

PROMOTERS FOR ENHANCING EXPRESSION IN POXVIRUSES

FIELD OF THE INVENTION

[001] The present invention relates to one or more novel promoters of protein expression in poxviruses, especially avipoxviruses such as fowlpoxvirus and canarypoxvirus. The invention further relates to polynucleotides comprising said promoter, in particular, polynucleotides comprising said promoter and a nucleic acid to be expressed; vectors comprising the same; host cells comprising the above constructs; and compositions comprising any of the above. Additionally the invention relates to one or more novel polypeptides operably linked to the one or more promoters. More particularly, the one or more novel polypeptides are related to the Brachyury protein.

BACKGROUND OF THE INVENTION

[002] Recombinant poxviruses have been used as vaccines for infectious organisms and, more recently, for tumors. Mastrangelo et al. J Clin Invest. 2000;105(8):1031–1034. Two of these poxvirus groups, avipoxvirus and orthopoxvirus, have been shown to be effective at battling tumors and have been involved with potential cancer treatments. *Id.*

[003] One exemplary avipoxvirus species, fowlpox, has been shown to be a safe vehicle for human administrations as fowlpox virus enters mammalian cells and expresses proteins, but replicates abortively. Skinner et al. Expert Rev Vaccines. 2005 Feb;4(1):63-76. Additionally, the use of fowlpox virus as a vehicle for expression is being evaluated in numerous clinical trials of vaccines against cancer, malaria, tuberculosis, AIDS, and EBOLA. *Id.*

[004] Recombinant poxviruses, such as fowlpox, has been used to express a wide range of inserted genes, including several infectious disease and tumor associated genes such as p97,

HER-2/neu, p53 and ETA (Paoletti, et al., 1993). One exemplary tumor antigen that is recently being studied is Brachyury (also known as “T”).

[005] Brachyury was identified in mice as a dominant short tail mutant that is also a recessive lethal; homozygous T/T embryos die in mid-gestation due to a failure of posterior mesoderm formation (Chesley, J. Exp. Zool., 70: 429-459, 1935). The murine Brachyury gene has been cloned (Herrmann et al., Nature (Lond.), 343: 617-622, 1990), as well as the homologs in other species, such as humans. The expression of the human homologue of the mouse Brachyury was detected by RT-PCR in the notochord remnant, the nucleus pulposus, of human abortuses at 14-15 weeks gestation (Edwards et al., Genome Res., 6: 226-233, 1996).

[006] Brachyury has generally proved to be a valuable marker for recognition of mesodermal differentiation (Herrmann et al., Trends Genet., 10: 280-286, 1994). For example, apart from expression in embryos themselves, Brachyury has been reported to be activated during the differentiation of certain murine EC and ES cell lines differentiating along mesodermal lineages in vitro (see, for example, Bain et al., Biochem. Biophys. Res. Commun., 223: 691-694, 1996). In humans, Brachyury has been shown to be expressed in teratocarcinomas (Gokhele et al., Cell Growth and Differentiation 11:157-62, 2000), chordomas (Vujovic et al., J. Pathol. 2: 157-65, 2006) and hemangioblastomas (Glasker et al., Cancer Res. 66: 4167-4172, 2006).

[007] More recently, it has been described that poxviruses expressing Brachyury can be effective as an active immunotherapeutic against tumors. (See, WO 2014/043535).

[008] There is clearly a substantial unmet medical need for improving infectious disease and cancer treatments, including active immunotherapies and vaccines. Based on the above, a

need in the art exists for improving expression of antigens, like Brachyury, used in active immunotherapies. The present invention fulfills this need.

BRIEF SUMMARY OF THE INVENTION

[009] The present invention provides one or more promoters, nucleic acids, expression cassettes, recombinant peptides, and recombinant poxviruses associated with enhancements in expression of coding sequences and antigens incorporated as part of poxviruses

[010] In one aspect of the invention, there is an expression cassette comprising:

- a. a promoter comprising a nucleic sequence having at least 70% identity to any one of SEQ ID NOs: 1-10, and 77; and
- b. a coding sequence operably linked to the promoter;

wherein expression of the coding sequence is controlled by the promoter.

[011] In further aspects of the present invention, the expression cassette can be incorporated as part of a vector such as a virus or plasmid, for enhanced expression of the coding sequence therein. Preferably, the expression cassette is part of a poxvirus, such as but not limited to, orthopoxvirus and avipoxvirus. More preferably, the expression cassette is an avipoxvirus such as fowlpoxvirus. In still further aspects, the expression cassette is not an expression cassette that naturally occurs in the genome of a poxvirus.

[012] In additional aspects, there are one or more promoters comprising or consisting of a) a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-10, b) a subsequence of any one of SEQ ID NOs: 1-10, and 77, or c) a derivative sequence of any one of SEQ ID NOs: 1-10, and 77, wherein the derivative has one or more substitutions, deletions, and/or insertions, and wherein the derivative sequence is active as a poxvirus promoter and/or active in a poxvirus infected cell.

[013] In still additional aspects, the present invention includes one or more nucleic acid sequences encoding one or more novel Brachyury proteins selected from the group consisting of: SEQ ID NOs: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71. In yet further aspects, the present invention includes one more novel nucleic acid sequences selected from the group consisting of: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

[014] In still further aspects, the present invention includes an expression cassette comprising:

- a. a promoter comprising a nucleic acid sequence having at least 70% identity to any one of SEQ ID NOs: 1-10, and 77; and
- b. a coding sequence operably linked to the promoter, wherein the coding sequences includes either i) a nucleic acid encoding a Brachyury protein selected from the group consisting of: SEQ ID NOs: 11, 13, 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71 or ii) comprises or consists of a nucleic acid having at least 70% identity to any one of the nucleic acids selected from the group consisting of: SEQ ID NOs 12, 14-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69; wherein expression of the coding sequence is controlled by the promoter.

[015] Additional objects and advantages of the invention will be set forth in part in the description which follows, and in part will be obvious from the description or may be learned by practice of the invention. The objects and advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims.

[016] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[017] Figure 1 illustrates expression of the Brachyury protein in human dendritic cells (DCs) infected with the non-recombinant virus FPV-WT, or recombinant viruses FPV-mBN343A, FPV-mBN344A, or FPV-mBN345A. A western blot analysis was performed using rabbit monoclonal anti-Brachyury antibody as detailed in Example 1.

[018] Figure 2 illustrates expression of the Brachyury protein in human dendritic cells (DCs) infected with non-recombinant viruses MVA-WT or FPV-WT or recombinant viruses MVA-Brachyury-TRICOM, FPV-mBN249B, FPV-mBN281A clone 32, FPV-mBN281A clone 35, FPV-mBN343A, FPV-mBN344A, FPV-mBN345A, FPV-mBN354A, or FPV-mBN355A. A western blot analysis was performed using rabbit monoclonal anti-Brachyury antibody as detailed in Example 2.

[019] Figure 3 depicts the relative expression of Brachyury protein compared to GAPDH from western blot analysis of human dendritic cells (DCs) infected with non-recombinant viruses MVA-WT or FPV-WT or recombinant viruses MVA-Brachyury-TRICOM, FPV-mBN249B, FPV-mBN281A clone 32, FPV-mBN281A clone 35, FPV-mBN343A, FPV-mBN344A, FPV-mBN345A, FPV-mBN354A, or FPV-mBN355A, as detailed in Example 2.

[020] Figure 4 illustrates expression of Brachyury and TRICOM proteins in CMMT cells (a rhesus macaque mammary tumor cell line) infected with the recombinant viruses MVA-Brachyury-TRICOM, FPV-mBN249B, FPV-mBN343A, or FPV-mBN345A assessed by flow

cytometry using fluorescently labeled antibodies specific for each protein, as described in Example 3.

[021] Figure 5 depicts median expression levels of Brachyury protein in CMMT cells (a rhesus macaque mammary tumor cell line) infected with the recombinant viruses MVA-Brachyury-TRICOM, FPV-mBN249B, FPV-mBN343A, or FPV-mBN345A assessed by flow cytometry, as described in Example 3.

[022] Figure 6 depicts expression of Brachyury and TRICOM proteins in CMMT cells (a rhesus macaque mammary tumor cell line) infected with a recombinant virus FPV-mBN345B assessed by flow cytometry, as described in Example 4.

DETAILED DESCRIPTION OF THE INVENTION

[023] The invention is based on the surprising determination that the promoter sequences as set out in SEQ ID NOs:1-10, and 77 enhance expression of the tumor antigen Brachyury. Shown in Figures 1-6 and described in more detail herein, expression of Brachyury antigen is enhanced when using promoters of present invention. Expression is further enhanced when the promoters and Brachyury antigen are used as part of a recombinant poxvirus.

[024] In at least one aspect, the various embodiments of the present disclosure were created as a result of insufficient expression levels of Brachyury protein using known Vaccinia promoters, such as PrS and Vaccinia virus 40k (VV-40K). In trying to enhance Brachyury expression levels, the present inventors analyzed various vaccinia promoters and associated proteins (e.g., VV-40k, I3, etc.) and any possible homologues in FPV. The inventors realized that some FPV homologous sequences were previously discovered. *See, e.g.,* Zantinge, J Gen Virol. 1996 Apr;77 (Pt 4):603-14 and Gene FPV 088 at NCBI Reference Sequence: NP_039051.1, Afonso, C.L et al., J. Virol. 74 (8), 3815-3831 (2000).

[025] In an initial attempt to enhance Brachyury expression, a possible promoter region of Gene FPV 088 at NCBI Reference Sequence: NP_039051.1 was constructed with Brachyury by the inventors and tested yielding undesired results (*see, e.g.*, Figures 1 and 2 at mBN344A) promoter. The inventors created a subsequent promoter with an addition of nucleotides from the ORF of Gene FPV 088, which similarly yielded undesired results. (*see, e.g.*, Figures 1 and 2 at mBN354A). Further constructs were created by the present inventors with yet additional nucleotides from the ORF of Gene FPV 088, which, as described and illustrated herein, enhance expression of the tumor antigen Brachyury.

[026] Thus, in various embodiments, the present invention is directed to one or more nucleic acid sequences, one or more promoters comprising the nucleic acids sequences, one or more expression cassettes comprising the nucleic acids, one or more peptides and/or peptide sequences for enhancing/expression of coding sequences and/or nucleic acids in expression vectors such as, but not limited to, plasmids, recombinant virus and so forth. In further embodiments, the present invention is directed to one or more recombinant poxviruses comprising one or more of the nucleic acid sequences, promoters, expression cassettes, and/or peptides and/or peptide sequences described herein.

[027] Additionally, in various embodiments of the invention, there are one or more nucleic acids sequences encoding brachyury polypeptides. In one embodiment, the one or more nucleic acids encoding a brachyury polypeptide are selected from the group consisting of: SEQ ID NOs: 11, 13, 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71. The nucleotide sequences encoding the brachyury polypeptides according to the present invention are selected from the group consisting of: SEQ ID NOs: 12,

14-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

Definitions

[028] It must be noted that, as used herein, the singular forms "a", "an", and "the", include plural references unless the context clearly indicates otherwise. Thus, for example, reference to "an epitope" includes one or more of epitopes and reference to "the method" includes reference to equivalent steps and methods known to those of ordinary skill in the art that could be modified or substituted for the methods described herein.

[029] Unless otherwise indicated, the term "at least" preceding a series of elements is to be understood to refer to every element in the series. Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments of the invention described herein. Such equivalents are intended to be encompassed by the present invention.

[030] Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integer or step. When used herein the term "comprising" can be substituted with the term "containing" or "including" or sometimes when used herein with the term "having". Any of the aforementioned terms (comprising, containing, including, having), though less preferred, whenever used herein in the context of an aspect or embodiment of the present invention can be substituted with the term "consisting of". When used herein "consisting of" excludes any element, step, or ingredient not specified in the

claim element. When used herein, "consisting essentially of" does not exclude materials or steps that do not materially affect the basic and novel characteristics of the claim.

[031] As used herein, the conjunctive term "and/or" between multiple recited elements is understood as encompassing both individual and combined options. For instance, where two elements are conjoined by "and/or", a first option refers to the applicability of the first element without the second. A second option refers to the applicability of the second element without the first. A third option refers to the applicability of the first and second elements together. Any one of these options is understood to fall within the meaning, and therefore satisfy the requirement of the term "and/or" as used herein. Concurrent applicability of more than one of the options is also understood to fall within the meaning, and therefore satisfy the requirement of the term "and/or."

[032] As used herein, the term "promoter" denotes a regulatory region of nucleic acid, usually DNA, located upstream of the sequence of a nucleic acid to be expressed, which contains specific DNA sequence elements, that are recognized and bound e.g. by protein transcription factors and polymerases responsible for synthesizing the RNA from the coding region of the gene being promoted. As promoters are typically immediately adjacent to the gene in question, positions in the promoter are designated relative to the transcriptional start site, where transcription of DNA begins for a particular gene (i.e., positions upstream are negative numbers counting back from -1, for example -100 is a position 100 base pairs upstream). Thus, the promoter sequence may comprise nucleotides until position -1. However, nucleotides from position +1 are not part of the promoter, i.e. in this regard it has to be noted that the translation initiation codon (ATG or AUG) is not part of the promoter. Thus, SEQ ID NOs: 1-10, and 77 are polynucleotides comprising promoters of the invention.

[033] As used herein, the term “enhancing” or “enhanced” when used with respect to expression levels of a coding sequence, nucleic acid, protein, and/or antigen, refers to an increase in expression of a coding sequence, nucleic acid, protein, and/or antigen when associated with and/or as part of one or more of the promoters, expression cassettes, nucleic acids, proteins, and/or vectors of the present invention relative to expression levels of a coding sequence, nucleic acids, protein, and/or antigen when associated with and/or as part of one or more of the promoters known in the art, such as PrS or VV-40k.

[034] As used herein, a nucleotide sequence having “essentially the same expression characteristics” as the nucleotide sequence set out in SEQ ID NOs: 1-10, and 77 will exhibit at least 70%, preferably at least 80%, even more preferably at least 90% of the promoter activity of SEQ ID NOs: 1-10, and 77, as measured by amount of recombinant protein produced. Whether or not a promoter sequence in question has “essentially the same expression characteristics” as any of SEQ ID NOs: 1-10, and 77 may be readily determined by one of ordinary skill in the art using the methods set forth in Examples 1-4 of the present application. The promoters according to the present invention are preferably active as poxvirus promoters, preferably avipoxvirus or active as promoters in poxvirus infected cells, preferably avipoxvirus infected cells. The avipoxvirus is preferably Fowlpox virus. “Active as pox virus promoter” means that the promoter is able to direct the expression of a gene to which it is operably linked in a pox virus after infection of cells with said virus. The cells are preferably cells that allow late and/or early and/or early/late expression of the poxvirus. “A promoter active in poxvirus infected cells” includes also the situation in which the promoter is not part of a poxvirus genome, e.g. part of a plasmid or linear polynucleotide or a non-poxvirus viral genome; in such a situation the promoter according to the present invention is active if the cell comprising the promoter also comprises a

poxvirus genome, e.g. if the cell is infected with a poxvirus. Under these circumstances the viral RNA polymerase recognizes the promoter according to the present invention and the expression of the gene/coding sequence that is linked to the promoter is activated.

[035] As used herein, the term “derived from the nucleic acid set out in SEQ ID NOs: 1-10, and 77” means that the nucleotide sequence of SEQ ID NOs: 1-10, and 77 is taken as a basis for effecting the nucleotide modifications specified, for example, at least one nucleotide addition, deletion, substitution and/or inversion. The term “derived” includes the possibility, for example, of actually modifying the physical sequence corresponding to SEQ ID NOs: 1-10, and 77 by known methods, for example, error-prone PCR. The term “derived” additionally includes the possibility of performing modifications on the sequence of SEQ ID NOs: 1-10, and 77 in silico, and then synthesizing the thus determined sequence as a physical nucleic acid. For example, the term “derived” encompasses the possibility of using any known computer program for the analysis of nucleic acid sequences with regard to, for example, hybridization stability and the possibility of any secondary nucleic acid structure in modifying the starting sequence of SEQ ID NOs: 1-10, and 77. Preferably, not more than 10, 9, 8, 7, 6, 5, 4, 3, 2 or 1 nucleotides have been added, deleted, substituted and/or inverted from the nucleic acids of SEQ ID NOs: 1-10, and 77. Furthermore, addition, insertion or deletion of at least one nucleotide should not result to a start codon of the nucleic acid to be expressed.

[036] As used herein, the terms “expressed”, “express”, “expression” and the like denote the transcription alone as well as both the transcription and translation of a sequence of interest. Thus, in referring to expression of a nucleic acid present in the form of DNA, the product resulting from this expression may be either RNA (resulting from transcription alone of the sequence to be expressed) or a polypeptide sequence (resulting from both transcription and

translation of the sequence to be expressed). The term “expression” thus also includes the possibility that both RNA and polypeptide product result from said expression and remain together in the same shared milieu. For example, this is the case when the mRNA persists following its translation into polypeptide product.

[037] As used herein, the term “expression cassette” is defined as a part of a vector or recombinant virus typically used for cloning and/or transformation. An expression cassette is typically comprised of a) one or more coding sequences (e.g., , open reading frame (ORF), genes, nucleic acids encoding a protein and/or antigen), and b) sequences controlling expression the one or more coding sequences. Additionally, an expression cassette may comprise a 3’ untranslated region that in eukaryotes usually contain a polyadenylation site.

[038] The term "recombinant" means a polynucleotide or polypeptide of semi-synthetic, or synthetic origin which either does not occur in nature or is linked to another polynucleotide in an arrangement not found in nature.

[039] One aspect of the invention includes promoters with nucleic acids having at least 70%, preferably 75%, 80%, 85%, 90% or 95% identity with SEQ ID NOs: 1-10, and 77 and having essentially the same expression characteristics as SEQ ID NOs: 1-10, and 77.

[040] "Percent (%) sequence homology or identity" with respect to nucleic acid sequences described herein is defined as the percentage of nucleotides in a candidate sequence that are identical with the nucleotides in the reference sequence (i.e., the nucleic acid sequence from which it is derived), after aligning the sequences and introducing gaps, if necessary, to achieve the maximum percent sequence identity, and not considering any conservative substitutions as part of the sequence identity. Alignment for purposes of determining percent nucleotide sequence identity or homology can be achieved in various ways that are within the

skill in the art, for example, using publically available computer software such as BLAST, ALIGN, or Megalign (DNASTAR) software. Those skilled in the art can determine appropriate parameters for measuring alignment, including any algorithms needed to achieve maximum alignment over the full length of the sequences being compared.

[041] For example, an appropriate alignment for nucleic acid sequences is provided by the local homology algorithm of Smith and Waterman, (1981), *Advances in Applied Mathematics* 2:482- 489. This algorithm can be applied to amino acid sequences by using the scoring matrix developed by Dayhoff, *Atlas of Protein Sequences and Structure*, M. O. Dayhoff ed., 5 suppl. 3:353-358, National Biomedical Research Foundation, Washington, D.C., USA, and normalized by Gribskov (1986), *Nucl. Acids Res.* 14(6):6745-6763. An exemplary implementation of this algorithm to determine percent identity of a sequence is provided by the Genetics Computer Group (Madison, Wis.) in the "BestFit" utility application. The default parameters for this method are described in the *Wisconsin Sequence Analysis Package Program Manual*, Version 8 (1995) (available from Genetics Computer Group, Madison, Wis.). A preferred method of establishing percent identity in the context of the present invention is to use the MPSRCH package of programs copyrighted by the University of Edinburgh, developed by John F. Collins and Shane S. Sturrok, and distributed by IntelliGenetics, Inc. (Mountain View, Calif). From this suite of packages the Smith-Waterman algorithm can be employed where default parameters are used for the scoring table (for example, gap open penalty of 12, gap extension penalty of one, and a gap of six). From the data generated the "Match" value reflects "sequence identity." Other suitable programs for calculating the percent identity or similarity between sequences are generally known in the art, for example, another alignment program is BLAST, used with default parameters. For example, BLASTN and BLASTP can be used using

the following default parameters: genetic code=standard; filter=none; strand=both; cutoff=60; expect=10; Matrix=BLOSUM62; Descriptions=50 sequences; sort by=HIGH SCORE; Databases=non- redundant, GenBank+EMBL+DDBJ+PDB+ GenBank CDS translations+Swiss protein+Spupdate+PIR. Details of these programs can be found at the following internet address: [http:// http://blast.ncbi.nlm.nih.gov/](http://blast.ncbi.nlm.nih.gov/).

Promoters and Nucleic Acid Sequences

[042] In one embodiment, the present disclosure includes a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-10, and 77.

[043] In another embodiment, the present disclosure includes a nucleic acid sequence having at least 70% identity with a nucleic acid selected from the group consisting of SEQ ID NOs: 1-10, and 77 and having essentially the same expression characteristics as a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-10, and 77. In further embodiments, there is a nucleic acid sequence having at least 75%, 80%, 85%, 90%, or 95% identity with a nucleic acid selected from the group consisting of SEQ ID NOs: 1-10, and 77 and having essentially the same expression characteristics as a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-10, and 77.

[044] In yet additional embodiment, there is a nucleic acid having a nucleotide sequence derived from the nucleic acid set out in SEQ ID NOs: 1-10, and 77, comprising at least one nucleotide addition, deletion, substitution and/or inversion as compared to the nucleotide sequence of SEQ ID NOs: 1-10, and 77 and having essentially the same expression characteristics as the nucleic acid of SEQ ID NOs: 1-10, and 77.

[045] In still an additional embodiment, there is a nucleic acid having a nucleotide sequence capable of hybridizing to a nucleic acid sequence selected from the group consisting of

SEQ ID NOs: 1-10, and 77, and having essentially the same expression characteristics as a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-10, and 77.

[046] In one aspect of the invention, there is a promoter for enhancing the expression of a coding and/or gene sequence, the promoter selected from the group consisting of:

- a) a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-10, and 77 or a subsequence thereof;
- b) a nucleic acid having a nucleotide sequence derived from the nucleic acid set out in (a), comprising at least one nucleotide addition, deletion, substitution and/or inversion as compared to the nucleotide sequence of (a) and having essentially the same expression characteristics as the nucleic acid of (a);
- c) a nucleic acid sequence having at least 70% identity with the nucleic acid of (a) and having essentially the same expression characteristics as the nucleic acid of (a); and
- d) a nucleic acid capable of hybridizing to a nucleic acid sequence of (a), (b) or (c) and having essentially the same expression characteristics as the nucleic acid of (a).
- e) a nucleic acid sequence comprising SEQ ID NOs: 3, 4, 5, 6, 7, 8, or 9, wherein the nucleic acid sequence includes up to 245 nucleotides.

