcg attctgggtt gagcaaatca ttaccattca 11880 ttttgtcatt aatggcctgg cctgcctggt gcgccatgtg ggagagcata tccactaatt 11940 gtgcaatatc cataatgctt ttccttaaaa taaatacatc gtaaggatac tggcaacata 12000 gcaaaattta gaaagcaatg aacatccggt atatacctga aaacgattac tccggcgcac 12060 gttgttctgg cgttacctga gccagcaaac gatataatgg gctgctgacc tgcataccgg 12120 tcattgccat cccatccata ccgaagcgag taaaactcat tagtccatag gtaatatcat 12180 taagacgete taataaatga ggetgtagte ceaaactaee acteeagtat gaatgegtea 12240 ttaccgtcgc ggttaaggct aatctaccgc ccagggagac ggctttagca atcgccatac 12300 ttttgcgttg attggcgaaa caattagcaa tataaaaaac ggcattgcct atactgtcgt 12360 gagccatagg caaatgatgt ttatgatggt agataagaca ggcgacatcc gcgatggcaa 12420 tagcaaggcc aatcoctgcc agggctacga gcggcgcgcc tccaccactt agcactgtta 12480 atgctattcc agcggaacag cataaaatct gtccgcccaa aataaccgtt tgccaactaa 12540 aaatttettt tggaaaacae tetateacte gtttegeaag teeggeeaat aacegetett 12600 ttccttgttg aggacctatt ctaccactct ccatattggt ttccggatgt ggcaatgagg 12660 gacatggagg tgatteetca ggegegttaa caggaegttg ceetectace tgageatttg 12720 ggctaacagg tttcatggtt ctccccgaga tgtatgacca gaactgtcca ttaatgcagg 12780 tgcagtagca gattgacaga gcgctgccat ttgttccgcc aataacgcac tgggatcggc 12840 ataaagttca tcaacagaat tttcctgatc gtcgccagag gggcgggcaa ggcaataatc 12900 cagtacegea ectategeeg teaggetaat ggaggtaatt acaeteeeca tgteeaaaga 12960 ggccgcaata ttttcagccg cgggcagtgg aaactgtagg ggtaaaacca acatagaaat 13020 agcgattcct gaacgtatta ataaagaaag acaattagca agggtgttag cgcagttaag 13080 acttgcccca cattttaagg ccagcgcact gaccacaaga gcaacgctat cactggcggt 13140 ttgtaatggc teettttget gacatatega ttgataatta tgataegeac ageaageate 13200 cccaatagca atcacgagcg ccgcccccgc aagaatagca atgggtaatc ctgccccgcc 13260 agaaattacc gctgcagcaa ccgataaccc aaacacgact gtcgcaccca gcgcacgaat 13320 agtgtattgc ataaaatgta tagcataatc cctctgctgc cttatttgtt caggcgtaag 13380 cagcacaggg gctgcggggg taccaggcgc tggaatttca gggggaggaa acgatacctc 13440 cttcgcttgt atatcggaag gaggactatt accatcgact atattacttg ccgctgacgg 13500 aatatgaatt ttcatatttc gttctgttat ttaagcaata agagtatcaa ccattatttg 13560

			-contin	nued	
cgcattctgg cgaatctca	ac tccatgaggc	atccgcataa	ctcatcttga	ttgcggtttg	13620
aaaagcetet etegeeaa	c cgggttcccc	catcattttg	agacagacgc	ccgtttggta	13680
aaccggttct ggatggct	yg catccagcat	caaggcatgt	ccatagaaat	taatggccgt	13740
tgtgtattct ttaagcat	ca tecaggtgee	agccaatgca	atatgggcac	gccaactcca	13800
tggctgggcc atcaccag	cc aactaaaatc	gattacggcg	cgcgaataat	ccccctcctg	13860
ccatgaggcg taaccact	yg cataaacggt	ttccggatca	acggataata	gctgtttcag	13920
aatgtetteg ggtatttta	at ttttctgatc	ttctttcatc	atcataccta	ttgattgtta	13980
ttttcacgtg ataatgat	t acgttaggaa	ggtcatttaa	aaacgtcgct	ggataagatg	14040
ctcggcggat aaaactgto	cc agttatcgcc	atcaagctgt	gtaaaggtcg	ctcccattac	14100
tgtcaggatg cgcaataa	t teetgegtag	catggctttt	ttttcatcca	gaacgtcggt	14160
gattatcaac atctttaaa	ac atgttaactg	cgggtgatgc	acaaatatcc	cgcgtaaaag	14220
tcccagtaag tgaaacaa	t getgtggteg	aggttgcccg	ggcgtcaggc	gcctgaactc	14280
acaaataatc atttcttt	g cctcaatacg	atagatcacc	aggtaaggcg	ataatataaa	14340
ctgctgccca agtaatat	g cggtctcccc	taaatatgca	ggctcagtaa	acacctgatg	14400
ccgacgcaac cattgctc	a tttcttgcac	catgtttacc	tcgttaatgc	ccggagtatt	14460
tcagcaagaa ccgtgacca	ag tgacgacccc	acgccgatga	tttgctgcat	aatttcagtt	14520
gettteteeg taattteeg	yt cagggattta	ttataagatt	gggccccatt	ttgttgcagg	14580
tcggcaatcg ctttatct	g atcactttga	cgttgcgcta	caccagcccc	caggcccatg	14640
acgcccccag ctgtgtgg	cc tacggcttga	cccgctataa	gaccggtttc	cccgcctacg	14700
gecectaate ctategtea	ag tacacccgac	aacattgcgc	cacccgcagt	aatcattgat	14760
gctctaaacg cttcatcaa	at tgttttcatt	tgcgtctgta	aaacattgac	ttgcagttcc	14820
caggccagcc gttgtttt	c tacgttatag	ctgcgcatga	tatcgcgcag	ctttttggca	14880
agctccatta gcttcatco	ca gatatcatca	aataacagaa	gcattgattc	agtacccatt	14940
ccctccccgg agggagate	yg agtggaagaa	ggtgttaaca	aggaaggcgc	tggtaatacc	15000
agtgctacgt tactcgct	c catatttta	tcctcagatt	aagcgcgata	gccagctatt	15060
ctcgcctgaa cgctacta	a gtgatcaatg	gtatctaata	catctctaag	cgcggcaccg	15120
ctccccttat aaagcttc1	c taagcgtttt	tgttctatct	ttttctggtt	ttctgtttgt	15180
tgcattatga aatccagaa	aa ccgttgctga	gttattaatt	gctctatttt	cttttcgatc	15240
ttcgcttttt ctgtgttaa	ac catgccagta	ttcatctgac	tggcgccctc	ggttgcacat	15300
ctgatageet gtaageet	t aaatgaacaa	tccctcagta	aggcatacag	gatttttttg	15360
aacatattga agagaacti	t attacggaat	tttttaaca	ggaactttcc	accttcttgc	15420
acacattttt ccagggct1	c ttttgccgct	tcttttgcca	tggctttcac	cccctctttc	15480
gtaaagcttt ttcccgcg	et tegegteata	ttattttcta	cgttacgaga	aaactcggca	15540
gcctcctctg ccatctca	t cgccatagcc	atttcacgtt	caagcggctc	aaattgtttg	15600
gaaaaacttt cgctcact	c ttcgccaaac	ttttcagcca	actcctctat	ttctgcttcc	15660
cctgcaccta ccatacgc	c aaccacttcc	tcgccaaaac	cggagtcaag	cacttttgca	15720
gctgcgccag ataaaccto	ct cgtcgccata	aaagcacggc	caatctggaa	aacatccagt	15780
gccagcgcga cggcttca	ca accaaattga	atcttacttg	tcacgtcaat	aattgcctga	15840
caggtatcgt ggtcagcad	cc gcacatcatt	gccgtttcgg	ctccggcttt	aaccattcct	15900