[047] A further aspect of the invention relates to a nucleic acid capable of hybridizing to a nucleic acid sequence of (a), (b) or (c) and having essentially the same expression characteristics as the nucleic acid of (a). The term “capable of hybridizing” means hybridization in conditions in which any portion of the nucleic acid of (a), (b) or (c) is able to hybridize to another DNA sequence to allow detection and isolation of any DNA sequence having essentially the same expression characteristics as the nucleic acid of (a). The hybridization is carried out in stringent conditions; the more stringent the conditions, the more likely partially complementary

sequences are to be forced apart, i.e. higher stringency lowers the probability of hybridization. In practice, the term “stringent conditions” means hybridization conditions with high temperature (e.g. 65° C.) and/or low salt concentration (e.g. 0.1×SSC). Increasing the temperature and/or decreasing the salt concentration increases the stringency. Under stringent conditions hybridization will occur only if there is at least 70% or preferably at least 75, 80, 85, 90 or 95% identity between the sequences. Hybridization can be carried out as set out in Ausubel et al. (2002) Short Protocols in Molecular Biology Vol. 1 5th ed. Canada.

[048] Preferably, the promoter and/or nucleic acid of the invention has a length of up to and including 245 or 242 nucleotides. Also, the promoter and/or nucleic acid of the invention has a length of up to and including 232 or 215 nucleotides. More preferably, the promoter of the invention has a length of up to and including 212, 200, or a length of up to and including 195 nucleotides, or a length of up to and including 183, or a length of up to and including 170 or 167 nucleotides. In one embodiment, the nucleic acid of (b), (c) or (d), as set out above, comprises about 50-250 nucleotides, about 60-220 nucleotides, about 70-200 nucleotides, about 80-190 nucleotides, or about 90-180 nucleotides.

[049] Alternatively it is within the scope of the present invention to use a derivative of these promoters, which may be a subsequence of the sequences as defined in anyone of SEQ ID NOs: 1-10, and 77. The term “subsequence of the sequences according to anyone of SEQ ID NOs: 1-10, and 77” refers to shorter fragments of anyone of SEQ ID NO: 1 to 10, and 77 that are still active as a promoter, in particular as promoter in an orthopoxvirus, such as FPV, or in an orthopoxvirus, such as FPV, infected cells.

[050] In various embodiments, exemplary subsequences of SEQ ID NO:9 are selected from SEQ ID NOs:2-8. In one aspect, SEQ ID NOs: 4 or 5 are preferred subsequence of SEQ ID

NO: 9. In other aspects, subsequences of SEQ ID NO: 8 include SEQ ID NOs: 2-7, subsequences of SEQ ID NO:7 include SEQ ID NO:s 2-6, subsequences of SEQ ID NO:6 includes SEQ ID NOs: 2-5, subsequences of SEQ ID NO:5 include SEQ ID NOs: 2-4 subsequences of SEQ ID NO:6 includes SEQ ID NOs: 2-5, subsequences of SEQ ID NO:5 include SEQ ID NOs: 2-4, subsequences of SEQ ID NO: 4 includes SEQ ID NOs: 2-3, and subsequences of SEQ ID NO: 3 includes SEQ ID NO: 2.

[051] The derivative of the promoter comprising or consisting of a nucleotide sequence of anyone of SEQ ID NOs: 1-10, and 77 or subsequences thereof, can also be a sequence that has one or more nucleotide substitutions, deletions and/or insertions with respect to any one of the sequences of SEQ ID NOs: 1-10, and 77. The derivatives according to the present invention are still active as a promoter, in particular as orthopoxvirus and/or avipoxvirus promoter in an orthopoxvirus and/or avipoxvirus virus infected cells, more preferably as an avipoxvirus promoter in avipoxvirus infected cells. In the derivatives according to the present invention deletions, substitutions and insertions may be combined in one sequence.

[052] Preferably the derivative has a homology of at least 40%, more preferably of at least 60%, even more preferably of at least 80%, most preferably of at least 90% when compared to anyone of the sequence of SEQ ID NOs: 1-10, and 77 or subsequences thereof, as described herein.

Brachyury proteins

[053] In several aspects of the present invention, the inventors' determined that as a result of synthesizing the various promoters described herein, the inventors' created one or more recombinant Brachyury proteins. In particular, the one or more recombinant Brachyury proteins are fusion proteins resulting from the combination of one or more of the promoters of the

invention and the Brachyury protein. It is contemplated that one or more of the recombinant Brachyury proteins can be useful as a part of a vaccine, pharmaceutical or other therapeutic composition.

[054] Thus, in various aspects, the invention includes one or more synthetic and novel recombinant Brachyury proteins and/or synthetic and novel nucleic acids encoding recombinant Brachyury proteins.

[055] In one embodiment, there are one or more nucleic acids sequences having at least 70% identity to a nucleic acid encoding a Brachyury protein, wherein the Brachyury protein is selected from the group consisting of: SEQ ID NOs: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71. In additional embodiments, there are one or more nucleic acids having at least 75%, 80%, 85%, 90%, or 95% identity to a nucleic acid encoding a Brachyury protein, wherein the Brachyury protein is selected from the group consisting of: SEQ ID NOs: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71.

[056] In various other embodiments of the invention, there are one or more Brachyury proteins selected from the group consisting of: SEQ ID NOs: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71. In further embodiments, there are one or more Brachyury proteins having at least 70% identity with a peptide selected from the group consisting of: SEQ ID NOs: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71. In still further embodiments, there is a peptide having at least 75%, 80%, 85%, 90%, or 95% identity with a peptide selected from the group consisting of SEQ ID NOs: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71.

[057] In another embodiment, there are one or more nucleic acids sequences encoding a Brachyury protein, the nucleic acid sequence selected from the group consisting of: SEQ ID NOs: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

[058] In other embodiments, there are one or more nucleic acid sequences having at least 70% identity with a nucleic acid selected from the group consisting of SEQ ID NOs: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69 and having essentially the same expression characteristics as a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69. In further embodiments, there is a nucleic acid sequence having at least 75%, 80%, 85%, 90%, or 95% identity with a nucleic acid selected from the group consisting of SEQ ID NOs: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69 and having essentially the same expression characteristics as a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

[059] In a preferred embodiment, there are one or more nucleic acid sequences selected from the group consisting of SEQ ID NOs: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

Expression Cassettes

[060] According to a further embodiment, the present invention refers to an expression cassette comprising one or more of the promoters and/or Brachyury recombinant proteins and/or nucleic acids according to the present invention.

[061] In one embodiment, there is an expression cassette comprising a promoter having at least 70% identity with a nucleic acid selected from the group consisting of SEQ ID NOs: 1-10 and a nucleic acid encoding a Brachyury peptide selected from the group consisting of: SEQ ID NOs: 11, 13, 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71. In an another embodiment, there is an expression cassette comprising a promoter selected from the group consisting of SEQ ID NOs: 1-10, and 77 and/or a nucleic acid encoding a Brachyury peptide, wherein the nucleic acid is selected from the group consisting of: SEQ ID NOs: 12, 14-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

[062] In a preferred embodiment, there is an expression cassette comprising a nucleic acid sequence at least 70% homologous to a nucleic acid sequence selected from the group consisting of: SEQ ID NOs: 72-76. In further embodiments, there is an expression cassette comprising a nucleic acid sequence having at least 75%, 80%, 85%, 90%, or 95% identity with a nucleic acid selected from the group consisting of SEQ ID NOs: 72-76.

[063] In a more preferred embodiment, there is an expression cassette comprising SEQ ID NO: 72.

[064] In a more preferred embodiment, there is an expression cassette comprising SEQ ID NO: 73.

[065] In a more preferred embodiment, there is an expression cassette comprising SEQ ID NO: 74.

Recombinant Poxviruses

[066] According to a further embodiment the nucleic acids, promoters, recombinant proteins, and/or expression cassettes according to the present invention may be part of a vector.

The term “vector” refers to any vectors known to the person skilled in the art. A vector can be a plasmid vector such as pBR322 or a vector of the pUC series. More preferably the vector is a recombinant virus. In the context of the present invention the term “virus” or “recombinant virus” refers to an infectious virus comprising a viral genome. In this case the nucleic acids, promoters, recombinant proteins, and/or expression cassettes of the present invention are part of the viral genome of the respective recombinant virus. The recombinant viral genome is packaged and the obtained recombinant viruses can be used for the infection of cells and cell lines, in particular for the infection of living animals including humans. Typical recombinant viruses that may be used according to the present invention are adenoviral vectors, retroviral vectors or vectors on the basis of the adeno associated virus 2 (AAV2). Most preferred are poxviral vectors.

[067] In several embodiments, the nucleic acids, promoters, polypeptides, and expression cassettes according to the present invention are preferably active as poxviral promoters or active as promoters in poxvirus infected cells. The poxvirus is preferably an avipoxvirus or an orthopoxvirus. More preferably, the poxvirus is an avipoxvirus.

[068] The term "avipoxvirus" refers to any avipoxvirus, such as Fowlpoxvirus, Canarypoxvirus, Uncopoxvirus, Mynahpoxvirus, Pigeonpoxvirus, Psittacinepoxvirus, Quailpoxvirus, Peacockpoxvirus, Penguinpoxvirus, Sparrowpoxvirus, Starlingpoxvirus and Turkeypoxvirus. Preferred avipoxviruses are Canarypoxvirus and Fowlpoxvirus.

[069] An example of a canarypox virus is strain Rentschler. A plaque purified Canarypox strain termed ALVAC (U.S. Pat. No. 5,766,598) was deposited under the terms of the Budapest treaty with the American Type Culture Collection (ATCC), accession number VR-

2547. Another Canarypox strain is the commercial canarypox vaccine strain designated LF2 CEP 524 24 10 75, available from Institute Merieux, Inc.

[070] Examples of a Fowlpox virus are strains FP-1, FP-5, TROVAC (U.S. Pat. No. 5,766,598), and POXVAC-TC (U.S. Patent 7,410,644). FP-1 is a Duvette strain modified to be used as a vaccine in one-day old chickens. The strain is a commercial fowlpox virus vaccine strain designated O DCEP 25/CEP67/2309 October 1980 and is available from Institute Merieux, Inc. FP-5 is a commercial fowlpox virus vaccine strain of chicken embryo origin available from American Scientific Laboratories (Division of Schering Corp.) Madison, Wis., United States Veterinary License No. 165, serial No. 30321.

[071] In certain embodiments, the recombinant FPV comprises a nucleic acid sequence selected from the group consisting of: SEQ ID NOs: 1-10, and 77. In various additional embodiments, the recombinant FPV comprises an expression cassette comprising a nucleic acid sequence selected from SEQ ID NOs: 72-76. In a more preferred embodiment, the recombinant FPV comprises an expression cassette comprising a nucleic acid sequence selected from SEQ ID NOs: 72, 73, and 74.

[072] In other embodiments, the recombinant FPV comprises a nucleic acid encoding a brachyury antigen selected from the group consisting of: SEQ ID NOs: 11, 13, 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71. In further embodiments, the recombinant FPV comprises a Brachyury peptide selected from the group consisting of: SEQ ID NOs: 11, 13, 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71. In further embodiments, the recombinant FPV comprises a nucleic acid selected from the group consisting of: SEQ ID NOs: 12, 14-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

In more preferred embodiments, , the recombinant FPV comprises a Brachyury peptide selected from the group consisting of: SEQ ID NOs: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71 and/or a nucleic acid selected from the group consisting of: SEQ ID NOs: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

[073] In the various other embodiments of the present disclosure, the recombinant poxvirus is an orthopoxvirus such as, but not limited to, a vaccinia virus, a Modified Vaccinia Virus Ankara (MVA), or MVA-BN.

[074] Examples of vaccinia virus strains are the strains Temple of Heaven, Copenhagen, Paris, Budapest, Dairen, Gam, MRIVP, Per, Tashkent, TBK, Tom, Bern, Patwadangar, BIEM, B-15, Lister, EM-63, New York City Board of Health, Elstree, Ikeda and WR. A preferred vaccinia virus (VV) strain is the Wyeth (DRYVAX) strain (U.S. Patent 7,410,644). Another preferred VV strain is MVA (Sutter, G. et al. [1994], Vaccine 12: 1032-40). Another preferred VV strain is MVA-BN.

[075] Examples of MVA virus strains that are useful in the practice of the present invention and that have been deposited in compliance with the requirements of the Budapest Treaty are strains MVA 572, deposited at the European Collection of Animal Cell Cultures (ECACC), Vaccine Research and Production Laboratory, Public Health Laboratory Service, Centre for Applied Microbiology and Research, Porton Down, Salisbury, Wiltshire SP4 0JG, United Kingdom, with the deposition number ECACC 94012707 on January 27, 1994, and MVA 575, deposited under ECACC 00120707 on December 7, 2000. MVA-BN, deposited on Aug. 30, 2000 at the European Collection of Cell Cultures (ECACC) under number V00083008, and its derivatives, are additional exemplary strains.

[076] Although MVA-BN is preferred for its higher safety (less replication competent), all MVAs are suitable for this invention. According to an embodiment of the present invention, the MVA strain is MVA-BN and its derivatives. A definition of MVA-BN and its derivatives is given in PCT/EP01/13628 which is incorporated by reference herein.

[077] In one embodiment, the invention encompasses recombinant orthopoxviruses, preferably a vaccinia virus (VV), a Wyeth strain, ACAM 1000, ACAM 2000, MVA, or MVA-BN for cancer therapy. Recombinant orthopoxviruses are generated by insertion of heterologous sequences into an orthopoxvirus.

[078] In certain embodiments, the MVA is MVA-BN, deposited on Aug. 30, 2000, at the European Collection of Cell Cultures (ECACC) under number V00083008, and described in International PCT publication WO2002042480 (see also e.g. U.S. Pat. Nos. 6,761,893 and 6,913,752), which are incorporated by reference herein.

[079] In certain embodiments, a recombinant MVA is a derivative of MVA-BN. Such "derivatives" include viruses exhibiting essentially the same replication characteristics as the deposited strain (ECACC No. V00083008), but exhibiting differences in one or more parts of its genome. Viruses having the same "replication characteristics" as the deposited virus are viruses that replicate with similar amplification ratios as the deposited strain in CEF cells and the cell lines, HeLa, HaCat and 143B; and that show similar replication characteristics *in vivo*, as determined, for example, in the AGR129 transgenic mouse model.

[080] In certain embodiments, the recombinant orthopoxvirus comprises a nucleic acid selected from the group consisting of: SEQ ID NOs: 1-10, and 77. In various additional embodiments, the recombinant orthopoxvirus comprises an expression cassette comprising a nucleic acid sequence selected from SEQ ID NOs: 72-76. In a more preferred embodiment, the

recombinant orthopoxvirus comprises an expression cassette comprising a nucleic acid sequence selected from SEQ ID NOs: 72, 73, and 74.

[081] In other embodiments, the recombinant orthopoxvirus comprises a nucleic acid encoding a brachyury antigen selected from the group consisting of: SEQ ID NOs: 11, 13, 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71. In further embodiments, the recombinant orthopoxvirus comprises a nucleic acid selected from the group consisting of: SEQ ID NOs: 12, 14-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69. In more preferred embodiments, the recombinant orthopoxvirus comprises a Brachyury peptide selected from the group consisting of: SEQ ID NOs: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71 and/or a nucleic acid selected from the group consisting of: SEQ ID NOs: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

[082] Methods are known to the person skilled in the art how the expression cassette or the promoter according to the present invention can be inserted into a viral genome, in particular into the genome of a poxvirus, most preferably into the genome of an orthopoxvirus and/or FPV. For example, the expression cassette or the promoter or derivative thereof according to the present invention may be inserted into the genome of a poxvirus by homologous recombination. To this end a nucleic acid is transfected into a permissive cell line such as CEF or BHK cells, wherein the nucleic acid comprises the expression cassette or the promoter or derivative thereof according to the present invention flanked by nucleotide stretches that are homologous to the region of the poxviral genome in which the expression cassette or the promoter or derivative thereof according to the present invention is to be inserted. The cells are infected by the poxvirus

and in the infected cells homologous recombination occurs between the nucleic acid and the viral genome. Alternatively, it is also possible to first infect the cells with a poxvirus and then to transfect the nucleic acid into the infected cells. Again recombination occurs in the cells. The recombinant poxvirus is then selected by methods known in the prior art. The construction of recombinant poxvirus is not restricted to this particular method. Instead, any suitable method known to the person skilled in the art may be used to this end.

[083] The expression cassette or the promoter according to the present invention may be introduced into any suitable part of the virus or viral vector, in particular into a viral genome. In case of an orthopoxvirus and an avipoxvirus, the insertion may be made into non-essential parts of the viral genome or into an intergenic region of the viral genome. The term “intergenic region” refers preferably to those parts of the viral genome located between two adjacent genes that do not comprise coding sequences. If the virus is an orthopoxvirus and an avipoxvirus the insertion may also be made into a deletion site of the viral genome. The term “deletion site” refers to those parts of the viral genome that are deleted with respect to the genome of a naturally occurring orthopoxvirus or avipoxvirus. However, the insertion sites are not restricted to these preferred insertion sites in the orthopoxvirus and an avipoxvirus genome, since it is within the scope of the present invention that the expression cassette may be inserted anywhere in the viral genome as long as it is possible to obtain recombinants that can be amplified and propagated in at least one cell culture system, such as Chicken Embryo Fibroblasts (CEF cells).

[084] The promoter according to the present invention may be used to express a gene that is already part of the vector, e.g. the genome of an orthopoxvirus and/or an avipoxvirus. Such a gene may be a gene that is naturally part of the viral genome or a foreign gene that has already been inserted into the vector. In these cases the promoter according to the present

invention is inserted upstream of the gene in the vector, the expression of which is to be controlled by the promoter.

Vaccines and/or Compositions

[085] According to a further embodiment the invention concerns the vector according to the present invention as vaccine or medicament. In more general term the invention relates to a vaccine or pharmaceutical composition comprising an expression cassette, a DNA or a vector according to the present invention. Methods are known to the person skilled in the art how the vaccine or pharmaceutical composition can be administered to the animal or human body. In case of DNA and recombinant plasmid vectors the DNA and the vector can simply be administered by injection. If the vaccine or composition is a recombinant virus such as an orthopoxvirus or an avipoxvirus, in particular a recombinant MVA or recombinant FPV, it may also be administered to the animal or human body according to the knowledge of the person skilled in the art, e.g. by intra venous, intra muscular, intra nasal, intra dermal or subcutaneous administration. Further details on the amount of virus administered are given below.

[086] The pharmaceutical composition or the vaccine may generally include one or more pharmaceutical acceptable and/or approved carriers, additives, antibiotics, preservatives, adjuvants, diluents and/or stabilizers in addition to the promoter, expression cassette or vector according to the present invention. Such auxiliary substances can be water, saline, glycerol, ethanol, wetting or emulsifying agents, pH buffering substances, or the like. Suitable carriers are typically large, slowly metabolized molecules such as proteins, polysaccharides, polylactic acids, polyglycolic acids, polymeric amino acids, amino acid copolymers, lipid aggregates, or the like.

[087] For the preparation of pharmaceutical compositions or vaccines, the DNA, expression cassette or vector according to the present invention, in particular a recombinant

orthopoxvirus or avipoxvirus such as recombinant MVA or recombinant FPV is converted into a physiologically acceptable form. For MVA and FPV, this can be done based on the experience in the preparation of poxvirus vaccines used for vaccination against smallpox (as described by Stickl, H. et al. [1974] Dtsch. med. Wschr. 99, 2386-2392). For example, the purified virus is stored at -80°C . with a titre of 5×10^8 TCID₅₀/ml formulated in about 10 mM Tris, 140 mM NaCl pH 7.4. For the preparation of vaccine shots, e.g., 10^1 - 10^9 particles of the recombinant virus according to the present invention are lyophilized in phosphate-buffered saline (PBS) in the presence of 2% peptone and 1% human albumin in an ampoule, preferably a glass ampoule. Alternatively, the vaccine shots can be produced by stepwise freeze-drying of the virus in a formulation. This formulation can contain additional additives such as mannitol, dextran, sugar, glycine, lactose or polyvinylpyrrolidone or other additives such as antioxidants or inert gas, stabilizers or recombinant proteins (e.g. human serum albumin) suitable for in vivo administration. A typical virus containing formulation suitable for freeze-drying comprises 10 mM Tris-buffer, 140 mM NaCl, 18.9 g/l Dextran (MW 36000-40000), 45 g/l Sucrose, 0.108 g/l L-glutamic acid mono potassium salt monohydrate pH 7.4. The glass ampoule is then sealed and can be stored between 4°C . and room temperature for several months. However, as long as no need exists the ampoule is stored preferably at temperatures below -20°C .

[088] For vaccination or therapy the lyophilisate or the freeze-dried product can be dissolved in 0.1 to 0.5 ml of an aqueous solution, preferably water, physiological saline or Tris buffer, and administered either systemically or locally, i.e. by parenteral, intramuscular or any other path of administration known to the skilled practitioner. The mode of administration, the dose and the number of administrations can be optimized by those skilled in the art in a known manner.

[089] In one or more embodiments, the invention further concerns a method for introducing a coding sequence into a target cell, such as human cell for therapeutic purposes, comprising the introduction of the nucleic acids, promoters, recombinant proteins, and/or expression cassettes according to the present invention into the target cell. Exemplary human target cells can include antigen presenting cells (APCs) such as dendritic cells, macrophages and other non APC'S such as fibroblasts, tumor cells, and so forth.

[090] The invention further relates to a method for producing a peptide, protein and/or virus comprising the infection of a host cell with a recombinant virus according to the present invention, followed by the cultivation of the infected host cell under suitable conditions, and further followed by the isolation and/or enrichment of the peptide and/or protein and/or viruses produced by said host cell. If it is intended to produce, i.e. amplify the virus according to the present invention the cell has to be a cell in which the virus is able to replicate. For poxviruses, in particular MVA, suitable cells are CEF (chicken embryonic fibroblast) or BHK (baby hamster kidney) cells. For avipoxviruses, such as fowlpoxvirus, suitable cells include CEF or CED (chicken embryonic dermal) cells. If it is intended to produce a peptide/protein encoded by the recombinant virus according to the present invention the cell may be any cell that can be infected by the recombinant virus vector and that allows the expression of the virus encoded proteins/peptides.

[091] The invention further relates to a method for producing a peptide, protein and/or virus comprising the transfection of a cell with the expression cassette, a nucleic acid, promoter, recombinant protein, and/or expression cassette DNA according to the present invention, followed by the infection of the cell with a poxvirus. The infected host cell is cultivated under suitable conditions. A further step comprises the isolation and/or enrichment of the peptide

and/or protein and/or viruses produced by said host cell. The step of infecting the cells with a poxvirus may be made before or after the step of transfection of the cells.

[092] The invention further relates to cells comprising a nucleic acid, promoter, recombinant protein, and/or expression cassette according to the present invention. In particular the invention relates to cells infected with the recombinant virus according to the present invention.

Examples

[093] The following examples further illustrate the present invention. It will be understood by a person of skill in the art that the provided examples in no way may be interpreted as limiting the applicability of the technology.

Example 1: Expression of Brachyury in Human DCs infected with recombinant fowlpox viruses

[094] To identify expression of Brachyury protein, human dendritic cells (DC) were infected with a positive control virus, recombinant MVA comprising Brachyury and TRICOM, at a multiplicity of infection (MOI) of 2.5. Human DCs were also infected with a negative control non-recombinant fowlpox (FPV-WT) or recombinant fowlpox virus strains comprising of a Brachyury expression cassette and TRICOM in accordance with the present disclosure. Each FPV strain, (listed in more detail in Table 1) including FPV-WT, FPV-mBN343A, FPV-mBN344A, and FPV-mBN345A were used to infect DCs with an MOI of 20. FPVBrachyury expression was detected via western blot analysis performed with a rabbit monoclonal anti-Brachyury antibody. The housekeeping protein glyceraldehyde 3-phosphate dehydrogenase (GAPDH) was also detected via western blot analysis as a loading control.

Table 1.
virus strains

<u>Recombinant FPV strain</u>	<u>Expression Cassette</u>
FPV-mBN343A	SEQ ID NO: 74
FPV-mBN344A	SEQ ID NO: 75
FPV-mBN345A	SEQ ID NO: 72
FPV-mBN354A	SEQ ID NO: 76
FPV-mBN355A	SEQ ID NO: 73

Brachyury expression cassette and TRICOM

Recombinant fowlpox
comprising a

[095] Results are shown in Figure 1. Expression of Brachyury was detected with the FPV-mBN343A and FPV-mBN345 recombinant FPVs, but was not detected using the FPV-mBN344A recombinant FPV. Brachyury expression was also detected with MVA-Brachyury-TRICOM. Similar loading of samples was demonstrated by GAPDH expression.

Example 2: Expression of Brachyury in Human DCs infected with recombinant fowlpox viruses

[096] Expression-levels of Brachyury protein were also compared between additional recombinant FPV strains expressing Brachyury with different promoters. Human dendritic cells (DC) were infected with an MOI of 5 of the positive control recombinant MVA comprising Brachyury and TRICOM, and the negative control non-recombinant strain MVA-WT. Human DCs were also infected with a recombinant FPVs comprising of a Brachyury expression cassette and TRICOM in accordance with the present disclosure (e.g, FPV-mBN343A, FPV-mBN344A, FPV-mBN345A, FPV-mBN354A, FPV-mBN355A, See Table 1). Human DCs were additionally infected with a recombinant Fowlpoxvirus (FPV) comprising a Brachyury expression cassette having either a Vaccinia Virus (VV)-40k promoter or a PrS promoter. The non-recombinant FPV-WT strain served as a negative control. All of the FPVs were used at an MOI of 40. Brachyury expression was detected via western blot analysis performed with a rabbit monoclonal anti-Brachyury antibody. GAPDH was also detected as a loading control.

[097] Results are shown in Figure 2. Expression of Brachyury was detected with the FPV-mBN343A and FPV-mBN345A recombinant FPVs, but was not detected using the FPV-mBN344A and FPV-mBN354A recombinant FPV. More particularly, expression of Brachyury was detected at lower levels for the recombinant FPVs having the VV-40k or PrS promoters driving Brachyury (i.e., FVP-mBN281A, FVP-mBN249B). No Brachyury expression was detected in the negative controls (uninfected DCs, MVA-WT, or FPV-WT). Similar loading of samples was demonstrated by GAPDH expression.

[098] The Brachyury expression levels from the Western blot shown in Example 2 were normalized relative to expression of the housekeeping gene GAPDH, which is expected to be expressed at equivalent levels between cells. The intensity of each Brachyury and GAPDH band was measured and a ratio was calculated between the intensity of the Brachyury and GAPDH bands within the same sample.

[099] Results are shown in Figure 3. Among the FPV constructs, the highest expression of Brachyury relative to GAPDH was detected in DCs infected with FPV-mBN355A. Moderate relative Brachyury expression was detected in DCs infected with FPV-mBN343A or FPV-mBN345A. The lowest relative Brachyury expression was detected from the recombinant FPVs having the VV-40k or PrS promoters driving Brachyury (i.e., FVP-mBN281A, FVP-mBN249B). Highest relative expression of Brachyury was observed from infection with the positive control virus MVA-Brachyury-TRICOM; no Brachyury expression was detected in the negative control samples. Therefore, among the recombinant FPV strains, superior expression of Brachyury was induced by vectors driving Brachyury expression from the FPV-mBN355, FPV-mBN345, or FPV-mBN344 promoters.

Example 3: Expression of Brachyury and TRICOM in CMMT cells infected with recombinant fowlpox viruses

[0100] Expression of the Brachyury and TRICOM proteins was also assessed by flow cytometry using fluorescently labeled antibodies specific for each protein. CMMT cells (a rhesus macaque mammary tumor cell line) were infected with the positive control recombinant MVA comprising Brachyury and TRICOM, or with a recombinant FPVs comprising of a Brachyury expression cassette and TRICOM in accordance with the present disclosure (e.g, FPV-mBN343A, FPV-mBN345A), or with the recombinant FPV having the PrS promoter driving Brachyury (FVP-mBN249B). Cells were infected with an MOI below 1, so that a mixture of uninfected and infected cells were analyzed. Uninfected CMMT cells served as a negative control.

[0101] FACS samples were acquired on the BD LSRII or Fortessa and analyzed using BD FACSDIVA software (BD Bioscience, San Jose, CA) or FlowJo (TreeStar Inc., Ashland, OR).

[0102] Results are shown in Figure 4. Histograms of the signals detected for Brachyury and the three TRICOM proteins (CD80, CD54, and CD58) were plotted, and gates were drawn where positive signal was detected (black lines). Among the FPV constructs, the highest expression of Brachyury (shown by the biggest shift in signal along the x-axis) was detected in CMMT cells infected with FPV-mBN343A or FPV-mBN345A. The lowest Brachyury expression was detected from the recombinant FPV with the PrS promoter driving Brachyury (i.e., FVP-mBN281A, FVP-mBN249B). Similar expression levels of the TRICOM proteins were detected among the FPV constructs. Expression of Brachyury and the TRICOM proteins were also observed from infection with the positive control virus MVA-Brachyury-TRICOM.

[0103] To quantify the expression level of Brachyury in infected cells the median fluorescence intensity (MFI) was calculated for the Brachyury-positive cells gated in Figure 4.

[0104] Results are shown in Figure 5. Among the FPV constructs, the highest Brachyury MFI was detected in CMMT cells infected with FPV-mBN343A or FPV-mBN345A. The lowest Brachyury MFI was detected from the recombinant FPV with the PrS promoter driving Brachyury (FVP-mBN249B). The highest Brachyury MFI of all tested constructs was in cells infected with the positive control virus MVA-Brachyury-TRICOM. Therefore, the median expression level of Brachyury in infected CMMT cells was higher from vectors driving Brachyury expression from the FPV-mBN345 or FPV-mBN344 promoters than from the PrS promoter.

Example 4: Expression of Brachyury from FPV-mBN345B

[0105] The drug selection cassette used to initially generate the recombinant FPV-mBN345A strain was removed to generate a recombinant vector suitable for clinical development. This was accomplished by passaging the virus on chicken embryonic fibroblast (CEF) cells without drug selection, plaque purifying individual clones, and identifying clones lacking the selection cassette by PCR and DNA sequencing. This resulted in generation of FPV-mBN345B which comprises of a Brachyury expression cassette driven by the I3+15aa promoter and TRICOM, but does not contain the drug selection cassette.

[0106] Expression of Brachyury and the TRICOM proteins from FPV-mBN345B was confirmed in CMMT cells by infecting them with FPV-BN345B at an MOI of 0.625 to infect a subset of cells, or of 40 to infect all cells.

[0107] Results are shown in Figure 6. Histograms of the signals detected for Brachyury and the three TRICOM proteins (CD80, CD54, and CD58) were plotted with a red lines for

samples infected with an MOI of 0.625 and blue lines for samples infected with an MOI of 40. Uninfected cells served as a negative control (black lines). At the MOI of 0.625, expression of Brachyury and the three TRICOM proteins was detected as a peak shifted to the right of the taller peak from uninfected cells. At the MOI of 40, expression of Brachyury and TRICOM was detected in all cells as a peak shifted to the right of the uninfected cells.

[0108] Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.

SEQUENCE LISTING

<110> BAVARIAN NORDIC A/S

<120> PROMOTERS FOR ENHANCING EXPRESSION IN POXVIRUSES

<130> BNIT0010PCT

<140> 62/199681

<141> 2015-07-31

<160> 77

<170> PatentIn version 3.5

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<213> Artificial Sequence

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<223> Promoter Sequence with nucleotides 5' of Gene FPV 088

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gggaaaaatc ttacaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa 120

ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaa 167

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<211> 170

<212> DNA

<213> Artificial Sequence

<220>

<223> Promoter Sequence with nucleotides 5' of Gene FPV 088 + atc sequence

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gggaaaaatc ttacaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa 120

ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaaatc 170

<210> 3

<211> 183

<212> DNA

<213> Artificial Sequence

<220>

<223> Promoter Sequence with nucleotides 5' of Gene FPV 088 plus addition of 16 nucleotides of FPV 088

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tgt 183

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<211> 194
<212> DNA
<213> Artificial Sequence

<220>
<223> Promoter Sequence with region from Gene FPV 088 plus addition of 27 nucleotides

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gggaaaaatc ttacaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa 120
ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaaatg aaaaataact 180
tgtatgaaga aaaa 194

<210> 5
<211> 200
<212> DNA
<213> Artificial Sequence

<220>
<223> Promoter Sequence with region from Gene FPV 088 plus addition of 33 nucleotides

<400> 5
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gggaaaaatc ttacaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa 120
ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaaatg aaaaataact 180
tgtatgaaga aaaaatgaac 200

<210> 6
<211> 212
<212> DNA

<213> Artificial Sequence

<220>

<223> Promoter Sequence with region from Gene FPV 088 plus addition of 45 nucleotides

<400> 6

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gggaaaaatc ttacaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa 120

ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaaatg aaaaataact 180

tgtatgaaga aaaaatgaac atgagtaaga aa 212

<210> 7

<211> 232

<212> DNA

<213> Artificial Sequence

<220>

<223> Promoter Sequence with region from Gene FPV 088 plus addition of 65 nucleotides

<400> 7

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gggaaaaatc ttacaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa 120

ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaaatg aaaaataact 180

tgtatgaaga aaaaatgaac atgagtaaga aacaagtaaa aactcaaagt aa 232

<210> 8

<211> 242

<212> DNA

<213> Artificial Sequence

<220>

<223> Promoter Sequence with region from Gene FPV 088 plus addition of 75 nucleotides

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gggaaaaatc ttacaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa 120

ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaaatg aaaaataact 180

tgtatgaaga aaaaatgaac atgagtaaga aacaagtaaa aactcaaagt aaatgtaata 240

at 242

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 <211> 245
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Promoter Sequence with region from Gene FPV 088 plus addition of 78 nucleotides

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 gggaaaaatc ttacaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa 120
 ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaaatg aaaaataact 180
 tgtatgaaga aaaaatgaac atgagtaaga aacaagtaaa aactcaaagt aaatgtaata 240
 atatc 245

<210> 10
 <211> 119
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Promoter Sequence with nucleotides 5' of the Gene FPV L2R

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 taattaaaat tgaaaaaaaa atatcattat aaaacgtaaa cgaacaaaaa acattaatt 119

<210> 11
 <211> 435
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Brachyury protein Isoform 1 from GenBank Accession No. 015178.1

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Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser
 20 25 30

Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu
 35 40 45

Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val
 50 55 60

Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser
 65 70 75 80

Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala
 85 90 95

Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly
 100 105 110

Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp
 115 120 125

Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser
 130 135 140

Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu
 145 150 155 160

Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly
 165 170 175

Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe
 180 185 190

Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile
 195 200 205

Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser
 210 215 220

Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly
 225 230 235 240

Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Leu Cys Pro

	245		250		255										
Pro	Ala	Asn	Pro	His	Pro	Gln	Phe	Gly	Gly	Ala	Leu	Ser	Leu	Pro	Ser
		260						265					270		
Thr	His	Ser	Cys	Asp	Arg	Tyr	Pro	Thr	Leu	Arg	Ser	His	Arg	Ser	Ser
		275					280					285			
Pro	Tyr	Pro	Ser	Pro	Tyr	Ala	His	Arg	Asn	Asn	Ser	Pro	Thr	Tyr	Ser
	290					295					300				
Asp	Asn	Ser	Pro	Ala	Cys	Leu	Ser	Met	Leu	Gln	Ser	His	Asp	Asn	Trp
305					310					315					320
Ser	Ser	Leu	Gly	Met	Pro	Ala	His	Pro	Ser	Met	Leu	Pro	Val	Ser	His
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Asn	Ala	Ser	Pro	Pro	Thr	Ser	Ser	Ser	Gln	Tyr	Pro	Ser	Leu	Trp	Ser
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Val	Ser	Asn	Gly	Ala	Val	Thr	Pro	Gly	Ser	Gln	Ala	Ala	Ala	Val	Ser
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	370					375					380				
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385					390					395					400
Tyr	Glu	Gly	Ala	Ala	Ala	Ala	Thr	Asp	Ile	Val	Asp	Ser	Gln	Tyr	Asp
			405					410					415		
Ala	Ala	Ala	Gln	Gly	Arg	Leu	Ile	Ala	Ser	Trp	Thr	Pro	Val	Ser	Pro
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Pro	Ser	Met													
		435													

<210> 12
 <211> 1308
 <212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence for Brachyury protein Isoform 1 GenBank Accession No. 015178.1

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ctgagcgccg tggagaatga gctgcaggcg ggcagcgaga agggcgaccc cacagagcgc	120
gaactgcgcg tgggcctgga ggagagcgag ctgtggctgc gcttcaagga gctcaccaat	180
gagatgatcg tgaccaagaa cggcaggagg atgtttccgg tgctgaaggt gaacgtgtct	240
ggcctggacc ccaacgccat gtactccttc ctgctggact tcgtggcggc ggacaaccac	300
cgctggaagt acgtgaacgg ggaatgggtg ccggggggca agccggagcc gcaggcgccc	360
agctgcgtct acatccaccc cgactcgccc aacttcgggg cccactggat gaaggctccc	420
gtctccttca gcaaagtcaa gctcaccaac aagctcaacg gagggggcca gatcatgctg	480
aactccttgc ataagtatga gcctcgaatc cacatagtga gagttggggg tccacagcgc	540
atgatcacca gccactgctt ccctgagacc cagttcatag cggtgactgc ttatcagaac	600
gaggagatca cagctcttaa aattaagtac aatccatttg caaaagcttt ccttgatgca	660
aaggaaagaa gtgatcacia agagatgatg gaggaacccg gagacagcca gcaacctggg	720
tactcccaat gggggtggct tcttcctgga accagcacc cgtgtccacc tgcaaactct	780
catcctcagt ttggaggtgc cctctccctc ccctccacgc acagctgtga caggtaccca	840
accctgagga gccaccggtc ctcaccctac cccagcccct atgctcatcg gaacaattct	900
ccaacctatt ctgacaactc acctgcatgt ttatccatgc tgcaatccca tgacaattgg	960
tccagccttg gaatgcctgc ccatcccagc atgctccccg tgagccacaa tgccagccca	1020
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<210> 13

<211> 435

<212> PRT
<213> Artificial Sequence

<220>
<223> Brachyury protein Isoform 1 (L254V)

<400> 13

Met Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg
1 5 10 15

Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser
20 25 30

Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu
35 40 45

Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val
50 55 60

Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser
65 70 75 80

Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala
85 90 95

Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly
100 105 110

Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp
115 120 125

Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser
130 135 140

Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu
145 150 155 160

Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly
165 170 175

Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe
180 185 190

Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile
195 200 205

Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser
210 215 220

Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly
225 230 235 240

Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Val Cys Pro
245 250 255

Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser
260 265 270

Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser
275 280 285

Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser
290 295 300

Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp
305 310 315 320

Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His
325 330 335

Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser
340 345 350

Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser
355 360 365

Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr
370 375 380

Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu
385 390 395 400

Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp
405 410 415

Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro
420 425 430

Pro Ser Met
435

<210> 14
<211> 1308
<212> DNA
<213> Artificial Sequence

<220>
<223> Coding sequence encoding Brachyury protein Isoform 1 with L254V

<400> 14
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ctgagcgccg tggagaatga gctgcaggcg ggcagcgaga agggcgaccc cacagagcgc 120
gaactgcgcg tgggcctgga ggagagcgag ctgtggctgc gcttcaagga gctcaccaat 180
gagatgatcg tgaccaagaa cggcaggagg atgtttccgg tgctgaaggt gaacgtgtct 240
ggcctggacc ccaacgccat gtactccttc ctgctggact tcgtggcggc ggacaaccac 300
cgctggaagt acgtgaacgg ggaatgggtg ccggggggca agccggagcc gcaggcgccc 360
agctgcgtct acatccaccc cgactcgccc aacttcgggg cccactggat gaaggctccc 420
gtctccttca gcaaagtcaa gctcaccaac aagctcaacg gagggggcca gatcatgctg 480
aactccttgc ataagtatga gcctcgaatc cacatagtga gagttggggg tccacagcgc 540
atgatcacca gccactgctt ccctgagacc cagttcatag cggtgactgc ttatcagaac 600
gaggagatca cagctcttaa aattaagtac aatccatttg caaaggcttt cttgatgca 660
aaggaaagaa gtgatcacia agagatgatg gaggaacccg gagacagcca gcaacctggg 720
tactcccaat gggggtggct tcttcctgga accagcaccg tttgtccacc tgcaaactct 780
catcctcagt ttggaggtgc cctctccctc ccctccacgc acagctgtga caggtaccca 840
accctgagga gccaccggtc ctaccctac ccagcccct atgctcatcg gaacaattct 900
ccaacctatt ctgacaactc acctgcatgt ttatccatgc tgcaatcca tgacaattgg 960
tccagccttg gaatgcctgc ccatcccagc atgctccccg tgagccacaa tgccagccca 1020

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tacgaagggg cggccgcggc cacagacatc gtggacagcc agtacgacgc cgcagcccaa	1260
ggccgcctca tagcctcatg gacacctgtg tcgccacctt ccatgtga	1308

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 <211> 1305
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding Brachyury protein Isoform 1 with L254V
 without 5' atg sequence

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agcgccgtgg agaatgagct gcaggcgggc agcgagaagg gcgacccac agagcgcgaa	120
ctgcgcgtgg gcctggagga gagcgagctg tggctgcgct tcaaggagct caccaatgag	180
atgatcgtga ccaagaacgg caggaggatg tttccggtgc tgaaggtgaa cgtgtctggc	240
ctggaccca acgccatgta ctcttctctg ctggacttcg tggcggcgga caaccaccgc	300
tggaagtacg tgaacgggga atgggtgccg gggggcaagc cggagccgca ggcgcccagc	360
tgcgtctaca tccacccga ctgcccacac ttcggggccc actggatgaa ggctcccgtc	420
tccttcagca aagtcaagct caccaacaag ctcaacggag ggggccagat catgctgaac	480
tccttgcata agtatgagcc tcgaatccac atagtgagag ttgggggtcc acagcgcattg	540
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tccaatggg ggtggcttct tcctggaacc agcaccgttt gtccacctgc aaatcctcat	780
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<210> 16

<211> 1323

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding fusion protein comprising Brachyury (L254V) Protein plus addition of 15 nucleotides from Gene FPV 088

<400> 16

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cgagtggacc	acctgctgag	cgccgtggag	aatgagctgc	aggcgggcag	cgagaagggc	120
gacccccacag	agcgcgaact	gcgcgtgggc	ctggaggaga	gcgagctgtg	gctgcgcttc	180
aaggagctca	ccaatgagat	gatcgtgacc	aagaacggca	ggaggatggt	tccggtgctg	240
aaggtgaacg	tgtctggcct	ggaccccaac	gccatgtact	ccttcctgct	ggacttcgtg	300
gcggcggaca	accaccgctg	gaagtacgtg	aacggggaat	gggtgccggg	gggcaagccg	360
gagccgcagg	cgcccagctg	cgtctacatc	caccccgact	cgcccaactt	cggggccac	420
tggatgaagg	ctcccgcttc	cttcagcaaa	gtcaagctca	ccaacaagct	caacggaggg	480
ggccagatca	tgctgaactc	cttgcataag	tatgagcctc	gaatccacat	agtgagagtt	540
gggggtccac	agcgcagatg	caccagccac	tgcttccttg	agaccagtt	catagcggtg	600
actgcttatc	agaacgagga	gatcacagct	cttaaaatta	agtacaatcc	atttgcaaag	660
gctttccttg	atgcaaagga	aagaagtgat	cacaaagaga	tgatggagga	acccggagac	720
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ccacctgcaa	atcctcatcc	tcagtttgga	ggtgccctct	ccctcccctc	cacgcacagc	840
tgtgacaggt	acccaaccct	gaggagccac	cggtcctcac	cctaccccag	cccctatgct	900
catcggaaca	attctccaac	ctattctgac	aactcacctg	catgtttatc	catgctgcaa	960

tcccatgaca attggtccag ccttggaaatg cctgcccata ccagcatgct ccccgtagagc	1020
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ggcgccgtca ccccgggctc ccaggcagca gccgtgtcca acgggctggg ggcccagttc	1140
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tcgggatccc cactgtacga aggggcggcc gcggccacag acatcgtgga cagccagtac	1260
gacgccgcag cccaaggccg cctcatagcc tcatggacac ctgtgtcgcc accttccatg	1320
tga	1323

<210> 17
 <211> 1320
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding fusion protein comprising Brachyury
 (L254V) Protein plus addition of 15 nucleotides from Gene FPV 088
 without Brachyury protein atg start codon