-continued

gcacaaccta cggctatata agctacgccg ctagccattt ctgcgggatt accggacaga 15960 aacccctcca caacttttaa ggagccaatc acagtttcaa atatgccggt aatccagtca 16020 aaaatagege caaaaatgee egetttaege getttateet eetgetetat egetttetgg 16080 atctgctcct gatactcctt tacctgctta tcacgtaatg cattttgcac ctcagttgcc 16140 cgctcaagct gttggcataa cgattgagcg ttattaccaa aaacgctgag tattaatgtc 16200 gtcatcaaca ttgataaaac cgcgggattg gtctgcaaaa agtcaggcaa tgatagacgc 16260 ttatgatttc cgggtacggc atcaagcagt tgcttcaacg cattgcttgc ctcctgaaga 16320 ctaattttcc ctgataacag gcacgeggeg ttgccatege caaaagtaga attcacaega 16380 tqccqqcqct ttccccaqcqa acccqaqqaa acqcaactqa cattqcttaa qtqatqatqt 16440 gttaaggcgg ttactcctgc ggtgctgtcg ctattactgt gaattcgatt catttttagc 16500 tcctgtcaga aagttgctgt aacatetttt etgeaegetg teggagaatt tgatgtteae 16560 tgacctcgcc gcaaatacgc accacggcct ttaacgcttt gattgcataa cagacgttat 16620 cacacgegag atageattee getgeggeee atggegeetg eggegeatea atettaattt 16680 gtgccgcgcg tccataagcg tatatcgctt ccccccaatg tttttgagcc tggcagcatt 16740 cccctaacct aaaccagtag tcaaatgacc aggcatcata tatcgtcaac aattgaaaaa 16800 gtcgcgctgc gccggcgaac tcttttacct ccataagctg catggcatag cgatacagag 16860 tattaagegg etgtgtaaca tegteateea acaacataeg eagegageeg eeaegeegga 16920 ctgcgctatc atactggaaa tttcccccca cttactgata agccctgtca gttgggtaag 17040 gacagegtta ageteetgag acattttttg aattgttate tgeeeetgae teataagate 17100 ggtattccgg ttggcgtcat tatccaaagc cgctttgatc gcctgtaggc cacctttatc 17160 cagetteecca tgategeeat atttageeat ataateatea atggteatae categatgag 17220 aataccatta tcacgcatgt atttaattac atcctcaggc acctcctctt tggttttagc 17280 atcccctttg gctgctttag caatcacctc atccatctca tttgactttt cctgggtatt 17340 totggcacgt toagcgttot totggactto aataaattta ttatttgcga tatootgaat 17400 aaccataagg agaataagca aaacaccata cccttcggca aacggatttt gctgggataa 17460 gtcatcctqg ctcccqgtat cagcgttgct gacgccgaag ctatttttaa acacaatagg 17520 gttttgactt ccccataaga tgtttcctga agacattatg ctttaccttt ttgtttttcc 17580 tgacggtatc tccaccgggg cttgagcatt aagttgtttc agtcgtactt caagttgttt 17640 aaacaaactt actattttct ttaaateett eteggeetee tggttaacee eggeaacgee 17700 ttgtggaaat aggttttgaa gaatactete tgtetetetg etettttgg ggetetetge 17760 cctttcagca agctgttgac tcaccttagc ccggatttgg tgaaattttt taagacagtg 17820 atttagetge atgtaacttt getetaaate aegatattea etaaaegeag eetttteett 17880 tatcattatt cccctccata tacacgatag ataattaacg tgctaactaa gagcctatcc 17940 cattagggct attttacttg ccattttgaa cctgggcagt gctcaaaatc ctcacgtact 18000 acgtgtacgc tccggttttt gcgcgctatc cgtgtccaaa ctggctgcgc caattaacgc 18060 ctggtgggat aggetetaag atatttttae tttaetettg eteaeteaet acaagtgege 18120 tgttatggta acgataataa ataatgttga tgatattttc ggcctgctcg atcgcttcaa 18180