<400> 17	
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gtggaccacc tgctgagcgc cgtggagaat gagctgcagg cgggcagcga gaagggcgac	120
cccacagagc gcgaactgcg cgtgggcctg gaggagagcg agctgtggct gcgcttcaag	180
gagctcacca atgagatgat cgtgaccaag aacggcagga ggatgtttcc ggtgctgaag	240
gtgaacgtgt ctggcctgga cccaacgcc atgtactcct tcctgctgga cttcgtggcg	300
gcggacaacc accgctggaa gtacgtgaac ggggaatggg tgccgggggg caagccggag	360
ccgcaggcgc ccagctgcgt ctacatccac cccgactcgc ccaacttcgg ggcccactgg	420
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cagcaacctg ggtactccca atgggggtgg cttcttcctg gaaccagcac cgtttgtcca	780
cctgcaaata ctatcctca gtttggaggt gccctctccc tcccctccac gcacagctgt	840

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aatgccagcc cacctaccag ctccagtcag taccacagcc tgtggtctgt gagcaacggc 1080
gccgtcaccc cgggctccca ggcagcagcc gtgtccaacg ggctgggggc ccagttcttc 1140
cggggctccc ccgcgcacta cacaccctc acccatccgg tctcggcgcc ctcttcctcg 1200
ggatccccac tgtacgaagg ggcgcccgcg gccacagaca tcgtggacag ccagtagcac 1260
gccgcagccc aaggccgcct catagcctca tggacacctg tgtcgccacc ttccatgtga 1320

<210> 18
<211> 440
<212> PRT
<213> Artificial Sequence

<220>
<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
SEQ ID NO:16

<400> 18

Met Lys Asn Asn Leu Met Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys
1 5 10 15

Ser Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu
20 25 30

Leu Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg
35 40 45

Val Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr
50 55 60

Asn Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu
65 70 75 80

Lys Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu
85 90 95

Leu Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly

100					105					110					
Glu	Trp	Val	Pro	Gly	Gly	Lys	Pro	Glu	Pro	Gln	Ala	Pro	Ser	Cys	Val
		115					120					125			
Tyr	Ile	His	Pro	Asp	Ser	Pro	Asn	Phe	Gly	Ala	His	Trp	Met	Lys	Ala
	130					135					140				
Pro	Val	Ser	Phe	Ser	Lys	Val	Lys	Leu	Thr	Asn	Lys	Leu	Asn	Gly	Gly
145					150					155					160
Gly	Gln	Ile	Met	Leu	Asn	Ser	Leu	His	Lys	Tyr	Glu	Pro	Arg	Ile	His
				165					170					175	
Ile	Val	Arg	Val	Gly	Gly	Pro	Gln	Arg	Met	Ile	Thr	Ser	His	Cys	Phe
			180					185					190		
Pro	Glu	Thr	Gln	Phe	Ile	Ala	Val	Thr	Ala	Tyr	Gln	Asn	Glu	Glu	Ile
		195					200					205			
Thr	Ala	Leu	Lys	Ile	Lys	Tyr	Asn	Pro	Phe	Ala	Lys	Ala	Phe	Leu	Asp
	210					215					220				
Ala	Lys	Glu	Arg	Ser	Asp	His	Lys	Glu	Met	Met	Glu	Glu	Pro	Gly	Asp
225					230					235					240
Ser	Gln	Gln	Pro	Gly	Tyr	Ser	Gln	Trp	Gly	Trp	Leu	Leu	Pro	Gly	Thr
				245					250					255	
Ser	Thr	Val	Cys	Pro	Pro	Ala	Asn	Pro	His	Pro	Gln	Phe	Gly	Gly	Ala
			260					265					270		
Leu	Ser	Leu	Pro	Ser	Thr	His	Ser	Cys	Asp	Arg	Tyr	Pro	Thr	Leu	Arg
		275					280					285			
Ser	His	Arg	Ser	Ser	Pro	Tyr	Pro	Ser	Pro	Tyr	Ala	His	Arg	Asn	Asn
	290					295					300				
Ser	Pro	Thr	Tyr	Ser	Asp	Asn	Ser	Pro	Ala	Cys	Leu	Ser	Met	Leu	Gln
305					310					315					320

Ser His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met
325 330 335

Leu Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr
340 345 350

Pro Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln
355 360 365

Ala Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser
370 375 380

Pro Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser
385 390 395 400

Ser Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val
405 410 415

Asp Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp
420 425 430

Thr Pro Val Ser Pro Pro Ser Met
435 440

<210> 19
<211> 439
<212> PRT
<213> Artificial Sequence

<220>
<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
SEQ ID NO:17 plus addition of 15 nucleotides from Gene FPV 088
without Brachyury atg start codon.

<400> 19

Met Lys Asn Asn Leu Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser
1 5 10 15

Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu
20 25 30

Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val

35

40

45

Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn
 50 55 60

Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys
 65 70 75 80

Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu
 85 90 95

Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu
 100 105 110

Trp Val Pro Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr
 115 120 125

Ile His Pro Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro
 130 135 140

Val Ser Phe Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly
 145 150 155 160

Gln Ile Met Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile
 165 170 175

Val Arg Val Gly Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro
 180 185 190

Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr
 195 200 205

Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala
 210 215 220

Lys Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser
 225 230 235 240

Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser
 245 250 255

Thr Val Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu
260 265 270

Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser
275 280 285

His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser
290 295 300

Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser
305 310 315 320

His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu
325 330 335

Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro
340 345 350

Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala
355 360 365

Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro
370 375 380

Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser
385 390 395 400

Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Thr Asp Ile Val Asp
405 410 415

Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr
420 425 430

Pro Val Ser Pro Pro Ser Met
435

<210> 20

<211> 1353

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding fusion protein comprising Brachyury
(L254V) Protein plus addition of 45 nucleotides from Gene FPV 088

<400> 20

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atgaaaaata acttgatatga agaaaaaatg aacatgagta agaaaatgag ctcccctggc      60
accgagagcg cgggaaagag cctgcagtac cgagtggacc acctgctgag cgccgtggag      120
aatgagctgc aggcgggcag cgagaagggc gacccacag agcgcgaact gcgcgtgggc      180
ctggaggaga gcgagctgtg gctgcgcttc aaggagctca ccaatgagat gatcgtgacc      240
aagaacggca ggaggatggt tccggtgctg aaggtgaacg tgtctggcct ggaccccaac      300
gccatgtact ccttcctgct ggacttcgtg gcggcggaca accaccgctg gaagtacgtg      360
aacgggggaat ggggtgccggg gggcaagccg gagccgcagg cgcccagctg cgtctacatc      420
caccccgact cgcccaactt cggggcccac tggatgaagg ctcccgtctc cttcagcaaa      480
gtcaagctca ccaacaagct caacggaggg ggccagatca tgctgaactc cttgcataag      540
tatgagcctc gaatccacat agtgagagtt ggggggtccac agcgcgatgat caccagccac      600
tgcttccctg agaccagtt catagcggtg actgcttata agaacgagga gatcacagct      660
cttaaaatta agtacaatcc atttgcaaag gctttccttg atgcaaagga aagaagtgat      720
caciaagaga tgatggagga acccgagagc agccagcaac ctgggtactc ccaatggggg      780
tggtttcttc ctggaaccag caccgtttgt ccacctgcaa atcctcatcc tcagtttgga      840
ggtgccctct ccctcccctc cacgcacagc tgtgacaggt acccaaccct gaggagccac      900
cggtcctcac cctaccccag cccctatgct catcggaaca attctccaac ctattctgac      960
aactcacctg catgtttatc catgctgcaa tcccatgaca attggtccag ctttggaatg     1020
cctgcccata ccagcatgct ccccgtagac cacaatgcca gccacctac cagctccagt     1080
cagtaccca gcctgtggtc tgtgagcaac ggcgccgtca ccccgggctc ccaggcagca     1140
gccgtgtcca acgggctggg ggcccagttc ttccggggct ccccgcgca ctacacaccc     1200
ctcacccatc cgggtctggc gccctcttcc tcgggatccc cactgtacga aggggcggcc     1260
gcggccacag acatcgtgga cagccagtac gacgccgag cccaaggccg cctcatagcc     1320
tcatggacac ctgtgtcgcc accttccatg tga                                  1353
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<210> 21

<211> 1350

<212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding fusion protein comprising Brachyury
 (L254V) Protein plus addition of 45 nucleotides from Gene FPV 088
 without Brachyury atg

<400> 21

atgaaaaata acttgtatga agaaaaaatg aacatgagta agaaaagctc ccctggcacc	60
gagagcgcgg gaaagagcct gcagtaccga gtggaccacc tgctgagcgc cgtggagaat	120
gagctgcagg cgggcagcga gaagggcgac cccacagagc gcgaactgcg cgtgggcctg	180
gaggagagcg agctgtggct gcgcttcaag gagctcacca atgagatgat cgtgaccaag	240
aacggcagga ggatgtttcc ggtgctgaag gtgaacgtgt ctggcctgga cccaacgcc	300
atgtactcct tcctgctgga cttcgtggcg gcggacaacc accgctggaa gtacgtgaac	360
ggggaatggg tgccgggggg caagccggag ccgcaggcgc ccagctgcgt ctacatccac	420
cccgactcgc ccaacttcgg ggcccactgg atgaaggctc ccgtctcctt cagcaaagtc	480
aagctcacca acaagctcaa cggagggggc cagatcatgc tgaactcctt gcataagtat	540
gagcctcgaa tccacatagt gagagtggg ggtccacagc gcatgatcac cagccactgc	600
ttccctgaga cccagttcat agcggtgact gcttatcaga acgaggagat cacagctctt	660
aaaattaagt acaatccatt tgcaaaggct ttccttgatg caaaggaaag aagtgatcac	720
aaagagatga tggaggaacc cggagacagc cagcaacctg ggtactcca atgggggtgg	780
cttcttcctg gaaccagcac cgtttgtcca cctgcaaatc ctcatcctca gtttgagggt	840
gccctctccc tcccctccac gcacagctgt gacaggtacc caaccctgag gagccaccgg	900
tcctcaccct accccagccc ctatgctcat cggaacaatt ctccaaccta ttctgacaac	960
tcacctgcat gtttatccat gctgcaatcc catgacaatt ggtccagcct tggaatgcct	1020
gcccattcca gcatgctccc cgtgagccac aatgccagcc cacctaccag ctccagtcag	1080
tacccagcc tgtggtctgt gagcaacggc gccgtcacc cgggctcca ggcagcagcc	1140
gtgtccaacg ggctgggggc ccagttcttc cggggctccc ccgcgcacta cacaccctc	1200
acccatccgg tctcggcgcc ctcttcctcg ggatccccac tgtacgaagg ggcggccgcg	1260
gccacagaca tcgtggacag ccagtagcag gccgcagccc aaggccgcct catagcctca	1320
tggacacctg tgtcgccacc ttccatgtga	1350

<210> 22
 <211> 450
 <212> PRT
 <213> Artificial Sequence

 <220>
 <223> Fusion protein comprising Brachyury (L254V) Protein encoded by
 SEQ ID NO:20

<400> 22

Met Lys Asn Asn Leu Tyr Glu Glu Lys Met Asn Met Ser Lys Lys Met
 1 5 10 15

Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val
 20 25 30

Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu
 35 40 45

Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser
 50 55 60

Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr
 65 70 75 80

Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser Gly
 85 90 95

Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala
 100 105 110

Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly Gly
 115 120 125

Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp Ser
 130 135 140

Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser Lys
 145 150 155 160

Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu Asn

165

170

175

Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly Gly
 180 185 190

Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe Ile
 195 200 205

Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys
 210 215 220

Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp
 225 230 235 240

His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr
 245 250 255

Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Val Cys Pro Pro
 260 265 270

Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr
 275 280 285

His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser Pro
 290 295 300

Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser Asp
 305 310 315 320

Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp Ser
 325 330 335

Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His Asn
 340 345 350

Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val
 355 360 365

Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser Asn
 370 375 380

Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr Pro
 385 390 395 400

Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr
 405 410 415

Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala
 420 425 430

Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro
 435 440 445

Ser Met
 450

<210> 23
 <211> 449
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Fusion protein comprising Brachyury (L254V) Protein encoded by
 SEQ ID NO:21

<400> 23

Met Lys Asn Asn Leu Tyr Glu Glu Lys Met Asn Met Ser Lys Lys Ser
 1 5 10 15

Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val Asp
 20 25 30

His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu Lys
 35 40 45

Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser Glu
 50 55 60

Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr Lys
 65 70 75 80

Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser Gly Leu
 85 90 95

Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala Asp
100 105 110

Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly Gly Lys
115 120 125

Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp Ser Pro
130 135 140

Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser Lys Val
145 150 155 160

Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu Asn Ser
165 170 175

Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly Gly Pro
180 185 190

Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe Ile Ala
195 200 205

Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys Tyr
210 215 220

Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp His
225 230 235 240

Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr Ser
245 250 255

Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Val Cys Pro Pro Ala
260 265 270

Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr His
275 280 285

Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser Pro Tyr
290 295 300

Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser Asp Asn
 305 310 315 320

Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp Ser Ser
 325 330 335

Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His Asn Ala
 340 345 350

Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val Ser
 355 360 365

Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser Asn Gly
 370 375 380

Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr Pro Leu
 385 390 395 400

Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr Glu
 405 410 415

Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala Ala
 420 425 430

Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro Ser
 435 440 445

Met

<210> 24

<211> 1326

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding fusion protein comprising Brachyury
 (L254V) Protein plus addition of 18 nucleotides from Gene FPV 088

<400> 24

atgaacatga gtaagaaaat gagctcccct ggcaccgaga gcgcgggaaa ggcctgcag 60

taccgagtgg accacctgct gagcgccgtg gagaatgagc tgcaggcggg cagcgagaag 120

ggcgacccca cagagcgca actgcgcgtg ggcctggagg agagcgagct gtggctgcgc	180
ttcaaggagc tcaccaatga gatgatcgtg accaagaacg gcaggaggat gtttccggtg	240
ctgaaggtga acgtgtctgg cctggacccc aacgccatgt actccttcct gctggacttc	300
gtggcggcgg acaaccaccg ctggaagtac gtgaacgggg aatgggtgcc ggggggcaag	360
ccggagccgc aggcgcccag ctgcgtctac atccaccccg actcgcccaa cttcggggcc	420
cactggatga aggctcccg tctccttcagc aaagtcaagc tcaccaacaa gctcaacgga	480
ggggggccaga tcatgctgaa ctccttgcac aagtatgagc ctcgaatcca catagtgaga	540
gttgggggtc cacagcgcat gatcaccagc cactgcttcc ctgagacca gttcatagcg	600
gtgactgctt atcagaacga ggagatcaca gctcttaaaa ttaagtacaa tccatttgca	660
aaggctttcc ttgatgcaaa ggaaagaagt gatcacaag agatgatgga ggaaccgga	720
gacagccagc aacctgggta ctccaatgg gggtggcttc ttcctggaac cagcaccgtt	780
tgtccacctg caaatcctca tcctcagttt ggaggtgccc tctccctccc ctccacgcac	840
agctgtgaca ggtacccaac cctgaggagc caccggtcct caccctaccc cagcccctat	900
gctcatcgga acaattctcc aacctattct gacaactcac ctgcatgttt atccatgctg	960
caatcccatg acaattgggtc cagccttgga atgcctgccc atcccagcat gctccccgtg	1020
agccacaatg ccagcccacc taccagctcc agtcagtacc ccagcctgtg gtctgtgagc	1080
aacggcgccg tcaccccggtg ctcccaggca gcagccgtgt ccaacgggct gggggcccag	1140
ttcttccggg gctccccgc gcactacaca cccctcacc atccggtctc ggcgcctct	1200
tcctcgggat cccactgta cgaagggcg gccgcggcca cagacatcgt ggacagccag	1260
tacgacgccg cagcccaagg ccgcctcata gcctcatgga cacctgtgtc gccaccttcc	1320
atgtga	1326

<210> 25
 <211> 1323
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding fusion protein comprising Brachyury
 (L254V) Protein plus addition of 18 nucleotides from Gene FPV 088
 without Brachyury atg

<400> 25

atgaacatga gtaagaaaag ctcccctggc accgagagcg cgggaaagag cctgcagtac	60
cgagtggacc acctgctgag cgccgtggag aatgagctgc aggcgggcag cgagaagggc	120
gacccacacag agcgcgaact gcgcgtgggc ctggaggaga gcgagctgtg gctgcgcttc	180
aaggagctca ccaatgagat gatcgtgacc aagaacggca ggaggatgtt tccggtgctg	240
aaggtgaacg tgtctggcct ggacccaac gccatgtact ctttcctgct ggacttcgtg	300
gcggcggaca accaccgctg gaagtacgtg aacggggaat gggtgccggg gggcaagccg	360
gagccgcagg cgcccagctg cgtctacatc caccgact cgccaactt cggggccac	420
tgatgaagg ctcccgtctc cttcagcaaa gtcaagctca ccaacaagct caacggaggg	480
ggccagatca tgctgaactc cttgcataag tatgagcctc gaatccacat agtgagagtt	540
gggggtccac agcgcagatg caccagccac tgcttcctg agaccagtt catagcggtg	600
actgcttattc agaacgagga gatcacagct cttaaaatta agtacaatcc atttgcaaag	660
gctttccttg atgcaaagga aagaagtgat cacaagaga tgatggagga acccgagac	720
agccagcaac ctgggtactc ccaatggggg tggcttcttc ctggaaccag caccgtttgt	780
ccacctgcaa atcctcatcc tcagtttga ggtgccctct ccctcccctc cacgcacagc	840
tgtgacaggt acccaaccct gaggagccac cggtcctcac cctacccag cccctatgct	900
catcggaaca attctccaac ctattctgac aactcacctg catgtttatc catgctgcaa	960
tcccatgaca attggtccag ctttggaaatg cctgcccac cagcatgct ccccgtagc	1020
cacaatgcca gccacctac cagctccagt cagtaccca gcctgtggtc tgtgagcaac	1080
ggcgccgtca ccccgggctc ccaggcagca gccgtgtcca acgggctggg ggcccagttc	1140
ttccggggct ccccgcgca ctacacacc ctcacccatc cggctctcggc gccctcttcc	1200
tcgggatccc cactgtacga aggggcggcc gcggccacag acatcgtgga cagccagtac	1260
gacgccgcag cccaaggccg cctcatagcc tcatggacac ctgtgtcgcc accttccatg	1320
tga	1323

<210> 26

<211> 441

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury (L254V) Protein encoded by

SEQ ID NO:24

<400> 26

Met Asn Met Ser Lys Lys Met Ser Ser Pro Gly Thr Glu Ser Ala Gly
1 5 10 15

Lys Ser Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn
20 25 30

Glu Leu Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu
35 40 45

Arg Val Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu
50 55 60

Thr Asn Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val
65 70 75 80

Leu Lys Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe
85 90 95

Leu Leu Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn
100 105 110

Gly Glu Trp Val Pro Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys
115 120 125

Val Tyr Ile His Pro Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys
130 135 140

Ala Pro Val Ser Phe Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly
145 150 155 160

Gly Gly Gln Ile Met Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile
165 170 175

His Ile Val Arg Val Gly Gly Pro Gln Arg Met Ile Thr Ser His Cys
180 185 190

Phe Pro Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu
195 200 205

Ile Thr Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu
 210 215 220

Asp Ala Lys Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly
 225 230 235 240

Asp Ser Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly
 245 250 255

Thr Ser Thr Val Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly
 260 265 270

Ala Leu Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu
 275 280 285

Arg Ser His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn
 290 295 300

Asn Ser Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu
 305 310 315 320

Gln Ser His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser
 325 330 335

Met Leu Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln
 340 345 350

Tyr Pro Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser
 355 360 365

Gln Ala Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly
 370 375 380

Ser Pro Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser
 385 390 395 400

Ser Ser Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile
 405 410 415

Val Asp Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser
420 425 430

Trp Thr Pro Val Ser Pro Pro Ser Met
435 440

<210> 27
<211> 440
<212> PRT
<213> Artificial Sequence

<220>
<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
SEQ ID NO:25

<400> 27

Met Asn Met Ser Lys Lys Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys
1 5 10 15

Ser Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu
20 25 30

Leu Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg
35 40 45

Val Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr
50 55 60

Asn Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu
65 70 75 80

Lys Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu
85 90 95

Leu Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly
100 105 110

Glu Trp Val Pro Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val
115 120 125

Tyr Ile His Pro Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala
130 135 140

Pro Val Ser Phe Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly
 145 150 155 160

Gly Gln Ile Met Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His
 165 170 175

Ile Val Arg Val Gly Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe
 180 185 190

Pro Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile
 195 200 205

Thr Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp
 210 215 220

Ala Lys Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp
 225 230 235 240

Ser Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr
 245 250 255

Ser Thr Val Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala
 260 265 270

Leu Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg
 275 280 285

Ser His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn
 290 295 300

Ser Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln
 305 310 315 320

Ser His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met
 325 330 335

Leu Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr
 340 345 350

Pro Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln

355

360

365

Ala Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser
 370 375 380

Pro Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser
 385 390 395 400

Ser Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val
 405 410 415

Asp Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp
 420 425 430

Thr Pro Val Ser Pro Pro Ser Met
 435 440

<210> 28
 <211> 1320
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding Fusion protein comprising Brachyury
 (L254V) Protein plus addition of 12 nucleotides from Gene FPV 088

<400> 28
 atgagtaaga aaatgagctc ccctggcacc gagagcgagg gaaagagcct gcagtaccga 60
 gtggaccacc tgctgagcgc cgtggagaat gagctgcagg cgggcagcga gaagggcgac 120
 cccacagagc gcgaactgcg cgtgggcctg gaggagagcg agctgtggct gcgcttcaag 180
 gagctacca atgagatgat cgtgaccaag aacggcagga ggatgtttcc ggtgctgaag 240
 gtgaacgtgt ctggcctgga cccaacgcc atgtactcct tcctgctgga cttcgtggcg 300
 gcggacaacc accgctggaa gtacgtgaac ggggaatggg tgccgggggg caagccggag 360
 ccgcaggcgc ccagctgcgt ctacatccac cccgactcgc ccaacttcgg ggcccactgg 420
 atgaaggctc ccgtctcctt cagcaaagtc aagctcacca acaagctcaa cggagggggc 480
 cagatcatgc tgaactcctt gcataagtat gaggctcgaa tccacatagt gagagttggg 540
 ggtccacagc gcatgatcac cagccactgc ttccctgaga cccagttcat agcggtgact 600
 gcttatcaga acgaggagat cacagctctt aaaattaagt acaatccatt tgcaaaggct 660

ttccttgatg caaaggaaag aagtgatcac aaagagatga tggaggaacc cggagacagc	720
cagcaacctg ggtactccca atgggggtgg cttcttcctg gaaccagcac cgtttgtcca	780
cctgcaaadc ctcatcctca gtttggaggt gccctctccc tcccctccac gcacagctgt	840
gacaggtacc caaccctgag gagccaccgg tcctcacctt accccagccc ctatgctcat	900
cggaacaatt ctccaaccta ttctgacaac tcacctgcat gtttatccat gctgcaatcc	960
catgacaatt ggtccagcct tggaatgcct gcccatccca gcatgctccc cgtgagccac	1020
aatgccagcc cacctaccag ctccagtcag taccacagcc tgttgtctgt gagcaacggc	1080
gccgtcacc cgggctccca ggcagcagcc gtgtccaacg ggctgggggc ccagttcttc	1140
cggggctccc ccgcgcacta cacaccctc acccatccgg tctcggcgcc ctcttcctcg	1200
ggatccccac tgtacgaagg ggcggccgcg gccacagaca tcgtggacag ccagtacgac	1260
gccgcagccc aaggccgcct catagcctca tggacacctg tgtcgccacc ttccatgtga	1320

<210> 29

<211> 1317

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding Fusion protein comprising Brachyury (L254V) Protein plus addition of 12 nucleotides from Gene FPV 088 without Brachyury atg start codon

<400> 29

atgagtaaga aaagctcccc tggcaccgag agcgcgggaa agagcctgca gtaccgagtg	60
gaccacctgc tgagcgccgt ggagaatgag ctgcaggcgg gcagcgagaa gggcgacccc	120
acagagcgcg aactgcgcgt gggcctggag gagagcgagc tgtggctgcg cttcaaggag	180
ctcaccaatg agatgatcgt gaccaagaac ggcaggagga tgtttccggt gctgaagggtg	240
aacgtgtctg gcctggaccc caacgccatg tactccttcc tgctggactt cgtggcggcg	300
gacaaccacc gctggaagta cgtgaacggg gaatgggtgc cggggggcaa gccggagccg	360
caggcgccca gctgctgcta catccacccc gactcgccca acttcggggc cactggatg	420
aaggctcccc tctccttcag caaagtcaag ctaccaaca agctcaacgg agggggccag	480
atcatgctga actccttgca taagtatgag cctcgaatcc acatagtgag agttgggggt	540
ccacagcgca tgatcaccag ccactgcttc cctgagaccc agttcatagc ggtgactgct	600

tatcagaacg aggagatcac agctcttaaa attaagtaca atccatttgc aaaggctttc	660
cttgatgcaa aggaaagaag tgatcacaaa gagatgatgg aggaaccgg agacagccag	720
caacctgggt actccaatg ggggtggctt cttcctggaa ccagcaccgt ttgtccacct	780
gcaaatacctc atcctcagtt tggaggtgcc ctctccctcc cctccacgca cagctgtgac	840
aggtacccaa ccctgaggag ccaccgggtcc tcaccctacc ccagccccta tgctcatcgg	900
aacaattctc caacctattc tgacaactca cctgcatggt tatccatgct gcaatcccat	960
gacaattggt ccagccttgg aatgcctgcc catcccagca tgctccccgt gagccacaat	1020
gccagcccac ctaccagctc cagtcagtac cccagcctgt ggtctgtgag caacggcgcc	1080
gtcaccccg gctcccaggc agcagccgtg tccaacgggc tgggggcca gttcttcgg	1140
ggctcccccg cgcactacac acccctcacc catccggtct cggcgccctc ttcctcgga	1200
tccccactgt acgaaggggc ggccgcggcc acagacatcg tggacagcca gtacgacgcc	1260
gcagcccaag gccgcctcat agcctcatgg acacctgtgt cgccaccttc catgtga	1317

<210> 30

<211> 439

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
SEQ ID NO:28

<400> 30

Met	Ser	Lys	Lys	Met	Ser	Ser	Pro	Gly	Thr	Glu	Ser	Ala	Gly	Lys	Ser
1				5					10					15	

Leu	Gln	Tyr	Arg	Val	Asp	His	Leu	Leu	Ser	Ala	Val	Glu	Asn	Glu	Leu
			20					25					30		

Gln	Ala	Gly	Ser	Glu	Lys	Gly	Asp	Pro	Thr	Glu	Arg	Glu	Leu	Arg	Val
		35					40					45			

Gly	Leu	Glu	Glu	Ser	Glu	Leu	Trp	Leu	Arg	Phe	Lys	Glu	Leu	Thr	Asn
	50					55					60				

Glu	Met	Ile	Val	Thr	Lys	Asn	Gly	Arg	Arg	Met	Phe	Pro	Val	Leu	Lys
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

65				70				75				80				
Val	Asn	Val	Ser	Gly	Leu	Asp	Pro	Asn	Ala	Met	Tyr	Ser	Phe	Leu	Leu	
				85					90					95		
Asp	Phe	Val	Ala	Ala	Asp	Asn	His	Arg	Trp	Lys	Tyr	Val	Asn	Gly	Glu	
				100					105					110		
Trp	Val	Pro	Gly	Gly	Lys	Pro	Glu	Pro	Gln	Ala	Pro	Ser	Cys	Val	Tyr	
				115					120					125		
Ile	His	Pro	Asp	Ser	Pro	Asn	Phe	Gly	Ala	His	Trp	Met	Lys	Ala	Pro	
				130					135					140		
Val	Ser	Phe	Ser	Lys	Val	Lys	Leu	Thr	Asn	Lys	Leu	Asn	Gly	Gly	Gly	
				145					150					155		
Gln	Ile	Met	Leu	Asn	Ser	Leu	His	Lys	Tyr	Glu	Pro	Arg	Ile	His	Ile	
				165					170					175		
Val	Arg	Val	Gly	Gly	Pro	Gln	Arg	Met	Ile	Thr	Ser	His	Cys	Phe	Pro	
				180					185					190		
Glu	Thr	Gln	Phe	Ile	Ala	Val	Thr	Ala	Tyr	Gln	Asn	Glu	Glu	Ile	Thr	
				195					200					205		
Ala	Leu	Lys	Ile	Lys	Tyr	Asn	Pro	Phe	Ala	Lys	Ala	Phe	Leu	Asp	Ala	
				210					215					220		
Lys	Glu	Arg	Ser	Asp	His	Lys	Glu	Met	Met	Glu	Glu	Pro	Gly	Asp	Ser	
				225					230					235		
Gln	Gln	Pro	Gly	Tyr	Ser	Gln	Trp	Gly	Trp	Leu	Leu	Pro	Gly	Thr	Ser	
				245					250					255		
Thr	Val	Cys	Pro	Pro	Ala	Asn	Pro	His	Pro	Gln	Phe	Gly	Gly	Ala	Leu	
				260					265					270		
Ser	Leu	Pro	Ser	Thr	His	Ser	Cys	Asp	Arg	Tyr	Pro	Thr	Leu	Arg	Ser	
				275					280					285		

Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu
85 90 95

Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu
100 105 110

Trp Val Pro Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr
115 120 125

Ile His Pro Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro
130 135 140

Val Ser Phe Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly
145 150 155 160

Gln Ile Met Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile
165 170 175

Val	Arg	Val	Gly	Gly	Pro	Gln	Arg	Met	Ile	Thr	Ser	His	Cys	Phe	Pro
			180					185					190		

Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr
195 200 205

Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala
210 215 220

Lys Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser
225 230 235 240

Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser
245 250 255

Thr Val Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu
260 265 270

Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser
275 280 285

His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser
 290 295 300

Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser
 305 310 315 320

His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu
 325 330 335

Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro
 340 345 350

Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala
 355 360 365

Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro
 370 375 380

Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser
 385 390 395 400

Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp
 405 410 415

Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr
 420 425 430

Pro Val Ser Pro Pro Ser Met
 435

<210> 31
 <211> 438
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Fusion protein comprising Brachyury (L254V) Protein encoded by
 SEQ ID NO:29

<400> 31

Met Ser Lys Lys Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu
 1 5 10 15

Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln
20 25 30

Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly
35 40 45

Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu
50 55 60

Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val
65 70 75 80

Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp
85 90 95

Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp
100 105 110

Val Pro Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile
115 120 125

His Pro Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val
130 135 140

Ser Phe Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln
145 150 155 160

Ile Met Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val
165 170 175

Arg Val Gly Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu
180 185 190

Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala
195 200 205

Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys
210 215 220

Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln
 225 230 235 240

Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr
 245 250 255

Val Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser
 260 265 270

Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His
 275 280 285

Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro
 290 295 300

Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His
 305 310 315 320

Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro
 325 330 335

Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser
 340 345 350

Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala
 355 360 365

Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala
 370 375 380

His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly
 385 390 395 400

Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser
 405 410 415

Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro
 420 425 430

Val Ser Pro Pro Ser Met
 435

<210> 32
 <211> 1386
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding Fusion protein comprising Brachyury
 (L254V) Protein plus addition of 75 nucleotides from Gene FPV 088
 and an atc

<400> 32
 atgaaaaata acttgtatga agaaaaaatg aacatgagta agaaacaagt aaaaactcaa 60
 agtaaatgta ataatatcat gagctcccct ggcaccgaga gcgcgggaaa gagcctgcag 120
 taccgagtgg accacctgct gagcgccgtg gagaatgagc tgcaggcggg cagcgagaag 180
 ggcgaccca cagagcgca actgcgcgtg ggcctggagg agagcgagct gtggctgcgc 240
 ttcaaggagc tcaccaatga gatgatcgtg accaagaacg gcaggaggat gtttccggtg 300
 ctgaaggatga acgtgtctgg cctggacccc aacgccatgt actccttcct gctggacttc 360
 gtggcggcgg acaaccaccg ctggaagtac gtgaacgggg aatgggtgcc ggggggcaag 420
 ccggagccgc aggcgcccag ctgcgtctac atccaccccg actcgcccaa cttcggggcc 480
 cactggatga aggctcccgt ctccttcagc aaagtcaagc tcaccaacaa gctcaacgga 540
 gggggccaga tcatgctgaa ctccttgcac aagtatgagc ctcgaatcca catagtgaga 600
 gttgggggtc cacagcgcat gatcaccagc cactgcttcc ctgagacca gttcatagcg 660
 gtgactgctt atcagaacga ggagatcaca gctcttaaaa ttaagtacaa tccatttgca 720
 aaggctttcc ttgatgcaaa ggaaagaagt gatcacaag agatgatgga ggaaccgga 780
 gacagccagc aacctgggta ctccaatgg ggggtggcttc ttcctggaac cagcaccgtt 840
 tgtccacctg caaatcctca tcctcagttt ggaggtgccc tctccctccc ctccacgcac 900
 agctgtgaca ggtacccaac cctgaggagc caccggtcct caccctaccc cagcccctat 960
 gctcatcgga acaattctcc aacctattct gacaactcac ctgcatgttt atccatgctg 1020
 caatcccatg acaattggct cagccttgga atgcctgccc atcccagcat gctccccgtg 1080
 agccacaatg ccagcccacc taccagctcc agtcagtacc ccagcctgtg gtctgtgagc 1140
 aacggcgccg tcaccccggt ctcccaggca gcagccgtgt ccaacgggct gggggcccag 1200
 ttcttccggg gctccccgc gcactacaca cccctcacc atccggtctc ggcgccctct 1260

tcctcgggat cccactgta cgaaggggcg gccgcggcca cagacatcgt ggacagccag	1320
tacgacgccg cagcccaagg ccgcctcata gcctcatgga cacctgtgtc gccaccttcc	1380
atgtga	1386

<210> 33
 <211> 1383
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding Fusion protein comprising Brachyury
 (L254V) Protein plus addition of 75 nucleotides from Gene FPV 088
 and an atc, without Brachyury atg start codon

<400> 33	
atgaaaaata acttgatatga agaaaaaatg aacatgagta agaaacaagt aaaaactcaa	60
agtaaatgta ataatatcag ctcccctggc accgagagcg cgggaaagag cctgcagtac	120
cgagtggacc acctgctgag cgccgtggag aatgagctgc aggcgggcag cgagaagggc	180
gacccacag agcgcgaact gcgcgtgggc ctggaggaga gcgagctgtg gctgcgcttc	240
aaggagctca ccaatgagat gatcgtgacc aagaacggca ggaggatgtt tccggtgctg	300
aaggtgaacg tgtctggcct ggacccaac gccatgtact ctttctgct ggacttcgtg	360
gcggcggaca accaccgctg gaagtacgtg aacggggaat gggtgccggg gggcaagccg	420
gagccgcagg cgcccagctg cgtctacatc caccgact cgcccaactt cggggcccac	480
tggatgaagg ctccgtctc cttcagcaaa gtcaagctca ccaacaagct caacggaggg	540
ggccagatca tgctgaactc cttgcataag tatgagcctc gaatccacat agtgagagtt	600
gggggtccac agcgcagatg caccagccac tgcttcctg agaccagtt catagcgggtg	660
actgcttatc agaacgagga gatcacagct cttaaaatta agtacaatcc atttgcaaag	720
gctttccttg atgcaaagga aagaagtgat cacaagaga tgatggagga acccgagac	780
agccagcaac ctgggtactc ccaatggggg tggcttcttc ctggaaccag caccgtttgt	840
ccacctgcaa atcctcatcc tcagtttgga ggtgccctct ccctccctc cagcacagc	900
tgtgacaggt acccaaccct gaggagccac cggtcctcac cctacccag cccctatgct	960
catcggaaca attctccaac ctattctgac aactcacctg catgtttatc catgctgcaa	1020
tcccatgaca attggtccag ccttggaaatg cctgcccac ccagcatgct cccgtgagc	1080

cacaatgccacacccacctac cagctccagt cagtacccca gcctgtggtc tgtgagcaac 1140
ggcgccgtca ccccgggctc ccaggcagca gccgtgtcca acgggctggg ggcccagttc 1200
ttccggggct ccccgcgca ctacacacc ctcaccatc cggctctggc gccctcttcc 1260
tcgggatccc cactgtacga aggggcggcc gcggccacag acatcgtgga cagccagtac 1320
gacgccgag cccaaggccg cctcatagcc tcatggacac ctgtgtcgcc accttccatg 1380
tga 1383

<210> 34
<211> 461
<212> PRT
<213> Artificial Sequence

<220>
<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
SEQ ID NO: 32

<400> 34

Met Lys Asn Asn Leu Tyr Glu Glu Lys Met Asn Met Ser Lys Lys Gln
1 5 10 15

Val Lys Thr Gln Ser Lys Cys Asn Asn Ile Met Ser Ser Pro Gly Thr
20 25 30

Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val Asp His Leu Leu Ser
35 40 45

Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr
50 55 60

Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg
65 70 75 80

Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr Lys Asn Gly Arg Arg
85 90 95

Met Phe Pro Val Leu Lys Val Asn Val Ser Gly Leu Asp Pro Asn Ala
100 105 110

Met Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala Asp Asn His Arg Trp

115		120		125
Lys Tyr Val Asn Gly Glu Trp Val Pro Gly Gly Lys Pro Glu Pro Gln				
130		135		140
Ala Pro Ser Cys Val Tyr Ile His Pro Asp Ser Pro Asn Phe Gly Ala				
145		150		155
				160
His Trp Met Lys Ala Pro Val Ser Phe Ser Lys Val Lys Leu Thr Asn				
		165		170
				175
Lys Leu Asn Gly Gly Gly Gln Ile Met Leu Asn Ser Leu His Lys Tyr				
		180		185
				190
Glu Pro Arg Ile His Ile Val Arg Val Gly Gly Pro Gln Arg Met Ile				
		195		200
				205
Thr Ser His Cys Phe Pro Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr				
		210		215
				220
Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala				
225		230		235
				240
Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp His Lys Glu Met Met				
		245		250
				255
Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp				
		260		265
				270
Leu Leu Pro Gly Thr Ser Thr Val Cys Pro Pro Ala Asn Pro His Pro				
		275		280
				285
Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr His Ser Cys Asp Arg				
		290		295
				300
Tyr Pro Thr Leu Arg Ser His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr				
305		310		315
				320
Ala His Arg Asn Asn Ser Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys				
		325		330
				335

Leu Ser Met Leu Gln Ser His Asp Asn Trp Ser Ser Leu Gly Met Pro
340 345 350

Ala His Pro Ser Met Leu Pro Val Ser His Asn Ala Ser Pro Pro Thr
355 360 365

Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val Ser Asn Gly Ala Val
370 375 380

Thr Pro Gly Ser Gln Ala Ala Ala Val Ser Asn Gly Leu Gly Ala Gln
385 390 395 400

Phe Phe Arg Gly Ser Pro Ala His Tyr Thr Pro Leu Thr His Pro Val
405 410 415

Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala
420 425 430

Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg
435 440 445

Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro Ser Met
450 455 460

<210> 35
<211> 460
<212> PRT
<213> Artificial Sequence

<220>
<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
SEQ ID NO: 33

<400> 35

Met Lys Asn Asn Leu Tyr Glu Glu Lys Met Asn Met Ser Lys Lys Gln
1 5 10 15

Val Lys Thr Gln Ser Lys Cys Asn Asn Ile Ser Ser Pro Gly Thr Glu
20 25 30

Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala
35 40 45

Val Glu Asn Glu Leu Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu
50 55 60

Arg Glu Leu Arg Val Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe
65 70 75 80

Lys Glu Leu Thr Asn Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met
85 90 95

Phe Pro Val Leu Lys Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met
100 105 110

Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys
115 120 125

Tyr Val Asn Gly Glu Trp Val Pro Gly Gly Lys Pro Glu Pro Gln Ala
130 135 140

Pro Ser Cys Val Tyr Ile His Pro Asp Ser Pro Asn Phe Gly Ala His
145 150 155 160

Trp Met Lys Ala Pro Val Ser Phe Ser Lys Val Lys Leu Thr Asn Lys
165 170 175

Leu Asn Gly Gly Gly Gln Ile Met Leu Asn Ser Leu His Lys Tyr Glu
180 185 190

Pro Arg Ile His Ile Val Arg Val Gly Gly Pro Gln Arg Met Ile Thr
195 200 205

Ser His Cys Phe Pro Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln
210 215 220

Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys
225 230 235 240

Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp His Lys Glu Met Met Glu
245 250 255

Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu
260 265 270

Leu Pro Gly Thr Ser Thr Val Cys Pro Pro Ala Asn Pro His Pro Gln
275 280 285

Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr
290 295 300

Pro Thr Leu Arg Ser His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala
305 310 315 320

His Arg Asn Asn Ser Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu
325 330 335

Ser Met Leu Gln Ser His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala
340 345 350

His Pro Ser Met Leu Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser
355 360 365

Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr
370 375 380

Pro Gly Ser Gln Ala Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe
385 390 395 400

Phe Arg Gly Ser Pro Ala His Tyr Thr Pro Leu Thr His Pro Val Ser
405 410 415

Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala
420 425 430

Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu
435 440 445

Ile Ala Ser Trp Thr Pro Val Ser Pro Pro Ser Met
450 455 460

<210> 36
<211> 1359

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding Fusion protein comprising Brachyury (L254V) Protein plus addition of 48 nucleotides from Gene FPV 088 and an atc

<400> 36

atgaacatga gtaagaaaca agtaaaaact caaagtaaata gtaataatat catgagctcc	60
cctggcaccg agagcgcggg aaagagcctg cagtaccgag tggaccacct gctgagcgcc	120
gtggagaatg agctgcaggc gggcagcgag aagggcgacc ccacagagcg cgaactgcgc	180
gtgggccttg aggagagcga gctgtggctg cgcttcaagg agctcaccaa tgagatgac	240
gtgaccaaga acggcaggag gatgtttccg gtgctgaagg tgaacgtgtc tggcctggac	300
cccaacgcca tgtactcctt cctgctggac ttcgtggcgg cggacaacca ccgctggaag	360
tacgtgaacg gggaatgggt gccggggggc aagccggagc cgcaggcgcc cagctgcgtc	420
tacatccacc ccgactcgcc caacttcggg gccactgga tgaaggctcc cgtctccttc	480
agcaaagtca agctcaccaa caagctcaac ggagggggcc agatcatgct gaactccttg	540
cataagtatg agcctcgaat ccacatagtg agagttgggg gtccacagcg catgatcacc	600
agccactgct tccctgagac ccagttcata gcggtgactg cttatcagaa cgaggagatc	660
acagctctta aaattaagta caatccattt gcaaaggctt tccttgatgc aaaggaaaga	720
agtgatcaca aagagatgat ggaggaaccc ggagacagcc agcaacctgg gtactcccaa	780
tgggggtggc ttcttccttg aaccagcacc gtttgtccac ctgcaaatcc tcatcctcag	840
tttggaggtg ccctctccct cccctccacg cacagctgtg acaggtaccc aaccctgagg	900
agccaccggt cctcacccta cccagcccc tatgctcatc ggaacaattc tccaacctat	960
tctgacaact cacctgcatg tttatccatg ctgcaatccc atgacaattg gtccagcctt	1020
ggaatgcctg cccatcccag catgctcccc gtgagccaca atgccagccc acctaccagc	1080
tccagtcagt accccagcct gtggtctgtg agcaacggcg ccgtcacccc gggctcccag	1140
gcagcagccg tgtccaacgg gctggggggc cagttcttcc ggggctcccc cgcgcactac	1200
acacccctca cccatccggt ctcggcgccc tcttcctcgg gatccccact gtacgaaggg	1260
gcggccgcgg ccacagacat cgtggacagc cagtacgacg ccgcagccca aggccgcctc	1320
atagcctcat ggacacctgt gtcgccacct tccatgtga	1359

<210> 37
 <211> 1356
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding Fusion protein comprising Brachyury (L254V) Protein plus addition of 48 nucleotides from Gene FPV 088 and an atc, without Brachyury atg start codon

<400> 37
 atgaacatga gtaagaaaca agtaaaaact caaagtaa atgtaataat cagctcccct 60
 ggacaccgaga gcgcgggaaa gaggcctgcag taccgagtgg accacctgct gagcgccgtg 120
 gagaatgagc tgcaggcggg cagcgagaag ggcgacccca cagagcgcgga actgcgcgtg 180
 ggcttgagg agagcgagct gtggctgcgc ttcaaggagc tcaccaatga gatgatcgtg 240
 accaagaacg gcaggaggat gtttccggtg ctgaaggatga acgtgtcttg cctggacccc 300
 aacgccatgt actccttcct gctggacttc gtggcggcgg acaaccaccg ctggaagtac 360
 gtgaacgggg aatgggtgcc ggggggcaag ccggagccgc aggcgcccag ctgcgtctac 420
 atccaccccg actcgcccaa cttcggggcc cactggatga aggctcccgt ctccttcagc 480
 aaagtcaagc tcaccaacaa gctcaacgga gggggccaga tcatgctgaa ctccttgcat 540
 aagtatgagc ctcgaatcca catagtgaga gttgggggtc cacagcgcat gatcaccagc 600
 cactgcttcc ctgagaccca gttcatagcg gtgactgctt atcagaacga ggagatcaca 660
 gctcttaaaa ttaagtacaa tccatttgca aaggctttcc ttgatgcaaa ggaaagaagt 720
 gatcacaaaag agatgatgga ggaacccgga gacagccagc aacctgggta ctcccaatgg 780
 ggggtggcttc ttcctggaac cagcaccgtt tgtccacctg caaatcctca tcctcagttt 840
 ggaggtgccc tctccctccc ctccacgcac agctgtgaca ggtacccaac cctgaggagc 900
 caccggtcct caccctaccc cagcccctat gtcctcggga acaattctcc aacctattct 960
 gacaactcac ctgcatgttt atccatgctg caatcccatg acaattggtc cagccttgga 1020
 atgcctgccc atcccagcat gctccccgtg agccacaatg ccagcccacc taccagctcc 1080
 agtcagtacc ccagcctgtg gtctgtgagc aacggcgccg tcacccggg ctcccaggca 1140
 gcagccgtgt ccaacgggct gggggcccag ttcttcggg gctccccgc gcactacaca 1200
 cccctcacc atccggtctc ggcgccctct tcctcgggat cccactgta cgaaggggcg 1260

gccgcggcca cagacatcgt ggacagccag tacgacgccg cagcccaagg ccgcctcata 1320
gcctcatgga cacctgtgtc gccaccttcc atgtga 1356