				-contin	nued	
gcaataaggt	gttttgctga	tattgctgcg	gatcctgtaa	cttgccgttg	ttctctccta	18240
actgtttccg	ggcagccctt	aattgtaaaa	ttatgccttt	ggcctcttca	cgcgaatgaa	18300
gcagcaaatc	ttctaaccgg	gtcaaagttg	tcattttcca	ctcacttaaa	atctaatgga	18360
tagttaatca	aagtatcata	atgtttaatc	gttaccacat	cggcactcag	atggacaatt	18420
tctcccccat	tgggtaacaa	tgcccctaca	cgtaaacgct	ctttattcgt	cagtaataag	18480
taattaccat	ggcgactctg	tacaaagcca	gccactggcg	caggcagata	cttgctttca	18540
tcatgggaag	gcgcaatatc	ctgataaatt	aaagaaagag	cgggatcctt	tttctttaat	18600
gctgctaacg	tttcttgcaa	aatgcgttga	tgagattcat	ccagtacacc	actgataaca	18660
aaagagcgcc	gcattggcgt	aacattgaca	agccccacta	aaccgttctc	tattatcgca	18720
gaaataatat	catctccctg	agactgatga	gagtgactaa	tctgccagtg	caataacccg	18780
ggaatatctg	caagtaatgg	ttgaacctta	cgccattgct	gatccatttg	tatatcatca	18840
tgaattaaca	cgctccccgg	cccttcgctg	gatacttcag	catgcgggta	acccattttt	18900
atcaaaacat	cctgcacttc	tcgtaccaat	aagtcatcac	agattacacc	atcccgatac	18960
atgacccccc	atgattcgag	agtcgctctc	accttttgca	tctgttcgct	tgacgagcaa	19020
taaccggaca	actgcaggct	gccatcttct	ttccattgcg	cccgcacata	atgaatattg	19080
cttttgtcta	ataaaaactt	aacccgcaaa	ggtaagtcat	ttaccgtttc	aggctgacca	19140
ctaatactta	acaggacacc	cattccaccg	atgaaaatca	agaatacgcc	agccaaccac	19200
cagtaccctg	atctggaaac	gggtatttga	taatcagcaa	gttcacaatc	ctgtttacca	19260
aacgcgatag	ccactcccgc	aacctgcaaa	accccactgg	atggtagcgg	cttatttgga	19320
ttaaatctgc	ggccattaac	tctaactctg	gctttcccgg	catcaacaaa	taaattatct	19380
gcctgttctc	tcagaataat	tttttcattt	atagtaagcg	gaatacaaat	atcgcatcct	19440
ttctccccca	gtgacaggtt	accttcattc	agccatactt	cccggccttg	taaaacgtga	19500
cctaaaaaac	gtattttcca	ggaactcttt	ggattaacca	tgagatatgc	cattatttac	19560
tactgaggct	ttaatcaaaa	aaagcctgat	tacactatgt	acttgagtcg	tatcattgcg	19620
aaacaaatgg	cctacgacag	gaatatcgcc	caataaagga	attttattt	gcgagtggat	19680
ttgtttacct	tgtttaaatc	ctcccagcaa	tagactttgc	ccggccaata	atgtggcctg	19740
cgaagcaatt	tcagaatttt	gcacttcggg	cagegggtet	gtttcgcttt	gcgtatcact	19800
ttgttgtcca	tcctgaatat	taagatcaag	cattatttt	tgcgtgccat	tatcatttaa	19860
caagcgaggt	gtaacgcgca	acaaagaacc	cgtagtgatg	gattcaagtt	tagccacttt	19920
ttctccctgc	agtttggtat	agaaagtaat	atttttatcc	agcacagcct	ggatattatt	19980
taaagtcacc	acagatggct	gggaaagtac	ataagcctga	gagctttttt	ccagggcatt	20040
caaacgcacc	ataaagtttg	aggtatcgct	gattaccgtt	gaaaaaccgc	tagcaccacc	20100
gtcattcaaa	cctgtattga	acgcaatttt	cttgccaccc	agcgacactg	ccgttcccca	20160
gtcgatgcct	aactggttaa	tatctccagc	attaacatcg	ataattttca	ccgaaatctc	20220
tatcatctgc	tggcgttgat	ctaattctgt	gataagtttc	cgatacccgg	ccatattgga	20280
cgcataatca	cgaacgatca	ctgcattctg	gcgtgggtcg	gcagcaaaca	tgggcaatgc	20340
ctgtgtagcg	ggtgaaccat	tgttcgtcga	tgacgccggt	acgctggttt	tactcatctc	20400
acgcaataca	ctcacgaccc	ctggaaccac	gacggactga	tcgcgatatt	ggtattgggt	20460
atccatcgca	gtggcatact	taagcgtgta	tatacttaca	ctcaccgcac	tgtcttttcg	20520

-continued

tttgattaac gcattatcca gcactgaagc taattgacta atacgagtca ggcagctggg 20580 aacaccgctc acctccacag ctttggtacc ggtaatttct ttaacctcgc atcccggtga 20640 tgaaagaata ttctggctgc gtaagtaatg aatgaaccgt ccagtagata aaatattgaa 20700 agtgataacc tgatgtttta ataacgatgc aggatataca tataacatgc tgccatcaaa 20760 ccaqqtaaqc aaatcatatt qtqctqccaq qttattcaaa atatcqaccq qtqqtccaqq 20820 cqqaattttt ccactaaatq taqctqttat caatqqqcta ataqtaataq ccqtatcata 20880 gttctctgag agcagatgta aaacctctgc taatggcatt tgtctggcat aaagggtgaa 20940 gtcattacct ttccatgata actcatcact ctttgctgta ttgagtataa atagtaaaat 21000 taaqattaaa cqtttattta ctaccatttt ataccccacc cqaataaaqt ttatqqtqat 21060 tgcgtattac attttttaaa atgcaagtta aagccaggtg tttttctatc tcaatagcaa 21120 taageteaga getactaett gtggtataat aacegtttaa eeateeecea teegetgtga 21180 gctgtatagc ataatcatgg acgtccgggt gtgctgcaag cagtagtgtc acataggcaa 21240 gacaaggett aggtaagett teeaggteat ttaagaacaa agaaatagaa aatgettetg 21300 agaaaatttc tcctctggca ggatgcccat caatagtcat tatccaggat cggctattac 21360 cttcggcctt gatatcctga attaatggaa tgccttttaa aactgccagc atgaatccct 21420 cctcagacat aaatgggagt ttctatcaaa ttcgctcaca accacatccg taaaaagcct 21480 gattcacatt tatttcgact atacttttct tgtacaatat caggatgctg tctacatata 21540 ccttgtcaca ggcgattcta tcattcggat tttccgataa attcacaatt acattttcag 21600 cactgacata aaaacttaca atttgaaaaa tcatttatta aatgaactgt tacgatgttt 21660 ttacatcgcc atcttattaa aaagtaattg tagtcatcga ctgggttata tatgaagaaa 21720 tttatcttcc taatgataac accatcgatt aatcttctga tgaaactata tgtactgcga 21780 tagtgatcaa gtgccaaaga ttttgcaaca ggcaactgga gggaagcatt atgaatttgc 21840 tcaatctcaa gaatacgctg caaacatctt tagtaatcag gctaactttt ttattttat 21900 taacaacaat aattatttgg ctgctatctg tgcttaccgc agcttatata tcaatggttc 21960 agaaacggca gcatataata gaggatttat ccgttctatc cgagatgaat attgtactaa 22020 gcaatcaacg gtttgaagaa gctgaacgtg acgctaaaaa tttaatgtat caatgctcat 22080 tageqactqa qattcatcat aacqatattt teeetqaqqt qaqeeqqcat ctatctqteq 22140 gtccttcaaa ttgcacgccg acgctaaacg gagagaagca ccgtctcttt ctgcagtcct 22200 ctgatatcga tgaaaatagc tttcgtcgcg atagttttat tcttaatcat aaaaatgaga 22260 tttcqttatt atctactqat aaccettcaq attattcaac tctacaqeet ttaacqeqaa 22320 aaagetttee tttataecea acceatgeeg ggttttaetg gagtgaacea gaataeataa 22380 acggcaaagg atggcacgct tccgttgcgg ttgccgatca gcaaggcgta ttttttgggg 22440 tgacggttaa actteeegat eteattaeta agageeaeet geeattagat gatagtatte 22500 gagtatggct ggatcaaaac aaccacttat tgccgttttc atacatcccg caaaaaatac 22560 gtacacagtt agaaaatgta acgctgcatg atggatggca gcaaattccc ggatttctga 22620 tattacgcac aaccttgcat ggccccggat ggagtctggt tacgctgtac ccatacggta 22680 atctacataa tcgcatctta aaaattatcc ttcaacaaat cccctttaca ttaacagcat 22740 tggtgttgat gacgtcggct ttttgctggt tactacatcg ctcactggcc aaaccgttat 22800

				-contir	nued	
ggcattttgt	cgatgtcatt	aataaaaccg	caactgcacc	gctgagcaca	cgtttaccag	22860
cacaacgact	ggatgaatta	gatagtattg	ccggtgcttt	taaccaactg	cttgatactc	22920
tacaagtcca	atacgacaat	ctggaaaaca	aagtcgcaga	gcgcacccag	gcgctaaatg	22980
aagcaaaaaa	acgcgctgag	cgagctaaca	aacgtaaaag	cattcatctt	acggtaataa	23040
gtcatgagtt	acgtactccg	atgaatggcg	tactcggtgc	gattgaatta	ttacaaacca	23100
cccctttaaa	catagagcag	caaggattag	ctgataccgc	cagaaattgt	acactgtctt	23160
tgttagctat	tattaataat	ctgctggatt	tttcatgcat	cgagtctggt	catttcacat	23220
tacatatgga	agaaacagcg	ttactgccgt	tactggacca	ggcaatgcaa	accatccagg	23280
ggccagcgca	aagcaaaaaa	ctgtcattac	gtacttttgt	cggtcaacat	gtccctctct	23340
attttcatac	cgacagtatc	cgtttacggc	aaattttggt	taatttactc	gggaatgcgg	23400
taaaatttac	cgaaaccgga	gggatacgtc	tgacggtcaa	gcgtcatgag	gaacaattaa	23460
tatttctggt	tagcgatagc	ggtaaaggga	ttgaaataca	gcagcagtct	caaatcttta	23520
ctgcttttta	tcaagcagac	acaaattcgc	aaggtacagg	aattggactg	actattgcgt	23580
caagcctggc	taaaatgatg	ggcggtaatc	tgacactaaa	aagtgtcccc	ggggttggaa	23640
cctgtgtctc	gctagtatta	cccttacaag	aataccagcc	gcctcaacca	attaaaggga	23700
cactatcagc	gccgttctgc	ctgcatcgcc	aactggcttg	ctggggaata	cgcggcgaac	23760
caccccacca	gcaaaatgcg	cttctcaacg	cagagctttt	gtatttcccc	ggaaaactct	23820
acgacctggc	gcaacagtta	atattgtgta	caccaaatat	accagtaata	aataatttgt	23880
tacccccctg	gcagttgcag	attcttttgg	ttgatgatgc	cgatattaat	cgggatatca	23940
tcggcaaaat	gcttgtcagc	ctgggacaac	acgtcactgt	tgeegeeagt	agtaacgagg	24000
ctctgacttt	atcacaacag	cagcgattcg	atttagtact	gattgacatt	agaatgccag	24060
aaatagatgg	tattgaatgt	gtacaattat	ggcacgatga	gccgaataat	ttagatcctg	24120
actgcatgtt	tgtggcgcta	tccgctagcg	tagcgacaga	agatattcat	cgttgtaaaa	24180
aaaatgggat	tcatcattac	attaccaaac	cagtgacatt	ggctacctta	gctcgctata	24240
tcagtattgc	cgcagaatat	caacttttgc	gaaatataga	gctacaggag	caggatccga	24300
gtcgctgctc	agcgttactg	gcgacagatg	atatggtcat	taatagcaag	attttccaat	24360
cactggacct	cttgctggct	gatattgaaa	atgctgtatc	ggctggacaa	aaaatcgatc	24420
agttaattca	cacattaaaa	ggctgtttag	gtcaaatagg	gcagactgaa	ttggtatgct	24480
atgtcataga	cattgagaat	cgcgtaaaaa	tggggaaaat	catcgcgctg	gaggaactaa	24540
ccgacttacg	ccagaaaata	cgtatgatct	tcaaaaacta	caccattact	taatattatc	24600
ttaattttcg	cgagggcagc	aaaatgaaag	aatataagat	cttattagta	gacgatcatg	24660
aaatcatcat	taacggcatt	atgaatgcct	tattaccctg	gcctcatttt	aaaattgtag	24720
agcatgttaa	aaatggtctt	gaggtttata	atgcctgttg	cgcatacgag	cctgacatac	24780
ttatccttga	tcttagctta	cctggcatca	atggcctgga	tatcattcct	caattacatc	24840
agcgttggcc	agcaatgaat	attctggttt	acacagcata	ccaacaagag	tatatgacca	24900
ttaaaacttt	agccgcaggt	gctaatggct	atgttttaaa	aagcagtagt	cagcaagttc	24960
tgttagcggc	attgcaaaca	gtagcagtaa	acaagcgtta	cattgaccca	acgttgaatc	25020
gggaagctat	cctggctgaa	ttaaacgctg	acacgaccaa	tcatcaactg	cttactttgc	25080
gcgagcgtca	ggttcttaaa	cttattgacg	aggggtatac	caatcatggg	atcagcgaaa	25140