<210> 38
<211> 452
<212> PRT
<213> Artificial Sequence

<220>
<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
SEQ ID NO:36

<400> 38

Met Asn Met Ser Lys Lys Gln Val Lys Thr Gln Ser Lys Cys Asn Asn
1 5 10 15

Ile Met Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr
20 25 30

Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly
35 40 45

Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu
50 55 60

Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile
65 70 75 80

Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val
85 90 95

Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val
100 105 110

Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro
115 120 125

Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro
130 135 140

Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe

145		150		155		160									
Ser	Lys	Val	Lys	Leu	Thr	Asn	Lys	Leu	Asn	Gly	Gly	Gly	Gln	Ile	Met
				165					170					175	
Leu	Asn	Ser	Leu	His	Lys	Tyr	Glu	Pro	Arg	Ile	His	Ile	Val	Arg	Val
			180					185					190		
Gly	Gly	Pro	Gln	Arg	Met	Ile	Thr	Ser	His	Cys	Phe	Pro	Glu	Thr	Gln
		195					200					205			
Phe	Ile	Ala	Val	Thr	Ala	Tyr	Gln	Asn	Glu	Glu	Ile	Thr	Ala	Leu	Lys
	210					215					220				
Ile	Lys	Tyr	Asn	Pro	Phe	Ala	Lys	Ala	Phe	Leu	Asp	Ala	Lys	Glu	Arg
225					230					235					240
Ser	Asp	His	Lys	Glu	Met	Met	Glu	Glu	Pro	Gly	Asp	Ser	Gln	Gln	Pro
				245					250					255	
Gly	Tyr	Ser	Gln	Trp	Gly	Trp	Leu	Leu	Pro	Gly	Thr	Ser	Thr	Val	Cys
			260					265						270	
Pro	Pro	Ala	Asn	Pro	His	Pro	Gln	Phe	Gly	Gly	Ala	Leu	Ser	Leu	Pro
		275					280					285			
Ser	Thr	His	Ser	Cys	Asp	Arg	Tyr	Pro	Thr	Leu	Arg	Ser	His	Arg	Ser
	290					295					300				
Ser	Pro	Tyr	Pro	Ser	Pro	Tyr	Ala	His	Arg	Asn	Asn	Ser	Pro	Thr	Tyr
305					310					315					320
Ser	Asp	Asn	Ser	Pro	Ala	Cys	Leu	Ser	Met	Leu	Gln	Ser	His	Asp	Asn
				325					330					335	
Trp	Ser	Ser	Leu	Gly	Met	Pro	Ala	His	Pro	Ser	Met	Leu	Pro	Val	Ser
			340					345					350		
His	Asn	Ala	Ser	Pro	Pro	Thr	Ser	Ser	Ser	Gln	Tyr	Pro	Ser	Leu	Trp
		355					360					365			

Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val
 370 375 380

Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr
 385 390 395 400

Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro
 405 410 415

Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr
 420 425 430

Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser
 435 440 445

Pro Pro Ser Met
 450

<210> 39

<211> 451

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
 SEQ ID NO:37

<400> 39

Met Asn Met Ser Lys Lys Gln Val Lys Thr Gln Ser Lys Cys Asn Asn
 1 5 10 15

Ile Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg
 20 25 30

Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser
 35 40 45

Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu
 50 55 60

Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val
 65 70 75 80

Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser
85 90 95

Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala
100 105 110

Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly
115 120 125

Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp
130 135 140

Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser
145 150 155 160

Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu
165 170 175

Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly
180 185 190

Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe
195 200 205

Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile
210 215 220

Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser
225 230 235 240

Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly
245 250 255

Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Val Cys Pro
260 265 270

Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser
275 280 285

Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser
290 295 300

Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser
305 310 315 320

Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp
325 330 335

Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His
340 345 350

Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser
355 360 365

Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser
370 375 380

Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr
385 390 395 400

Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu
405 410 415

Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp
420 425 430

Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro
435 440 445

Pro Ser Met
450

<210> 40
<211> 1353
<212> DNA
<213> Artificial Sequence

<220>
<223> Coding sequence encoding Fusion protein comprising Brachyury
(L254V) Protein plus addition of 42 nucleotides from Gene FPV 088
and an atc

<400> 40
atgagtaaga aacaagtaaa aactcaaagt aaatgtaata atatcatgag ctcccctggc 60
accgagagcg cgggaaagag cctgcagtac cgagtggacc acctgctgag cgccgtggag 120
aatgagctgc aggcgggcag cgagaagggc gacccacag agcgcgaact gcgcgtgggc 180
ctggaggaga gcgagctgtg gctgcgcttc aaggagctca ccaatgagat gatcgtgacc 240
aagaacggca ggaggatgtt tccggtgctg aaggtgaacg tgtctggcct ggaccccaac 300
gccatgtact ctttcctgct ggacttcgtg gcggcggaca accaccgctg gaagtacgtg 360
aacggggaat ggggtgccggg gggcaagccg gagccgcagg cgcccagctg cgtctacatc 420
caccccgact cgcccaactt cggggcccac tggatgaagg ctcccgtctc cttcagcaaa 480
gtcaagctca ccaacaagct caacggaggg ggccagatca tgctgaactc cttgcataag 540
tatgagcctc gaatccacat agtgagagtt gggggtccac agcgcgatgat caccagccac 600
tgcttccctg agaccagtt catagcggtg actgcttata agaacgagga gatcacagct 660
cttaaaatta agtacaatcc atttgcaaag gctttccttg atgcaaagga aagaagtgat 720
caciaagaga tgatggagga acccggagac agccagcaac ctgggtactc ccaatggggg 780
tggtttcttc ctggaaccag caccgtttgt ccacctgcaa atcctcatcc tcagtttgga 840
ggtgccctct ccctcccctc cacgcacagc tgtgacaggt acccaaccct gaggagccac 900
cggtcctcac cctaccccag cccctatgct catcggaaca attctccaac ctattctgac 960
aactcacctg catgtttatc catgctgcaa tcccatgaca attggtccag ctttggaatg 1020
cctgcccata ccagcatgct ccccgtagac cacaatgcca gccacctac cagctccagt 1080
cagtaccca gcctgtggtc tgtgagcaac ggcgccgtca ccccgggctc ccaggcagca 1140
gccgtgtcca acgggctggg ggcccagttc ttccggggct ccccgcgca ctacacaccc 1200
ctcaccatac cggctctggc gccctcttcc tcgggatccc cactgtacga aggggcggcc 1260
gcggccacag acatcgtgga cagccagtac gacgccgag cccaaggccg cctcatagcc 1320
tcatggacac ctgtgtcgcc accttccatg tga 1353

<210> 41
<211> 1350
<212> DNA
<213> Artificial Sequence

<220>

<223> Coding sequence encoding Fusion protein comprising Brachyury (L254V) Protein plus addition of 42 nucleotides from Gene FPV 088 and an atc, without Brachyury atg start codon

<400> 41

atgagtaaga aacaagtaaa aactcaaagt aaatgtaata atatcagctc ccctggcacc	60
gagagcgcgg gaaagagcct gcagtaccga gtggaccacc tgctgagcgc cgtggagaat	120
gagctgcagg cgggcagcga gaagggcgac cccacagagc gcgaactgcg cgtgggcctg	180
gaggagagcg agctgtggct gcgcttcaag gagctcacca atgagatgat cgtgaccaag	240
aacggcagga ggatgtttcc ggtgctgaag gtgaacgtgt ctggcctgga cccaacgcc	300
atgtactcct tcctgctgga cttcgtggcg gcggacaacc accgctggaa gtacgtgaac	360
ggggaatggg tgccgggggg caagccggag ccgcaggcgc ccagctgcgt ctacatccac	420
cccgactcgc ccaacttcgg ggcccactgg atgaaggctc ccgtctcctt cagcaaagtc	480
aagctcacca acaagctcaa cggagggggc cagatcatgc tgaactcctt gcataagtat	540
gagcctcgaa tccacatagt gagagttagg ggtccacagc gcatgatcac cagccactgc	600
ttccctgaga ccagttcat agcgggtgact gcttatcaga acgaggagat cacagctctt	660
aaaattaagt acaatccatt tgcaaaggct ttccttgatg caaaggaaag aagtgatcac	720
aaagagatga tggaggaacc cggagacagc cagcaacctg ggtactcca atgggggtgg	780
cttcttcctg gaaccagcac cgtttgtcca cctgcaaatc ctcacctca gtttggaggt	840
gccctctccc tcccctccac gcacagctgt gacaggtacc caaccctgag gagccaccgg	900
tcctcacct accccagccc ctatgctcat cggaacaatt ctccaaccta ttctgacaac	960
tcacctgcat gtttatccat gctgcaatcc catgacaatt ggtccagcct tggaatgcct	1020
gcccattcca gcatgctccc cgtgagccac aatgccagcc cacctaccag ctccagtcag	1080
taccccagcc tgttgtctgt gagcaacggc gccgtcacc cgggctcca ggcagcagcc	1140
gtgtccaacg ggctgggggc ccagttcttc cggggctccc ccgcgcacta cacaccctc	1200
acccatccgg tctcggcgcc ctcttcctcg ggatccccac tgtacgaagg ggcggccgcg	1260
gccacagaca tcgtggacag ccagtacgac gccgcagccc aaggccgcct catagcctca	1320
tggacacctg tgtcgccacc ttccatgtga	1350

<210> 42

<211> 450

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
SEQ ID NO:40

<400> 42

Met Ser Lys Lys Gln Val Lys Thr Gln Ser Lys Cys Asn Asn Ile Met
1 5 10 15

Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val
20 25 30

Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu
35 40 45

Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser
50 55 60

Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr
65 70 75 80

Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser Gly
85 90 95

Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala
100 105 110

Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly Gly
115 120 125

Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp Ser
130 135 140

Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser Lys
145 150 155 160

Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu Asn
165 170 175

Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly Gly

180	185	190
Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe Ile		
195	200	205
Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys		
210	215	220
Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp		
225	230	235
His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr		
245	250	255
Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Val Cys Pro Pro		
260	265	270
Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr		
275	280	285
His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser Pro		
290	295	300
Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser Asp		
305	310	315
Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp Ser		
325	330	335
Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His Asn		
340	345	350
Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val		
355	360	365
Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser Asn		
370	375	380
Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr Pro		
385	390	395
		400

Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr
405 410 415

Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala
420 425 430

Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro
435 440 445

Ser Met
450

<210> 43
<211> 449
<212> PRT
<213> Artificial Sequence

<220>
<223> Fusion protein comprising Brachyury (L254V) Protein encoded by
SEQ ID NO:41

<400> 43

Met Ser Lys Lys Gln Val Lys Thr Gln Ser Lys Cys Asn Asn Ile Ser
1 5 10 15

Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val Asp
20 25 30

His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu Lys
35 40 45

Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser Glu
50 55 60

Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr Lys
65 70 75 80

Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser Gly Leu
85 90 95

Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala Asp
100 105 110

Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly Gly Lys
115 120 125

Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp Ser Pro
130 135 140

Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser Lys Val
145 150 155 160

Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu Asn Ser
165 170 175

Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly Gly Pro
180 185 190

Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe Ile Ala
195 200 205

Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys Tyr
210 215 220

Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp His
225 230 235 240

Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr Ser
245 250 255

Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Val Cys Pro Pro Ala
260 265 270

Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr His
275 280 285

Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser Pro Tyr
290 295 300

Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser Asp Asn
305 310 315 320

Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp Ser Ser
325 330 335

Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His Asn Ala
340 345 350

Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val Ser
355 360 365

Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser Asn Gly
370 375 380

Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr Pro Leu
385 390 395 400

Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr Glu
405 410 415

Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala Ala
420 425 430

Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro Ser
435 440 445

Met

<210> 44
<211> 1323
<212> DNA
<213> Artificial Sequence

<220>
<223> Coding sequence encoding fusion protein comprising Brachyury
protein Isoform 1 plus addition of 15 nucleotides from Gene FPV
088

<400> 44
atgaaaaata acttgatgag ctcccctggc accgagagcg cgggaaagag cctgcagtac 60
cgagtggacc acctgctgag cgccgtggag aatgagctgc aggcgggcag cgagaagggc 120
gacccacag agcgcgaact gcgcgtgggc ctggaggaga gcgagctgtg gctgcgcttc 180
aaggagctca ccaatgagat gatcgtgacc aagaacggca ggaggatgtt tccggtgctg 240

aaggtgaacg tgtctggcct ggacccaac gccatgtact ccttcctgct ggacttcgtg	300
gcggcggaca accaccgctg gaagtacgtg aacggggaat gggtgccggg gggcaagccg	360
gagccgcagg cgcccagctg cgtctacatc caccgact cgcccaactt cggggccac	420
tggatgaagg ctcccgtctc cttcagcaaa gtcaagctca ccaacaagct caacggaggg	480
ggccagatca tgctgaactc cttgcataag tatgagcctc gaatccacat agtgagagtt	540
gggggtccac agcgcgatgat caccagccac tgcttcctg agaccagtt catagcggtg	600
actgcttattc agaacgagga gatcacagct cttaaaatta agtacaatcc atttgcaaaa	660
gctttccttg atgcaaagga aagaagtgat cacaagaga tgatggagga acccgagac	720
agccagcaac ctgggtactc ccaatggggg tggcttcttc ctggaaccag caccgtttgt	780
ccacctgcaa atcctcatcc tcagtttgga ggtgccctct ccctcccctc cagcacagc	840
tgtgacaggt acccaaccct gaggagccac cggtcctcac cctacccag cccctatgct	900
catcggaaca attctccaac ctattctgac aactcacctg catgtttatc catgctgcaa	960
tcccatgaca attggtccag cttggaatg cctgcccac ccagcatgct cccgtgagc	1020
cacaatgcca gccacctac cagctccagt cagtaccca gcctgtggtc tgtgagcaac	1080
ggcgccgtca ccccggtc ccaggcagca gccgtgtcca acgggctggg ggcccagttc	1140
ttccggggct ccccgcgca ctacacacc ctcaccatc cggctcggc gccctcttc	1200
tcgggatccc cactgtacga agggcgggc gcggccacag acatcgtgga cagccagtac	1260
gacgccgag cccaaggccg cctcatagcc tcatggacac ctgtgtcgcc accttccatg	1320
tga	1323

<210> 45

<211> 1320

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding fusion protein comprising Brachyury protein Isoform 1 plus addition of 15 nucleotides from Gene FPV 088 without Brachyury protein atg start codon

<400> 45

atgaaaaata acttgagctc ccctggcacc gagagcgcgg gaaagagcct gcagtaccga	60
---	----

gtggaccacc tgctgagcgc cgtggagaat gagctgcagg cgggcagcga gaaggcgac	120
--	-----

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cccacagagc gcgaactgcg cgtgggcctg gaggagagcg agctgtggct gcgcttcaag      180
gagctcacca atgagatgat cgtgaccaag aacggcagga ggatgtttcc ggtgctgaag      240
gtgaacgtgt ctggcctgga ccccaacgcc atgtactcct tcctgctgga cttcgtggcg      300
gcggacaacc accgctggaa gtacgtgaac ggggaatggg tgccgggggg caagccggag      360
ccgcaggcgc ccagctgcgt ctacatccac cccgactcgc ccaacttcgg ggcccactgg      420
atgaaggctc ccgtctcctt cagcaaagtc aagctcacca acaagctcaa cggagggggc      480
cagatcatgc tgaactcctt gcataagtat gagcctcgaa tccacatagt gagagtggg      540
ggtccacagc gcatgatcac cagccactgc ttccctgaga ccagttcat agcggtgact      600
gcttatcaga acgaggagat cacagctctt aaaattaagt acaatccatt tgcaaaagct      660
ttccttgatg caaaggaaag aagtgatcac aaagagatga tggaggaacc cggagacagc      720
cagcaacctg ggtactccca atgggggtgg cttcttcctg gaaccagcac cgtttgtcca      780
cctgcaaatc ctcatcctca gtttgagggt gccctctccc tcccctccac gcacagctgt      840
gacaggtacc caaccctgag gagccaccgg tcctcacctt accccagccc ctatgctcat      900
cggaacaatt ctccaaccta ttctgacaac tcacctgcat gtttatccat gctgcaatcc      960
catgacaatt ggtccagcct tggaatgcct gcccatccca gcatgctccc cgtgagccac     1020
aatgccagcc cacctaccag ctccagtcag taccacagcc tgtggtctgt gagcaacggc     1080
gccgtcacc cgggctccca ggcagcagcc gtgtccaacg ggctgggggc ccagttcttc     1140
cggggctccc ccgcgcacta cacaccctc acccatccgg tctcggcgcc ctcttcctcg     1200
ggatccccac tgtacgaagg ggcggccgcg gccacagaca tcgtggacag ccagtacgac     1260
gccgcagccc aaggccgcct catagcctca tggacacctg tgtcgccacc ttccatgtga     1320

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<210> 46

<211> 440

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
SEQ ID NO:44

<400> 46

Met Lys Asn Asn Leu Met Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys

1	5	10	15
Ser	Leu	Gln	Tyr
	20		
Arg	Val	Asp	His
		25	
Leu	Leu	Ser	Ala
			30
Val	Glu	Asn	Glu
Leu	Gln	Ala	Gly
	35		
Ser	Glu	Lys	Gly
		40	
Asp	Pro	Thr	Glu
			45
Arg	Glu	Leu	Arg
Val	Gly	Leu	Glu
	50		
Glu	Glu	Ser	Glu
		55	
Leu	Trp	Leu	Arg
			60
Phe	Lys	Glu	Leu
			Thr
Asn	Glu	Met	Ile
65			
Val	Thr	Lys	Asn
	70		
Gly	Arg	Arg	Met
		75	
Phe	Pro	Val	Leu
			80
Lys	Val	Asn	Val
		85	
Ser	Gly	Leu	Asp
Pro	Asn	Ala	Met
	90		
Tyr	Ser	Phe	Leu
			95
Leu	Asp	Phe	Val
	100		
Ala	Ala	Asp	Asn
			105
His	Arg	Trp	Lys
Tyr	Val	Asn	Gly
			110
Glu	Trp	Val	Pro
	115		
Gly	Gly	Lys	Pro
			120
Glu	Pro	Gln	Ala
			125
Pro	Ser	Cys	Val
Tyr	Ile	His	Pro
	130		
Asp	Ser	Pro	Asn
		135	
Phe	Gly	Ala	His
			140
Trp	Met	Lys	Ala
Pro	Val	Ser	Phe
145			
Ser	Lys	Val	Lys
	150		
Leu	Thr	Asn	Lys
		155	
Leu	Asn	Gly	Gly
			160
Gly	Gln	Ile	Met
		165	
Leu	Asn	Ser	Leu
His	Lys	Tyr	Glu
	170		
Pro	Arg	Ile	His
			175
Ile	Val	Arg	Val
	180		
Gly	Gly	Pro	Gln
			185
Arg	Met	Ile	Thr
Ser	His	Cys	Phe
			190
Pro	Glu	Thr	Gln
	195		
Phe	Ile	Ala	Val
			200
Thr	Ala	Tyr	Gln
			205
Asn	Glu	Glu	Ile
Thr	Ala	Leu	Lys
	210		
Ile	Lys	Tyr	Asn
		215	
Pro	Phe	Ala	Lys
			220
Ala	Phe	Leu	Asp

Ala Lys Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp
 225 230 235 240

Ser Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr
 245 250 255

Ser Thr Leu Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala
 260 265 270

Leu Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg
 275 280 285

Ser His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn
 290 295 300

Ser Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln
 305 310 315 320

Ser His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met
 325 330 335

Leu Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr
 340 345 350

Pro Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln
 355 360 365

Ala Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser
 370 375 380

Pro Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser
 385 390 395 400

Ser Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val
 405 410 415

Asp Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp
 420 425 430

Thr Pro Val Ser Pro Pro Ser Met

435

440

<210> 47

<211> 439

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
SEQ ID NO:45

<400> 47

Met Lys Asn Asn Leu Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser
1 5 10 15

Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu
20 25 30

Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val
35 40 45

Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn
50 55 60

Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys
65 70 75 80

Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu
85 90 95

Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu
100 105 110

Trp Val Pro Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr
115 120 125

Ile His Pro Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro
130 135 140

Val Ser Phe Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly
145 150 155 160

Gln Ile Met Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile
165 170 175

Val Arg Val Gly Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro
180 185 190

Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr
195 200 205

Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala
210 215 220

Lys Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser
225 230 235 240

Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser
245 250 255

Thr Leu Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu
260 265 270

Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser
275 280 285

His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser
290 295 300

Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser
305 310 315 320

His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu
325 330 335

Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro
340 345 350

Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala
355 360 365

Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro
370 375 380

Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser
385 390 395 400

Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Thr Asp Ile Val Asp
405 410 415

Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr
420 425 430

Pro Val Ser Pro Pro Ser Met
435

<210> 48
<211> 1353
<212> DNA
<213> Artificial Sequence

<220>
<223> Coding sequence encoding fusion protein comprising Brachyury
protein Isoform 1 plus addition of 45 nucleotides from Gene FPV
088

<400> 48
atgaaaaata acttgatatga agaaaaaatg aacatgagta agaaaatgag ctcccctggc 60
accgagagcg cgggaaagag cctgcagtac cgagtggacc acctgctgag cgccgtggag 120
aatgagctgc aggcgggagc cgagaagggc gacccacag agcgcgaact gcgcgtgggc 180
ctggaggaga gcgagctgtg gctgcgcttc aaggagctca ccaatgagat gatcgtgacc 240
aagaacggca ggaggatgtt tccggtgctg aaggtgaacg tgtctggcct ggaccccaac 300
gccatgtact ctttctgct ggacttcgtg gcggcggaca accaccgctg gaagtacgtg 360
aacggggaat gggtgccggg gggcaagccg gagccgcagg cgcccagctg cgtctacatc 420
caccgcgact cgcccaactt cggggcccac tggatgaagg ctcccgtctc cttcagcaaa 480
gtcaagctca ccaacaagct caacggaggg ggccagatca tgctgaactc cttgcataag 540
tatgagcctc gaatccacat agtgagagtt gggggtccac agcgcgatgat caccagccac 600
tgcttccctg agaccagtt catagcggtg actgcttata agaacgagga gatcacagct 660
cttaaaatta agtacaatcc atttgcaaag gctttccttg atgcaaagga aagaagtgat 720
caciaagaga tgatggagga acccgagagc agccagcaac ctgggtactc ccaatggggg 780

tggtttcttc ctggaaccag caccgtttgt ccacctgcaa atcctcatcc tcagtttgga	840
ggtgccctct ccctcccctc cacgcacagc tgtgacaggt acccaaccct gaggagccac	900
cggtcctcac cctaccccag cccctatgct catcggaaca attctccaac ctattctgac	960
aactcacctg catgtttatc catgctgcaa tcccatgaca attggtccag ctttggaatg	1020
cctgcccata ccagcatgct ccccgtagag cacaatgcca gccacactac cagctccagt	1080
cagtaccca gcctgtggtc tgtgagcaac ggcgccgtca ccccgggctc ccaggcagca	1140
gccgtgtcca acgggctggg ggcccagttc ttccggggct ccccgcgca ctacacaccc	1200
ctcaccatc cggctctggc gccctcttcc tcgggatccc cactgtacga aggggcggcc	1260
gcggccacag acatcgtgga cagccagtac gacgccgag cccaaggccg cctcatagcc	1320
tcatggacac ctgtgtcgcc accttccatg tga	1353

<210> 49

<211> 1350

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding fusion protein comprising Brachyury protein Isoform 1 plus addition of 45 nucleotides from Gene FPV 088 without Brachyury atg

<400> 49

atgaaaaata acttgtatga agaaaaaatg aacatgagta agaaaagctc ccctggcacc	60
gagagcgcgg gaaagagcct gcagtaccga gtggaccacc tgctgagcgc cgtggagaat	120
gagctgcagg cgggcagcga gaaggcgac cccacagagc gcgaactgcg cgtgggcctg	180
gaggagagcg agctgtggct gcgcttcaag gagctcacca atgagatgat cgtgaccaag	240
aacggcagga ggatgtttcc ggtgctgaag gtgaacgtgt ctggcctgga cccaacgcc	300
atgtactcct tcctgctgga cttcgtggcg gcggacaacc accgctggaa gtacgtgaac	360
ggggaatggg tgccgggggg caagccggag ccgcaggcgc ccagctgcgt ctacatccac	420
cccgactcgc ccaacttcgg ggcccactgg atgaaggctc ccgtctcctt cagcaaagtc	480
aagctcacca acaagctcaa cggagggggc cagatcatgc tgaactcctt gcataagtat	540
gagcctcgaa tccacatagt gagagttggg ggtccacagc gcatgatcac cagccactgc	600
ttccctgaga ccagttcat agcggtgact gcttatcaga acgaggagat cacagctctt	660

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aaaattaagt acaatccatt tgcaaaagct ttccttgatg caaaggaaag aagtgatcac      720
aaagagatga tggaggaacc cggagacagc cagcaacctg ggtactccca atgggggtgg      780
cttcttcctg gaaccagcac cgtttgtcca cctgcaaadc ctcctcctca gtttggaggt      840
gccctctccc tcccctccac gcacagctgt gacaggtacc caaccctgag gagccaccgg      900
tcctcacctt accccagccc ctatgctcat cggaacaatt ctccaaccta ttctgacaac      960
tcacctgcat gtttatccat gctgcaatcc catgacaatt ggtccagcct tggaatgcct     1020
gcccattcca gcatgctccc cgtgagccac aatgccagcc cacctaccag ctccagtcag     1080
taccacagcc tgtggtctgt gagcaacggc gccgtcacc cgggctccca ggcagcagcc     1140
gtgtccaacg ggctgggggc ccagttcttc cggggctccc ccgcgcacta cacaccctc     1200
acccatccgg tctcggcgcc ctcttcctcg ggatccccac tgtacgaagg ggcggccgcg     1260
gccacagaca tcgtggacag ccagtagcac gccgcagccc aaggccgcct catagcctca     1320
tggacacctg tgtcgccacc ttccatgtga                                     1350

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```

<210> 50
<211> 450
<212> PRT
<213> Artificial Sequence

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<220>
<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
      SEQ ID NO:48

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```

<400> 50

```

```

Met Lys Asn Asn Leu Tyr Glu Glu Lys Met Asn Met Ser Lys Lys Met
1           5           10          15

```

```

Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val
          20          25          30

```

```

Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu
          35          40          45

```

```

Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser
          50          55          60

```