-continued

agctacatat cagtataaaa accgtcgaaa cacaccggat gaatatgatg agaaagctac 25200 aggttcataa agtgacagag ttacttaact gtgcccgaag aatgaggtta atagagtatt 25260 25262 aa <210> SEQ ID NO 3 <211> LENGTH: 6053 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: spvRABCD operon <400> SEOUENCE: 3 atqqatttct tqattaataa aaaattaaaa attttcataa cactqatqqa aacaqqttcc 60 ttcaqtatcq caacatcaqt actqtatatc acccqaaccc cqctqaqcaq qqttatttca 120 gacetggaaa gagagetgaa acaaagaete tttataegga agaatggeae tettateeea 180 accgaatttg cacaaactat ttatcgaaaa gtaaaatccc attatatttt cttacatgca 240 ctggagcagg aaatcggacc tacgggtaaa acgaaacaac tagaaataat atttgacgaa 300 atttatccgg aaagtttaaa aaatctgatc atttcagcac tgaccatttc cggccaaaaa 360 acaaatataa tggggagagc cgttaacagc caaataatag aagaactgtg tcagacaaac 420 aactgcattg ttatttctgc cagaaattat tttcatcggg aatcgcttgt ctgccggaca 480 tcagtggagg gtggggtcat gttatttatt cctaaaaaat tctttctctg cggcaaacct 540 gatatcaaca ggctggccgg aacacctgta ctttttcatg agggggctaa aaattttaat 600 ctggacacca tataccattt ttttaaacag acactaggta ttaccaaccc tgcattcagt 660 tttgataacg tcgatttgtt cagttcactg taccggttac aacaagggct ggcgatgtta 720 ctcatccccg tcagagtctg tcgggctctg ggattatcaa cagatcacgc actgcacatc 780 aaaggcgtag cgctctgtac ctccttgtat tacccgacca agaaacggga gacaccagat 840 tatcgtaaag ctataaaact gatacagcag gaactgaaac agtccacctt ctgaccttat 900 gcagcgtaag ggccgcaaca cctgtattca cggcatttgc cagattcaga ttgtcagcaa 960 tecceateet ceatageggt agtteacege ggageatgga gtaaacegge tggtegeegt 1020 caatetgaca cagaateagt ttgatgetet ggtggattac etaaaacatg ggeattaacg 1080 cqctqqctca cqccacttta ctqaaqaaac tqaataacqq tqactatqac qqcqcaqcqa 1140 atgaatteet gaaatgggae caegeeageg gteaggttgt teeeggeetg accegaegee 1200 ggagcgctga acgttgttta ttcctgagtt aatttgttgt gccatctttg cacaccggga 1260 accecente cecacaecae aaaaataeca cataaataaa ctcaatataa eccactcatt 1320 ttctqqcaat acaaaataat tcccctqcaq acattatcaq tcttcaqqat ttcattctqt 1380 ttattttcag gagtcatcat tatttatgaa tatgaatcag accaccagtc cggcactttc 1440 1500 acaggtcgaa accgccatcc gggtcccggc agggaatttt gcaaaatata attattattc cgtgtttgat attgtccgtc agacccgtaa acagtttatt aacgccaata tgtcatggcc 1560 gggatcccgc ggaggtaaag cctgggacct ggcgatgggc caggcgcagt atatccgctg 1620 catgttccga gaaaatcaat tgacccgcag agttcggggg accttgcagc agacaccgga 1680 caatggcacg aacctgagca gttccgctgt cggcggtatt cagggacagg cagagcgtcg 1740 gccggacctg gccaccctga tggtggttaa tgatgccatt aaccagcaaa taccgaccct 1800

-cont	inued
- COIIC	TITUEU

				-contir	nued	
gctgccgtat	cattttccac	acgaccaggt	ggagttatct	ctgctgaata	ccgatgtgtc	1860
gctggaagat	attatcagcg	agagcagcat	tgactggccg	tggttcctga	gcaactcgct	1920
gaccggcgat	aacagtaact	atgccatgga	gctcgccagc	cggctgtcac	cagagcagca	1980
gacactgccg	accgagccgg	acaacagtac	cgccactgac	ctgacctctt	tttaccagac	2040
caatctgggg	ctgaaaaccg	ccgactatac	gccatttgaa	gcactgaata	cctttgcccg	2100
acagttagcg	attaccgttc	ccccaggtgg	aacagttgat	tgcgggtact	ctgcgtgcca	2160
gccggcagtt	tagcttcccg	cgctaccaga	gtagtgagca	gcagaccatt	ctgcagaatc	2220
tgagcgacgt	cattgttcag	gtgcattcta	ccgcgctgta	cggcggcagc	acttttgaac	2280
aggccgtaga	gcagacgctg	taagcagaaa	atatacctgt	ccatcgtcag	acggccagtt	2340
tcaggagata	gtgtatgttg	atactaaatg	gtttttcatc	tgccacttta	gcgctgatca	2400
ctccccttt	cctgccaaaa	ggggggcaagg	cgctgagtca	gtcaggccct	gacggcctag	2460
ccagtataac	gctgtctctg	cccatcagcg	ccgaacgcgg	ctttgcgcct	gcgctggcgc	2520
tgcactacag	cagcggtggc	ggcaatggcc	ccttcggcgt	gggctggtcc	tgcgcgacaa	2580
tgagcattgc	ccgccgcacc	agccatggcg	tgccgcagta	taacgacagc	gatgagtttc	2640
tggggccgga	cggagaagtg	ctggttcaaa	cgctcagcac	cggtgatgcc	cccaatcccg	2700
tcacctgctt	cgcgtacggt	gacgtatcgt	tcccgcaaag	ctacacggtg	acccgctatc	2760
agccccgcac	ggagagcagt	ttttatcgcc	tggagtactg	ggtgggcaac	agcaacggcg	2820
atgatttctg	gttactgcat	gacagtaacg	gcatcctgca	cctgctgggg	aaaaccgccg	2880
cagcacgcct	cagcgatccg	caggccgcct	ctcatacggc	gcaatggctg	gttgaggagt	2940
cggtgacccc	tgccggcgag	catatctatt	actcctactt	ggcggagaac	ggtgacaatg	3000
tggacctcaa	tggggacgag	gccggacgcg	atcgcagcgc	catgcgctat	ctcagcaagg	3060
tacagtatgg	caacgcgacc	cccgccgccg	atctgtacct	ctggactagc	gccacacccg	3120
cggtacagtg	gctgttcacc	ctagtgtttg	actacggcga	acgtggtgta	gatccacagg	3180
taccgcctgc	attcactgct	cagaacagct	ggetegeeeg	ccaggatccc	tteteeetgt	3240
ataactacgg	ctttgagatc	cgcctccatc	gcctgtgccg	ccaagtcctg	atgttccacc	3300
actttcctga	tgaactgggt	gaagccgata	cgctggtttc	ccgtctgctg	ctggagtatg	3360
acgaaaatcc	gatactgaca	cagetttgeg	ctgctcggac	gctggcctat	gaaggcgacg	3420
gttatagaag	ageteetgte	aacaatatga	tgccaccgcc	accgccaccg	cctcctccga	3480
tgatgggagg	taattcatct	cgaccaaaat	caaaatgggc	gattgtagag	gaatcaaagc	3540
agattcaagc	tctgaggtac	tattcagete	aagggtacag	tgtgattaat	aaatatttac	3600
gtggggatga	ttatcctgaa	acacaggcaa	aagaaactct	gctctccaga	gactatcttt	3660
ccacaaatga	acccagtgat	gaggagttta	aaaatgccat	gtcagtttat	ataaatgata	3720
ttgtggaggg	attaagttca	cttcccgaaa	cagatcacag	agtcgtatac	cggggcctga	3780
agcttgataa	gcccgcatta	tcggatgtgc	tgaaggaata	cactactata	ggtaatataa	3840
taatagataa	agcttttatg	agtacatcgc	cagataaggc	atggataaat	gacactattc	3900
tcaacatata	cctagaaaaa	ggacataaag	gtagaatact	cggagatgtt	gcacatttta	3960
agggagaggc	agagatgctt	ttccctccaa	atactaaact	caaaatcgaa	agcattgtaa	4020
attgtggatc	ccaagacttt	gcaagccagc	ttagtaagct	gagattaagt	gatgatgcaa	4080
ctgctgacac	aaacaggata	aaaagaataa	taaacatgag	ggtactcaac	tcatagatac	4140

-	CC	nt	1	n	u	е	a

taagaateta tteeagaagt ggtatgageg geetagetet ataaggggtt ataeteegga 4200 accccagatt tttccgtcac cctaggcccg caaagtagtg catctaaact tttgccatta 4260 cccttcttta actttctgct cggaacggac cgaaatatca ttttttcgcc tgataaaaaa 4320 tgaggttttc tggataacta atcgttttat taaaaaaaac tgagaattta tatctaataa 4380 tatogcoata tatccatate ocaaaogaga ttteccatge ceataaatag ocetaateta 4440 4500 aatctaaaca tccctccttt qaatattqta qctqcttatq atqqqqcqqa aataccatct 4560 acaagtaagc acctgaaaaa taatttcaac teettgeaca accaaatgeg gaagatgeeg 4620 gtatcccact ttaaagaggc gctggatgtg cctgactatt cagggatgcg ccagagtggt ttctttgcta tgagccaagg ttttcagctg aataaccatg gttacgatgt tttcatccat 4680 gctcgtcgag aatcacctca gtctcagggc aaatttgccg gtgacaagtt ccacatcagt 4740 4800 gtgetcaggg atatggtgec acaagcattt caagegetgt ceggattget gtttteagag 4860 gacagtccgg tagataagtg gaaagtgacc gatatggaga aggtcgctca acaagaccgt gttagcctgg gcgctcagtt cacgttgtat ataaaaccag accaggaaaa ttcgcagtac 4920 agtgcgtcgt ttctccacaa gacacggcaa tttatagagt gtctggaatc cagactatcc 4980 gaaaatgggg ttatttcagg acagtgtcct gagtcagacg ttcatcctga aaattggaaa 5040 tatctcagtt atcgtaatga actacgaagt gggcgtgatg gtggcgaaat gcagagacag 5100 gctttacgtg aggaaccgtt ttatcgtttg atgacagagt aagtatgggt ttggggagca 5160 acggaacagt aaacgccgtt aaacaactat tttaaatgct cattaattta ttaatcaata 5220 aattacaaat tttcattgaa ggctcccccc ttactgacga attccggcac cgtaaaggaa 5280 taacgctcat gcatattgat gtgtccgcac tgtaatggtg aaaattacat aagcaagagc 5340 gttttttgaa aaatattata tttaatgttt tgtaatatgc attttattga ggtagtgtaa 5400 ctatgagagt ttctggtagt gcgtcatccc aagatataat atcacgtata aattcaaaaa 5460 atatcaataa taatgattca aatgaagtca agagaattaa agatgcgctt tgtattgaat 5520 caaaagagag aattttgtat ccaaaaaatt tgagtctaga taatttaaaa caaatggcta 5580 gatatgtaaa taatacatac atccattact ctgggaactg cgttttatta tcagcgtgtt 5640 tacattataa catacatcac cgacaggata tattaagttc gaagaacact gcctctccta 5700 caqtqqqatt aqacaqcqcc attqttqata aaatcatttt tqqtcatqaq cttaaccaat 5760 catattgttt aaattccatc gatgaggtgg aaaaagaaat attaaaccgt tatgacatta 5820 5880 agagggaaag ttettttate attagegeag agaactacat ageteeaata attggegaat gtagacatga tttcaacgct gtggttatct gtgaatatga taaaaaacca tatgtacaat 5940 tcattgattc ttggaaaaca tccaacatac ttcctagctt acaagaaata aaaaaacact 6000 teteateate aggggaattt tatgteaggg ettatgatga aaaacaegat tga 6053

<210> SEQ ID NO 4 <211> LENGTH: 1590 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: faeHIoperon

<400> SEQUENCE: 4

CONT	inued	

-continued	
tatteegeag cacceegggg eegaattett gaeggegggg aaataeagtt teacegtetg	120
gtcactgacg aggeteegaa atggaeetgg eaggtggget eeeetgaeea gaeatgggeg	180
gtggataccg ctgatgcccg tacagcgaac ggacaactgg tttttgattt acgcggcaag	240
ggeteeetge egtttetgga aggeeatetg tatgaggtgg eagagegegg tggteeegge	300
ttcacccctt ttatctcctc cagcagtaac gggcagccgt tttccgtgac ggatggcggc	360
acgacgacgg cgcaacactt ccgcgcctct gtcccggtac gtaacccgga gaacggtcac	420
gtggegggac agetttettt caccettgae cagggaatgg eegteagege eggaeaeeag	480
gaagacgggg cggttctacc ggcagcgatg tcgctcgtaa acgggcagag cgtgacgggt	540
gtgcaggccg gcaccctgcc gcagtggctc aaaaaccgtc tgccttccct gctgatgctg	600
aaccggggct tcggtaacgg aatgagcacg gcagataacg gtcaggttat cagtcagggc	660
gtgctggctg acggccgggt gacccggctg gcggcggcct atgcgtccgc cgtctcggat	720
tttgagetga egetgeegge agaaaacaeg eeggtgeagt ggeaggeegg getgagtgtg	780
acggtgacgg tccagtaaag aacgggcagg gagaggaaga acacaatgaa acgaatgacg	840
attttactgc tggccgccag tctgctgccg tcctgtgtgc tggcgtggaa cacgccgggg	900
gaagacttca geggagaget gaagetggge gggeeggtga eeageaeeeg taateeetgg	960
gtetggaagg teggggaagg gaacacacag ataaacaega aagetgtete tgteetgege	1020
agtggggagg aggtaatacc ggttcccctg ccggccatga cggtcctgct gggaaaaact	1080
ateetgaeea eeegggeegg eegggagggg ettgegeege aggtgaegta eggtaaggae	1140
acagagggtt ttgcactgac gtggacggca ccgggtatgg catcggtgac actgccggtg	1200
acgggggagg gaaatgtccg taccgggaca ttcaccttcc ggatgcaggc ggcgggtgtg	1260
ctgcgccatg teetggggaa eegggeggag tatgeeggge tgtatggega eetgeaggge	1320
aacggottgo ogocacagac gcaggtgatg ooggoagggo agacgooggg tgtgotgoag	1380
accctgtttg acagtgaagg cccggtctgg ctccgggaga tgacggtcag cagcgtgtcc	1440
ggactgagee ggtteagtga egeegeetg egeeaggttg aeggggtata eggegeaeag	1500
acggtggcgg acagcggtga gctgcgtttt aagggggggg taccgtcccg ctggcatacc	1560
teeetggegg tgageattga atateggtaa	1590
<210> SEQ ID NO 5 <211> LENGTH: 70 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: SPI-1-P1 primer	
<400> SEQUENCE: 5	
ttatggeget ggaaggattt eetetggeag geaacettat aattteatta gtgtaggetg	60
gagetgette	70
<210> SEQ ID NO 6 <211> LENGTH: 70 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: SPI-1-P2 primer	
<400> SEQUENCE: 6	
atgcaaaata tggtcttaat tatatcatga tgagttcagc caacggtgat catatgaata	60

-continued	
tcctccttag	70
<210> SEQ ID NO 7	
<211> LENGTH: 21	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE:	
<223> OTHER INFORMATION: SPI-1-P3 primer	
<400> SEQUENCE: 7	
atgttettaa caaegttaet g	21
<210> SEQ ID NO 8	
<211> LENGTH: 21	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: SPI-1-P4 primer	
<400> SEQUENCE: 8	21
aggtagtacg ttactgacca c	21
<210> SEQ ID NO 9	
<211> LENGTH: 70	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: SPI-2-P1 primer	
<400> SEQUENCE: 9	
accotottaa oottogoagt ggootgaaga agoataccaa aagoatttat gtgtaggotg	60
gagetgette	70
5-5-5	
<210> SEQ ID NO 10	
<211> LENGTH: 70	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence <220> FEATURE:	
<223> FRANKE: <223> OTHER INFORMATION: SPI-2-P2 primer	
<400> SEQUENCE: 10	
actgcgtggc gtaaggetea teaaaatatg aceaatgett aataeeateg eatatgaata	60
tcctccttag	70
<210> SEQ ID NO 11	
<211> LENGTH: 21	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: SPI-2-P3 primer	
<400> SEQUENCE: 11	
tgttcgtact gccgatgtcg c	21
<210> SEQ ID NO 12	
<211> LENGTH: 21	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: SPI-2-P4 primer	
<400> SEQUENCE: 12	
AND SERVINCE. IL	

-continued	
agtacgacga ctgacgccaa t	21
<210> SEQ ID NO 13 <211> LENGTH: 70	
<211> HENGIN: 70 <212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE:	
<223> OTHER INFORMATION: spv-P1 primer	
<400> SEQUENCE: 13	
gtgcaaaaac aggtcaccgc catcctgttt ttgcacatca aaacattttt gtgtaggctg	60
gagetgette	70
<210> SEQ ID NO 14 <211> LENGTH: 70	
<211> HENGIN: 70 <212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: spv-P2 primer	
<400> SEQUENCE: 14	
ttaccccaac agcttgccgt gtttgcgctt gaacataggg atgcgggctt catatgaata	60
	70
tcctccttag	, o
<210> SEQ ID NO 15	
<211> LENGTH: 21	
212> TYPE: DNA	
<pre><213> ORGANISM: Artificial Sequence <220> FEATURE:</pre>	
<pre><223> OTHER INFORMATION: spv-P3 primer</pre>	
<400> SEQUENCE: 15	
gaccatatet geetgeetea g	21
-210, CEO ID NO 16	
<210> SEQ ID NO 16 <211> LENGTH: 21	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: spv-P4 primer	
<400> SEQUENCE: 16	
	21
cagagecegt tetetaeega e	21
<210> SEQ ID NO 17	
<211> LENGTH: 70	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence <220> FEATURE:	
<pre><220> FEATORE. <223> OTHER INFORMATION: fae-P1 primer</pre>	
<400> SEQUENCE: 17	
ttaccgatat tcaatgctca ccgccaggga ggtatgccag cgggacggta gtgtaggctg	60
gagetgette	70
<210> SEQ ID NO 18	
<2105 SEQ 1D NO 18 <2115 LENGTH: 70	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: fae-P2 primer	
<400> SEQUENCE: 18	
~	

atgaaaataa cgcatcatta taaatctatt atttccgccc tggccgcgct catatgaata	60
tcctccttag	70
<210> SEQ ID NO 19	
<211> LENGTH: 21	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence <220> FEATURE:	
<223> OTHER INFORMATION: fae-P3 primer	
<400> SEQUENCE: 19	
caggeteeee tgeeacegge t	21
<210> SEQ ID NO 20	
<211> LENGTH: 21	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: fae-P4 primer	
caggccaact atctttccct a	21
	21
<210> SEQ ID NO 21	
<211> LENGTH: 22	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: spv-S1 primer	
<400> SEQUENCE: 21	
ggtcaattaa atccactcag aa	22
<210> SEQ ID NO 22	
<211> LENGTH: 20 <212> TYPE: DNA	
<212> TIPE: DNA <213> ORGANISM: Artificial Sequence	
<220> FEATURE:	
<223> OTHER INFORMATION: spv-S2 primer	
<400> SEQUENCE: 22	
acgggagaca ccagattatc	20
<210> SEQ ID NO 23	
<211> LENGTH: 20	
<211> HENGIN: 20 <212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE:	
<223> OTHER INFORMATION: spv-S3 primer	
<400> SEQUENCE: 23	
ttcagtaaag tggcgtgagc	20
<210> SEQ ID NO 24	
<211> LENGTH: 20	
<212> TYPE: DNA	
<213> ORGANISM: Artificial Sequence	
<220> FEATURE: <223> OTHER INFORMATION: spv-S4 primer	
<400> SEQUENCE: 24	
ccaggtggag ttatctctgc	20
-	

	Indea	
<210> SEQ ID NO 25		
<211> LENGTH: 20		
<212> TYPE: DNA		
<213> ORGANISM: Artificial Sequence		
<220> FEATURE:		
<223> OTHER INFORMATION: spv-S5 primer		
<400> SEQUENCE: 25		
actgtcgggc aaaggtattc	20	
<210> SEQ ID NO 26		
<211> LENGTH: 21 <212> TYPE: DNA		
<213> ORGANISM: Artificial Sequence		
<220> FEATURE:		
<223> OTHER INFORMATION: spv-S6 primer		
<400> SEQUENCE: 26		
tttctggtta ctgcatgaca g	21	
<210> SEQ ID NO 27		
<211> LENGTH: 19		
<212> TYPE: DNA		
<213> ORGANISM: Artificial Sequence		
<220> FEATURE:		
<223> OTHER INFORMATION: spv-S7 primer		
<400> SEQUENCE: 27		
tccagaggta cagatcggc	19	
<210> SEQ ID NO 28		
<211> LENGTH: 21 <212> TYPE: DNA		
<213> ORGANISM: Artificial Sequence		
<220> FEATURE:		
<223> OTHER INFORMATION: spv-S8 primer		
<400> SEQUENCE: 28		
gaaggaatac actactatag g	21	
<210> SEQ ID NO 29		
<211> LENGTH: 20		
<212> TYPE: DNA <213> ORGANISM: Artificial Sequence		
<220> FEATURE:		
<223> OTHER INFORMATION: spv-S9 primer		
<400> SEQUENCE: 29		
	20	
gtgtcagcag ttgcatcatc	20	
<210> SEQ ID NO 30		
<211> LENGTH: 20		
<212> TYPE: DNA		
<213> ORGANISM: Artificial Sequence <220> FEATURE:		
<220> FEATORE: <223> OTHER INFORMATION: spv-S10 primer		
r · r		
<400> SEQUENCE: 30		
	20	
agtgaccgat atggagaagg	20	
<210> SEQ ID NO 31		
<211> LENGTH: 20		
<212> TYPE: DNA		
<213> ORGANISM: Artificial Sequence		

<220> FEATURE: <223> OTHER INFORMATION: spv-S11 primer	
<400> SEQUENCE: 31	
aagcetgtet etgeattteg	20
<210> SEQ ID NO 32 <211> LENGTH: 21 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: spv-S12 primer	
<400> SEQUENCE: 32	
aaccgttatg acattaagag g	21
<210> SEQ ID NO 33 <211> LENGTH: 21 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: spv-S13 primer <400> SEQUENCE: 33	
taaggetete tattaaetta e	21
<210> SEQ ID NO 34 <211> LENGTH: 19 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: spv-S14 primer <400> SEQUENCE: 34	
	19
aaccgcttct ggctgtagc	19
<210> SEQ ID NO 35 <211> LENGTH: 22 <212> TYPE: DNA <213> ORGANISM: Artificial Sequence <220> FEATURE: <223> OTHER INFORMATION: spv-S15 primer	
<400> SEQUENCE: 35	
ccgtaacaat gacattatcc tc	22

1-14. (canceled)

15. A method for treating *Salmonella Gallinarum*-infectious fowl typhoid in animals by administering *Salmonella Gallinarum* variants as an effective ingredient, wherein pathogenecity of the *Salmonella Gallinarum* variants is reduced by inactivating at least one gene selected from the group consisting of the *Salmonella* Pathogenicity Island-1, *Salmonella* Pathogenicity Island-2, spvRABCD and faeHI.

16. The method of claim **15**, wherein the inactivation of the gene is carried out using a method selected from the group consisting of modification of single or plural nucleotides in the gene, deletion of single or plural genes, insertion of an exogenous gene into the genes, deletion of all of the gene clusters, and a combination thereof.

17. The method of claim **15**, wherein the pathogenecity of the *Salmonella Gallinarum* variants is reduced by deleting an entire gene cluster of *Salmonella* pathogenicity island-2 of SEO ID NO:2.

18. The method of claim **17**, wherein the *Salmonella Gallinarum* variant is deposited under accession No. KCCM 11009P.

19. The method of claim **15**, wherein the pathogenecity of the *Salmonella Gallinarum* variants is reduced by deleting all gene clusters of *Salmonella* Pathogenicity Island-1 of SEQ ID NO: 1, *Salmonella* Pathogenicity Island-2 of SEQ ID NO: 2, spvRABCD of SEQ ID NO: 3, and faeHI of SEQ ID NO: 4.

20. The method of claim **19**, wherein the *Salmonella Gallinarum* variant is deposited under accession No. KCCM 11011P.

* * * * *