```

Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr

```

65		70		75		80									
Lys	Asn	Gly	Arg	Arg	Met	Phe	Pro	Val	Leu	Lys	Val	Asn	Val	Ser	Gly
				85					90					95	
Leu	Asp	Pro	Asn	Ala	Met	Tyr	Ser	Phe	Leu	Leu	Asp	Phe	Val	Ala	Ala
			100					105					110		
Asp	Asn	His	Arg	Trp	Lys	Tyr	Val	Asn	Gly	Glu	Trp	Val	Pro	Gly	Gly
		115					120					125			
Lys	Pro	Glu	Pro	Gln	Ala	Pro	Ser	Cys	Val	Tyr	Ile	His	Pro	Asp	Ser
	130						135				140				
Pro	Asn	Phe	Gly	Ala	His	Trp	Met	Lys	Ala	Pro	Val	Ser	Phe	Ser	Lys
145					150					155					160
Val	Lys	Leu	Thr	Asn	Lys	Leu	Asn	Gly	Gly	Gly	Gln	Ile	Met	Leu	Asn
				165					170					175	
Ser	Leu	His	Lys	Tyr	Glu	Pro	Arg	Ile	His	Ile	Val	Arg	Val	Gly	Gly
			180					185					190		
Pro	Gln	Arg	Met	Ile	Thr	Ser	His	Cys	Phe	Pro	Glu	Thr	Gln	Phe	Ile
		195					200					205			
Ala	Val	Thr	Ala	Tyr	Gln	Asn	Glu	Glu	Ile	Thr	Ala	Leu	Lys	Ile	Lys
	210					215					220				
Tyr	Asn	Pro	Phe	Ala	Lys	Ala	Phe	Leu	Asp	Ala	Lys	Glu	Arg	Ser	Asp
225					230					235					240
His	Lys	Glu	Met	Met	Glu	Glu	Pro	Gly	Asp	Ser	Gln	Gln	Pro	Gly	Tyr
				245					250					255	
Ser	Gln	Trp	Gly	Trp	Leu	Leu	Pro	Gly	Thr	Ser	Thr	Leu	Cys	Pro	Pro
			260					265					270		
Ala	Asn	Pro	His	Pro	Gln	Phe	Gly	Gly	Ala	Leu	Ser	Leu	Pro	Ser	Thr
		275					280					285			

His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser Pro
 290 295 300

Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser Asp
 305 310 315 320

Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp Ser
 325 330 335

Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His Asn
 340 345 350

Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val
 355 360 365

Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser Asn
 370 375 380

Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr Pro
 385 390 395 400

Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr
 405 410 415

Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala
 420 425 430

Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro
 435 440 445

Ser Met
 450

<210> 51
 <211> 449
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
 SEQ ID NO:49

<400> 51

Met Lys Asn Asn Leu Tyr Glu Glu Lys Met Asn Met Ser Lys Lys Ser
1 5 10 15

Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val Asp
20 25 30

His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu Lys
35 40 45

Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser Glu
50 55 60

Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr Lys
65 70 75 80

Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser Gly Leu
85 90 95

Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala Asp
100 105 110

Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly Gly Lys
115 120 125

Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp Ser Pro
130 135 140

Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser Lys Val
145 150 155 160

Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu Asn Ser
165 170 175

Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly Gly Pro
180 185 190

Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe Ile Ala
195 200 205

Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys Tyr
 210 215 220

Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp His
 225 230 235 240

Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr Ser
 245 250 255

Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Leu Cys Pro Pro Ala
 260 265 270

Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr His
 275 280 285

Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser Pro Tyr
 290 295 300

Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser Asp Asn
 305 310 315 320

Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp Ser Ser
 325 330 335

Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His Asn Ala
 340 345 350

Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val Ser
 355 360 365

Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser Asn Gly
 370 375 380

Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr Pro Leu
 385 390 395 400

Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr Glu
 405 410 415

Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala Ala
 420 425 430

Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro Ser
435 440 445

Met

<210> 52
<211> 1326
<212> DNA
<213> Artificial Sequence

<220>
<223> Coding sequence encoding fusion protein comprising Brachyury protein Isoform 1 plus addition of 18 nucleotides from Gene FPV 088

<400> 52
atgaacatga gtaagaaaat gagctcccct ggcaccgaga gcgcgggaaa gaggcctgcag 60
taccgagtgg accacctgct gagcgccgtg gagaatgagc tgcaggcggg cagcgagaag 120
ggcgaccca cagagcgca actgcgctg ggcctggagg agagcgagct gtggctgcgc 180
ttcaaggagc tcaccaatga gatgatctg accaagaac gcaggaggat gtttccggtg 240
ctgaaggatga acgtgtctgg cctggacccc aacgccatgt actccttcct gctggacttc 300
gtggcggcgg acaaccaccg ctggaagtac gtgaacgggg aatgggtgcc ggggggcaag 360
ccggagccgc aggcgcccag ctgcgtctac atccacccc actcgcccaa cttcggggcc 420
cactggatga aggctcccgt ctccttcagc aaagtcaagc tcaccaacaa gctcaacgga 480
gggggccaaga tcatgctgaa ctccttgcac aagtatgagc ctcgaatcca catagtgaga 540
gttgggggtc cacagcgcat gatcaccagc cactgcttcc ctgagacca gttcatagcg 600
gtgactgctt atcagaacga ggagatcaca gctcttaaaa ttaagtacaa tccatttgca 660
aaggctttcc ttgatgcaaa ggaaagaagt gatcacaag agatgatgga ggaacccgga 720
gacagccagc aacctgggta ctccaatgg gggtggcttc ttcttggaa cagcaccgtt 780
tgtccacctg caaatcctca tcctcagttt ggaggtgccc tctccctccc ctccacgcac 840
agctgtgaca ggtaccaaac cctgaggagc caccggctct caccctacc cagcccctat 900
gctcatcgga acaattctcc aacctattct gacaactcac ctgcatgttt atccatgctg 960
caatcccatg acaattggct cagccttgga atgcctgccc atcccagcat gctccccgtg 1020

agccacaatg ccagcccacc taccagctcc agtcagtacc ccagcctgtg gtctgtgagc	1080
aacggcgccg tcaccccggg ctcccaggca gcagccgtgt ccaacgggct gggggcccag	1140
ttcttccggg gctccccgc gcactacaca cccctcacc atccggtctc ggcgcctct	1200
tcctcgggat cccactgta cgaagggcg gccgcggcca cagacatcgt ggacagccag	1260
tacgacgccg cagcccaagg ccgcctcata gcctcatgga cacctgtgtc gccaccttcc	1320
atgtga	1326

<210> 53
 <211> 1323
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding fusion protein comprising Brachyury protein Isoform 1 plus addition of 18 nucleotides from Gene FPV 088 without brachyury atg

<400> 53	
atgaacatga gtaagaaaag ctcccctggc accgagagcg cgggaaagag cctgcagtac	60
cgagtggacc acctgctgag cgccgtggag aatgagctgc aggcgggcag cgagaagggc	120
gacccacag agcgcgaact gcgcgtgggc ctggaggaga gcgagctgtg gctgcgcttc	180
aaggagctca ccaatgagat gatcgtgacc aagaacggca ggaggatgtt tccggtgctg	240
aaggtgaacg tgtctggcct ggacccaac gccatgtact ccttcctgct ggacttcgtg	300
gcggcggaca accaccgctg gaagtacgtg aacggggaat gggtgccggg gggcaagccg	360
gagccgcagg cgcccagctg cgtctacatc caccgcgact cgcccaactt cggggcccac	420
tggatgaagg ctcccgtctc cttcagcaaa gtcaagctca ccaacaagct caacggaggg	480
ggccagatca tgctgaactc cttgcataag tatgagcctc gaatccacat agtgagagtt	540
gggggtccac agcgcagatg caccagccac tgcttcctg agaccagtt catagcgggtg	600
actgcttatc agaacgagga gatcacagct cttaaaatta agtacaatcc atttgcaaaa	660
gctttccttg atgcaaagga aagaagtgat caciaagaga tgatggagga acccgagac	720
agccagcaac ctgggtactc ccaatggggg tggcttcttc ctggaaccag caccgtttgt	780
ccacctgcaa atcctcatcc tcagtttgga ggtgccctct ccctcccctc cagcacagc	840
tgtgacaggt acccaaccct gaggagccac cggtcctcac cctaccccag cccctatgct	900

catcggaaca attctccaac ctattctgac aactcacctg catgtttatc catgctgcaa 960
tcccatgaca attggtccag ccttggaatg cctgcccata ccagcatgct ccccgtagac 1020
cacaatgcca gcccacctac cagctccagt cagtaccca gcctgtggtc tgtgagcaac 1080
ggcgccgtca ccccgggctc ccaggcagca gccgtgtcca acgggctggg ggcccagttc 1140
ttccggggct cccccgcga ctacacacc ctcacccatc cggctctggc gccctcttcc 1200
tcgggatccc cactgtacga aggggcggcc gcggccacag acatcgtgga cagccagtac 1260
gacgccgcag cccaaggccg cctcatagcc tcatggacac ctgtgtcgcc accttccatg 1320
tga 1323

<210> 54
<211> 441
<212> PRT
<213> Artificial Sequence

<220>
<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
SEQ ID NO:52

<400> 54

Met Asn Met Ser Lys Lys Met Ser Ser Pro Gly Thr Glu Ser Ala Gly
1 5 10 15

Lys Ser Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn
20 25 30

Glu Leu Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu
35 40 45

Arg Val Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu
50 55 60

Thr Asn Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val
65 70 75 80

Leu Lys Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe
85 90 95

Leu Leu Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn

100	105	110															
Gly	Glu	Trp	Val	Pro	Gly	Gly	Lys	Pro	Glu	Pro	Gln	Ala	Pro	Ser	Cys		
	115						120					125					
Val	Tyr	Ile	His	Pro	Asp	Ser	Pro	Asn	Phe	Gly	Ala	His	Trp	Met	Lys		
	130					135					140						
Ala	Pro	Val	Ser	Phe	Ser	Lys	Val	Lys	Leu	Thr	Asn	Lys	Leu	Asn	Gly		
145					150					155					160		
Gly	Gly	Gln	Ile	Met	Leu	Asn	Ser	Leu	His	Lys	Tyr	Glu	Pro	Arg	Ile		
			165						170					175			
His	Ile	Val	Arg	Val	Gly	Gly	Pro	Gln	Arg	Met	Ile	Thr	Ser	His	Cys		
			180					185						190			
Phe	Pro	Glu	Thr	Gln	Phe	Ile	Ala	Val	Thr	Ala	Tyr	Gln	Asn	Glu	Glu		
	195						200					205					
Ile	Thr	Ala	Leu	Lys	Ile	Lys	Tyr	Asn	Pro	Phe	Ala	Lys	Ala	Phe	Leu		
	210					215					220						
Asp	Ala	Lys	Glu	Arg	Ser	Asp	His	Lys	Glu	Met	Met	Glu	Glu	Pro	Gly		
225					230					235					240		
Asp	Ser	Gln	Gln	Pro	Gly	Tyr	Ser	Gln	Trp	Gly	Trp	Leu	Leu	Pro	Gly		
				245					250					255			
Thr	Ser	Thr	Leu	Cys	Pro	Pro	Ala	Asn	Pro	His	Pro	Gln	Phe	Gly	Gly		
			260					265					270				
Ala	Leu	Ser	Leu	Pro	Ser	Thr	His	Ser	Cys	Asp	Arg	Tyr	Pro	Thr	Leu		
	275						280					285					
Arg	Ser	His	Arg	Ser	Ser	Pro	Tyr	Pro	Ser	Pro	Tyr	Ala	His	Arg	Asn		
	290					295					300						
Asn	Ser	Pro	Thr	Tyr	Ser	Asp	Asn	Ser	Pro	Ala	Cys	Leu	Ser	Met	Leu		
305					310					315					320		

Gln Ser His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser
325 330 335

Met Leu Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln
340 345 350

Tyr Pro Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser
355 360 365

Gln Ala Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly
370 375 380

Ser Pro Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser
385 390 395 400

Ser Ser Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile
405 410 415

Val Asp Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser
420 425 430

Trp Thr Pro Val Ser Pro Pro Ser Met
435 440

<210> 55
<211> 440
<212> PRT
<213> Artificial Sequence

<220>
<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
SEQ ID NO:53

<400> 55

Met Asn Met Ser Lys Lys Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys
1 5 10 15

Ser Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu
20 25 30

Leu Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg
35 40 45

Val Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr
50 55 60

Asn Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu
65 70 75 80

Lys Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu
85 90 95

Leu Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly
100 105 110

Glu Trp Val Pro Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val
115 120 125

Tyr Ile His Pro Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala
130 135 140

Pro Val Ser Phe Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly
145 150 155 160

Gly Gln Ile Met Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His
165 170 175

Ile Val Arg Val Gly Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe
180 185 190

Pro Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile
195 200 205

Thr Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp
210 215 220

Ala Lys Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp
225 230 235 240

Ser Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr
245 250 255

Ser Thr Leu Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala
260 265 270

Leu Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg
275 280 285

Ser His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn
290 295 300

Ser Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln
305 310 315 320

Ser His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met
325 330 335

Leu Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr
340 345 350

Pro Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln
355 360 365

Ala Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser
370 375 380

Pro Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser
385 390 395 400

Ser Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val
405 410 415

Asp Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp
420 425 430

Thr Pro Val Ser Pro Pro Ser Met
435 440

<210> 56

<211> 1320

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding Fusion protein comprising Brachyury protein Isoform 1 plus addition of 12 nucleotides from Gene FPV 088

<400> 56

atgagtaaga aaatgagctc ccctggcacc gagagcgagg gaaagagcct gcagtaccga	60
gtggaccacc tgctgagcgc cgtggagaat gagctgcagg cgggcagcga gaagggcgac	120
cccacagagc gcgaactgcg cgtgggcctg gaggagagcg agctgtggct gcgcttcaag	180
gagctcacca atgagatgat cgtgaccaag aacggcagga ggatgtttcc ggtgctgaag	240
gtgaacgtgt ctggcctgga cccaacgcc atgtactcct tcctgctgga cttcgtggcg	300
gcggacaacc accgctggaa gtacgtgaac ggggaatggg tgccgggggg caagccggag	360
ccgcaggcgc ccagctgcgt ctacatccac ccgactcgc ccaacttcgg ggcccactgg	420
atgaaggctc ccgtctcctt cagcaaagtc aagctcacca acaagctcaa cggagggggc	480
cagatcatgc tgaactcctt gcataagtat gagcctcgaa tccacatagt gagagttggg	540
ggtccacagc gcatgatcac cagccactgc ttccctgaga ccagttcat agcggtgact	600
gcttatcaga acgaggagat cacagctctt aaaattaagt acaatccatt tgcaaaagct	660
ttccttgatg caaaggaaag aagtgatcac aaagagatga tggaggaacc cggagacagc	720
cagcaacctg ggtactccca atgggggtgg cttcttcctg gaaccagcac cgtttgtcca	780
cctgcaaatc ctcatcctca gtttggaggt gccctctccc tcccctccac gcacagctgt	840
gacaggtacc caaccctgag gagccaccgg tcctcacctt accccagccc ctatgctcat	900
cggaacaatt ctccaaccta ttctgacaac tcacctgcat gtttatccat gctgcaatcc	960
catgacaatt ggtccagcct tggaatgcct gcccatccca gcatgctccc cgtgagccac	1020
aatgccagcc cacctaccag ctccagtcag taccacagcc tgtggtctgt gagcaacggc	1080
gccgtcacc cgggctccca ggcagcagcc gtgtccaacg ggctgggggc ccagttcttc	1140
cggggctccc ccgcgacta cacaccctc acccatccgg tctcggcgcc ctcttcctcg	1200
ggatccccac tgtacgaagg ggcggccgcg gccacagaca tcgtggacag ccagtacgac	1260
gccgcagccc aaggccgcct catagcctca tggacacctg tgtcgccacc ttccatgtga	1320

<210> 57

<211> 1317

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding Fusion protein comprising Brachyury protein Isoform 1 plus addition of 12 nucleotides from Gene FPV 088 without Brachyury atg start codon

<400> 57

atgagtaaga aaagctcccc tggcaccgag agcgcgggaa agagcctgca gtaccgagtg	60
gaccacctgc tgagcgccgt ggagaatgag ctgcaggcgg gcagcgagaa gggcgacccc	120
acagagcgcg aactgcgcgt gggcctggag gagagcgagc tgtggctgcg cttcaaggag	180
ctcaccaatg agatgatcgt gaccaagaac ggcaggagga tgtttccggt gctgaagggtg	240
aacgtgtctg gcctggaccc caacgccatg tactccttcc tgctggactt cgtggcggcg	300
gacaaccacc gctggaagta cgtgaacggg gaatgggtgc cggggggcaa gccggagccg	360
caggcgccca gctgctgcta catccacccc gactcgccca acttcggggc cactggatg	420
aaggctcccc tctccttcag caaagtcaag ctcaccaaca agctcaacgg agggggccag	480
atcatgctga actccttgca taagtatgag cctcgaatcc acatagttag agttgggggt	540
ccacagcgca tgatcaccag ccactgcttc cctgagaccc agttcatagc ggtgactgct	600
tatcagaacg aggagatcac agctcttaaa attaagtaca atccatttgc aaaagctttc	660
cttgatgcaa aggaaagaag tgatcacaaa gagatgatgg aggaacccgg agacagccag	720
caacctgggt actcccaatg ggggtggctt cttcctggaa ccagcacctg ttgtccacct	780
gcaaatactc atcctcagtt tggaggtgcc ctctccctcc cctccacgca cagctgtgac	840
aggtacccaa ccctgaggag ccaccgggtc tcaccctacc ccagccccta tgctcatcgg	900
aacaattctc caacctattc tgacaactca cctgcatgtt tatccatgct gcaatcccat	960
gacaattggt ccagccttgg aatgcctgcc catcccagca tgctccccgt gagccacaat	1020
gccagcccac ctaccagctc cagtcagtac cccagcctgt ggtctgtgag caacggcgcc	1080
gtcaccccg gctcccaggc agcagccgtg tccaacgggc tggggggcca gttcttccgg	1140
ggctcccccg cgactacac acccctcacc catccggtct cggcgccctc ttctcggga	1200
tccccactgt acgaaggggc ggccgcggcc acagacatcg tggacagcca gtacgacgcc	1260
gcagcccaag gccgcctcat agcctcatgg acacctgtgt cgccaccttc catgtga	1317

<210> 58

<211> 439

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
SEQ ID NO: 56

<400> 58

Met Ser Lys Lys Met Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser
1 5 10 15

Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu
20 25 30

Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val
35 40 45

Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn
50 55 60

Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys
65 70 75 80

Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu
85 90 95

Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu
100 105 110

Trp Val Pro Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr
115 120 125

Ile His Pro Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro
130 135 140

Val Ser Phe Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly
145 150 155 160

Gln Ile Met Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile
165 170 175

Val Arg Val Gly Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro

180	185	190
Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr		
195	200	205
Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala		
210	215	220
Lys Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser		
225	230	235
Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser		
245	250	255
Thr Leu Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu		
260	265	270
Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser		
275	280	285
His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser		
290	295	300
Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser		
305	310	315
His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu		
325	330	335
Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro		
340	345	350
Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala		
355	360	365
Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro		
370	375	380
Ala His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser		
385	390	395
		400

Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Thr Asp Ile Val Asp
405 410 415

Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr
420 425 430

Pro Val Ser Pro Pro Ser Met
435

<210> 59

<211> 438

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
SEQ ID NO:57

<400> 59

Met Ser Lys Lys Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu
1 5 10 15

Gln Tyr Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln
20 25 30

Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly
35 40 45

Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu
50 55 60

Met Ile Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val
65 70 75 80

Asn Val Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp
85 90 95

Phe Val Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp
100 105 110

Val Pro Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile
115 120 125

His Pro Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val
130 135 140

Ser Phe Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln
145 150 155 160

Ile Met Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val
165 170 175

Arg Val Gly Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu
180 185 190

Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala
195 200 205

Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys
210 215 220

Glu Arg Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln
225 230 235 240

Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr
245 250 255

Leu Cys Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser
260 265 270

Leu Pro Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His
275 280 285

Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro
290 295 300

Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His
305 310 315 320

Asp Asn Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro
325 330 335

Val Ser His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser
 340 345 350

Leu Trp Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala
 355 360 365

Ala Val Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala
 370 375 380

His Tyr Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly
 385 390 395 400

Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser
 405 410 415

Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro
 420 425 430

Val Ser Pro Pro Ser Met
 435

<210> 60
 <211> 1386
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding Fusion protein comprising Brachyury
 protein Isoform 1 plus addition of 75 nucleotides from Gene FPV
 088 and an atc

<400> 60
 atgaaaaata acttgtatga agaaaaaatg aacatgagta agaaacaagt aaaaactcaa 60
 agtaaatgta ataatatcat gagctcccct ggcaccgaga gcgcgggaaa gaggctgcag 120
 taccgagtgg accacctgct gagcgccgtg gagaatgagc tgcaggcggg cagcgagaag 180
 ggcgacccca cagagcgca actgcgcgtg ggcctggagg agagcgagct gtggctgcgc 240
 ttcaaggagc tcaccaatga gatgatcgtg accaagaacg gcaggaggat gtttccgggtg 300
 ctgaaggatga acgtgtctgg cctggacccc aacgccatgt actccttcct gctggacttc 360
 gtggcggcgg acaaccaccg ctggaagtac gtgaacgggg aatgggtgcc ggggggcaag 420
 ccggagccgc aggcgcccag ctgcgtctac atccaccccg actcgcccaa cttcggggcc 480

cactggatga aggctcccgt ctccttcagc aaagtcaagc tcaccaacaa gctcaacgga	540
ggggggccaga tcatgctgaa ctccttgcat aagtatgagc ctcgaatcca catagtgaga	600
gttgggggtc cacagcgcat gatcaccagc cactgcttcc ctgagacca gttcatagcg	660
gtgactgctt atcagaacga ggagatcaca gctcttaaaa ttaagtacaa tccatttgca	720
aaagcttttc ttgatgcaaa ggaaagaagt gatcacaaag agatgatgga ggaacccgga	780
gacagccagc aacctgggta ctcccaatgg ggggtggcttc ttcctggaac cagcaccgtt	840
tgtccacctg caaatcctca tcctcagttt ggaggtgccc tctccctccc ctccacgcac	900
agctgtgaca ggtacccaac cctgaggagc caccggtcct caccctaccc cagcccctat	960
gctcatcgga acaattctcc aacctattct gacaactcac ctgcatgttt atccatgctg	1020
caatcccatg acaattggtc cagccttgga atgcctgccc atcccagcat gctccccgtg	1080
agccacaatg ccagcccacc taccagctcc agtcagtacc ccagcctgtg gtctgtgagc	1140
aacggcgccg tcaccccggg ctcccaggca gcagccgtgt ccaacgggct gggggcccag	1200
ttcttccggg gtcccccgc gcactacaca cccctcacc atccggtctc ggcgccctct	1260
tcctcgggat cccactgta cgaaggggcg gccgcggcca cagacatcgt ggacagccag	1320
tacgacgccg cagcccaagg ccgcctcata gcctcatgga cacctgtgtc gccaccttcc	1380
atgtga	1386

<210> 61

<211> 1383

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding Fusion protein comprising Brachyury protein Isoform 1 plus addition of 75 nucleotides from Gene FPV 088 and an atc, without Brachyury atg start codon

<400> 61

atgaaaaata acttgtatga agaaaaaatg aacatgagta agaaacaagt aaaaactcaa	60
agtaaatgta ataatatcag ctcccctggc accgagagcg cgggaaagag cctgcagtac	120
cgagtggacc acctgctgag cgccgtggag aatgagctgc aggcgggcag cgagaagggc	180
gacccacag agcgcgaact gcgcgtgggc ctggaggaga gcgagctgtg gctgcgcttc	240
aaggagctca ccaatgagat gatcgtgacc aagaacggca ggaggatgtt tccggtgctg	300

aaggtgaacg tgtctggcct ggacccaac gccatgtact ccttcctgct ggacttcgtg	360
gcggcggaca accaccgctg gaagtacgtg aacggggaat gggtgccggg gggcaagccg	420
gagccgcagg cgcccagctg cgtctacatc caccgact cgcccaactt cggggccac	480
tggatgaagg ctcccgtctc cttcagcaaa gtcaagctca ccaacaagct caacggaggg	540
ggccagatca tgctgaactc cttgcataag tatgagcctc gaatccacat agtgagagtt	600
gggggtccac agcgcgatgat caccagccac tgcttcctg agaccagtt catagcggtg	660
actgcttatc agaacgagga gatcacagct cttaaaatta agtacaatcc atttgcaaaa	720
gctttccttg atgcaaagga aagaagtgat cacaagaga tgatggagga acccgagac	780
agccagcaac ctgggtactc ccaatggggg tggcttcttc ctggaaccag caccgtttgt	840
ccacctgcaa atcctcatcc tcagtttgga ggtgccctct ccctcccctc cagcacagc	900
tgtgacaggt acccaaccct gaggagccac cggtcctcac cctacccag cccctatgct	960
catcggaaca attctccaac ctattctgac aactcacctg catgtttatc catgctgcaa	1020
tcccatgaca attggtccag cttggaatg cctgcccac ccagcatgct cccgtgagc	1080
cacaatgcca gccacctac cagctccagt cagtaccca gcctgtggtc tgtgagcaac	1140
ggcgccgtca ccccggtc ccaggcagca gccgtgtcca acgggctggg ggcccagttc	1200
ttccggggct ccccgcgca ctacacacc ctcaccatc cggtctcggc gccctcttcc	1260
tcgggatccc cactgtacga aggggcggcc gcggccacag acatcgtgga cagccagtac	1320
gacgccgag cccaaggccg cctcatagcc tcatggacac ctgtgtcgcc accttccatg	1380
tga	1383

<210> 62

<211> 461

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
SEQ ID NO:60

<400> 62

Met	Lys	Asn	Asn	Leu	Tyr	Glu	Glu	Lys	Met	Asn	Met	Ser	Lys	Lys	Gln
1				5					10					15	

Val Lys Thr Gln Ser Lys Cys Asn Asn Ile Met Ser Ser Pro Gly Thr
 20 25 30
 Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val Asp His Leu Leu Ser
 35 40 45
 Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr
 50 55 60
 Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg
 65 70 75 80
 Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr Lys Asn Gly Arg Arg
 85 90 95
 Met Phe Pro Val Leu Lys Val Asn Val Ser Gly Leu Asp Pro Asn Ala
 100 105 110
 Met Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala Asp Asn His Arg Trp
 115 120 125
 Lys Tyr Val Asn Gly Glu Trp Val Pro Gly Gly Lys Pro Glu Pro Gln
 130 135 140
 Ala Pro Ser Cys Val Tyr Ile His Pro Asp Ser Pro Asn Phe Gly Ala
 145 150 155 160
 His Trp Met Lys Ala Pro Val Ser Phe Ser Lys Val Lys Leu Thr Asn
 165 170 175
 Lys Leu Asn Gly Gly Gly Gln Ile Met Leu Asn Ser Leu His Lys Tyr
 180 185 190
 Glu Pro Arg Ile His Ile Val Arg Val Gly Gly Pro Gln Arg Met Ile
 195 200 205
 Thr Ser His Cys Phe Pro Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr
 210 215 220
 Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala

225		230		235		240									
Lys	Ala	Phe	Leu	Asp	Ala	Lys	Glu	Arg	Ser	Asp	His	Lys	Glu	Met	Met
			245						250					255	
Glu	Glu	Pro	Gly	Asp	Ser	Gln	Gln	Pro	Gly	Tyr	Ser	Gln	Trp	Gly	Trp
			260					265					270		
Leu	Leu	Pro	Gly	Thr	Ser	Thr	Leu	Cys	Pro	Pro	Ala	Asn	Pro	His	Pro
		275					280					285			
Gln	Phe	Gly	Gly	Ala	Leu	Ser	Leu	Pro	Ser	Thr	His	Ser	Cys	Asp	Arg
	290					295					300				
Tyr	Pro	Thr	Leu	Arg	Ser	His	Arg	Ser	Ser	Pro	Tyr	Pro	Ser	Pro	Tyr
305					310					315					320
Ala	His	Arg	Asn	Asn	Ser	Pro	Thr	Tyr	Ser	Asp	Asn	Ser	Pro	Ala	Cys
			325						330					335	
Leu	Ser	Met	Leu	Gln	Ser	His	Asp	Asn	Trp	Ser	Ser	Leu	Gly	Met	Pro
		340						345					350		
Ala	His	Pro	Ser	Met	Leu	Pro	Val	Ser	His	Asn	Ala	Ser	Pro	Pro	Thr
	355						360					365			
Ser	Ser	Ser	Gln	Tyr	Pro	Ser	Leu	Trp	Ser	Val	Ser	Asn	Gly	Ala	Val
370						375					380				
Thr	Pro	Gly	Ser	Gln	Ala	Ala	Ala	Val	Ser	Asn	Gly	Leu	Gly	Ala	Gln
385					390					395					400
Phe	Phe	Arg	Gly	Ser	Pro	Ala	His	Tyr	Thr	Pro	Leu	Thr	His	Pro	Val
			405						410					415	
Ser	Ala	Pro	Ser	Ser	Ser	Gly	Ser	Pro	Leu	Tyr	Glu	Gly	Ala	Ala	Ala
			420					425					430		
Ala	Thr	Asp	Ile	Val	Asp	Ser	Gln	Tyr	Asp	Ala	Ala	Ala	Gln	Gly	Arg
		435					440					445			

Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro Ser Met
 450 455 460

<210> 63
 <211> 460
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
 SEQ ID NO:61

<400> 63

Met Lys Asn Asn Leu Tyr Glu Glu Lys Met Asn Met Ser Lys Lys Gln
 1 5 10 15

Val Lys Thr Gln Ser Lys Cys Asn Asn Ile Ser Ser Pro Gly Thr Glu
 20 25 30

Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val Asp His Leu Leu Ser Ala
 35 40 45

Val Glu Asn Glu Leu Gln Ala Gly Ser Glu Lys Gly Asp Pro Thr Glu
 50 55 60

Arg Glu Leu Arg Val Gly Leu Glu Glu Ser Glu Leu Trp Leu Arg Phe
 65 70 75 80

Lys Glu Leu Thr Asn Glu Met Ile Val Thr Lys Asn Gly Arg Arg Met
 85 90 95

Phe Pro Val Leu Lys Val Asn Val Ser Gly Leu Asp Pro Asn Ala Met
 100 105 110

Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala Asp Asn His Arg Trp Lys
 115 120 125

Tyr Val Asn Gly Glu Trp Val Pro Gly Gly Lys Pro Glu Pro Gln Ala
 130 135 140

Pro Ser Cys Val Tyr Ile His Pro Asp Ser Pro Asn Phe Gly Ala His
 145 150 155 160

Trp Met Lys Ala Pro Val Ser Phe Ser Lys Val Lys Leu Thr Asn Lys
165 170 175

Leu Asn Gly Gly Gly Gln Ile Met Leu Asn Ser Leu His Lys Tyr Glu
180 185 190

Pro Arg Ile His Ile Val Arg Val Gly Gly Pro Gln Arg Met Ile Thr
195 200 205

Ser His Cys Phe Pro Glu Thr Gln Phe Ile Ala Val Thr Ala Tyr Gln
210 215 220

Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys Tyr Asn Pro Phe Ala Lys
225 230 235 240

Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp His Lys Glu Met Met Glu
245 250 255

Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr Ser Gln Trp Gly Trp Leu
260 265 270

Leu Pro Gly Thr Ser Thr Leu Cys Pro Pro Ala Asn Pro His Pro Gln
275 280 285

Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr His Ser Cys Asp Arg Tyr
290 295 300

Pro Thr Leu Arg Ser His Arg Ser Ser Pro Tyr Pro Ser Pro Tyr Ala
305 310 315 320

His Arg Asn Asn Ser Pro Thr Tyr Ser Asp Asn Ser Pro Ala Cys Leu
325 330 335

Ser Met Leu Gln Ser His Asp Asn Trp Ser Ser Leu Gly Met Pro Ala
340 345 350

His Pro Ser Met Leu Pro Val Ser His Asn Ala Ser Pro Pro Thr Ser
355 360 365

Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val Ser Asn Gly Ala Val Thr
 370 375 380

Pro Gly Ser Gln Ala Ala Ala Val Ser Asn Gly Leu Gly Ala Gln Phe
 385 390 395 400

Phe Arg Gly Ser Pro Ala His Tyr Thr Pro Leu Thr His Pro Val Ser
 405 410 415

Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr Glu Gly Ala Ala Ala Ala
 420 425 430

Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala Ala Ala Gln Gly Arg Leu
 435 440 445

Ile Ala Ser Trp Thr Pro Val Ser Pro Pro Ser Met
 450 455 460

<210> 64
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding Fusion protein comprising Brachyury
 protein Isoform 1 plus addition of 48 nucleotides from Gene FPV
 088 and an atc

<400> 64
 atgaacatga gtaagaaaca agtaaaaact caaagtaa at gtaataatat catgagctcc 60
 cctggcaccg agagcgcggg aaagagcctg cagtaccgag tggaccacct gctgagcgcc 120
 gtggagaatg agctgcaggc gggcagcgag aagggcgacc ccacagagcg cgaactgcgc 180
 gtgggcctgg aggagagcga gctgtggctg cgcttcaagg agctcaccaa tgagatgatc 240
 gtgaccaaga acggcaggag gatgtttccg gtgctgaagg tgaacgtgtc tggcctggac 300
 cccaacgcca tgtactcctt cctgctggac ttcgtggcgg cggacaacca ccgctggaag 360
 tacgtgaacg gggaatgggt gccggggggc aagccggagc cgcaggcgcc cagctgcgtc 420
 tacatccacc ccgactcgcc caacttcggg gccactgga tgaaggctcc cgtctccttc 480
 agcaaagtca agctcaccaa caagctcaac ggagggggcc agatcatgct gaactccttg 540
 cataagtatg agcctcgaat ccacatagtg agagttgggg gtccacagcg catgatcacc 600

agccactgct tccctgagac ccagttcata gcggtgactg cttatcagaa cgaggagatc	660
acagctctta aaattaagta caatccattt gcaaaagctt tccttgatgc aaaggaaaga	720
agtgatcaca aagagatgat ggaggaaccc ggagacagcc agcaacctgg gtactcccaa	780
tgggggtggc ttcttcctgg aaccagcacc gtttgtccac ctgcaaattc tcctcctcag	840
tttggaggtg ccctctccct cccctccacg cacagctgtg acaggtaccc aaccctgagg	900
agccaccggt cctcacccta cccagcccc tatgctcatc ggaacaattc tccaacctat	960
tctgacaact cacctgcatg tttatccatg ctgcaatccc atgacaattg gtccagcctt	1020
ggaatgcctg cccatcccag catgctcccc gtgagccaca atgccagccc acctaccagc	1080
tccagtcagt accccagcct gtggtctgtg agcaacggcg ccgtcacccc gggctcccag	1140
gcagcagccg tgtccaacgg gctggggggc cagttcttcc ggggctcccc cgcgcactac	1200
acacccctca cccatccggt ctcggcgccc tcttcctcgg gatccccact gtacgaaggg	1260
gcggccgcgg ccacagacat cgtggacagc cagtacgacg ccgcagccca aggccgcctc	1320
atagcctcat ggacacctgt gtcgccacct tccatgtga	1359

<210> 65

<211> 1356

<212> DNA

<213> Artificial Sequence

<220>

<223> Coding sequence encoding Fusion protein comprising Brachyury protein Isoform 1 plus addition of 48 nucleotides from Gene FPV 088 and an atc, without Brachyury atg start codon

<400> 65

atgaacatga gtaagaaaca agtaaaaact caaagtaa atgtaataat cagctcccct	60
ggcaccgaga gcgcgggaaa gagcctgcag taccgagtgg accacctgct gagcgccgtg	120
gagaatgagc tgcaggcggg cagcgagaag ggcgacccca cagagcgcgga actgcgcgtg	180
ggcctggagg agagcgagct gtggctgcgc ttcaaggagc tcaccaatga gatgatcgtg	240
accaagaacg gcaggaggat gtttccggtg ctgaaggatga acgtgtctgg cctggacccc	300
aacgccatgt actccttcct gctggacttc gtggcggcgg acaaccaccg ctggaagtac	360
gtgaacgggg aatgggtgcc ggggggcaag ccggagccgc aggcgcccag ctgcgtctac	420
atccaccccg actcgcccaa cttcggggcc cactggatga aggctcccgt ctccttcagc	480

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aaagtcaagc tcaccaacaa gctcaacgga gggggccaga tcatgctgaa ctccttgcac      540
aagtatgagc ctcgaatcca catagtgaga gttgggggtc cacagcgcat gatcaccagc      600
cactgcttcc ctgagacca gttcatagcg gtgactgctt atcagaacga ggagatcaca      660
gctcttaaaa ttaagtacaa tccatttgca aaagctttcc ttgatgcaaa ggaaagaagt      720
gatcacaaaag agatgatgga ggaacccgga gacagccagc aacctgggta ctcccaatgg      780
gggtggcttc ttcctggaac cagcaccgtt tgtccacctg caaatcctca tcctcagttt      840
ggagggtgcc tctccctccc ctccacgcac agctgtgaca ggtaccaaac cctgaggagc      900
caccggtcct caccctaccc cagcccctat gctcatcgga acaattctcc aacctattct      960
gacaactcac ctgcatgttt atccatgctg caatcccatg acaattggtc cagccttgga     1020
atgcctgccc atcccagcat gctccccgtg agccacaatg ccagcccacc taccagctcc     1080
agtcagtacc ccagcctgtg gtctgtgagc aacggcgccg tcaccccggg ctcccaggca     1140
gcagccgtgt ccaacgggct gggggcccag ttcttccggg gctccccgc gcactacaca     1200
cccctcacc atccggtctc ggcgccctct tcctcgggat cccactgta cgaaggggcg     1260
gccgcggcca cagacatcgt ggacagccag tacgacgccg cagcccaagg ccgcctcata     1320
gcctcatgga cacctgtgtc gccaccttcc atgtga                                1356

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<210> 66
 <211> 452
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
 SEQ ID NO:64

<400> 66

```

Met Asn Met Ser Lys Lys Gln Val Lys Thr Gln Ser Lys Cys Asn Asn
1           5           10          15

```

```

Ile Met Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr
          20           25           30

```

```

Arg Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly
          35           40           45

```

Ser Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu
50 55 60

Glu Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile
65 70 75 80

Val Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val
85 90 95

Ser Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val
100 105 110

Ala Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro
115 120 125

Gly Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro
130 135 140

Asp Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe
145 150 155 160

Ser Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met
165 170 175

Leu Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val
180 185 190

Gly Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln
195 200 205

Phe Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys
210 215 220

Ile Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg
225 230 235 240

Ser Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro
245 250 255

Gly Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Leu Cys

260

265

270

Pro Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro
 275 280 285

Ser Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser
 290 295 300

Ser Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr
 305 310 315 320

Ser Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn
 325 330 335

Trp Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser
 340 345 350

His Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp
 355 360 365

Ser Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val
 370 375 380

Ser Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr
 385 390 395 400

Thr Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro
 405 410 415

Leu Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr
 420 425 430

Asp Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser
 435 440 445

Pro Pro Ser Met
 450

<210> 67

<211> 451

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
SEQ ID NO:65

<400> 67

Met Asn Met Ser Lys Lys Gln Val Lys Thr Gln Ser Lys Cys Asn Asn
1 5 10 15

Ile Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg
20 25 30

Val Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser
35 40 45

Glu Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu
50 55 60

Ser Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val
65 70 75 80

Thr Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser
85 90 95

Gly Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala
100 105 110

Ala Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly
115 120 125

Gly Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp
130 135 140

Ser Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser
145 150 155 160

Lys Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu
165 170 175

Asn Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly
180 185 190

Gly Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe
195 200 205

Ile Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile
210 215 220

Lys Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser
225 230 235 240

Asp His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly
245 250 255

Tyr Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Leu Cys Pro
260 265 270

Pro Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser
275 280 285

Thr His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser
290 295 300

Pro Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser
305 310 315 320

Asp Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp
325 330 335

Ser Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His
340 345 350

Asn Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser
355 360 365

Val Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser
370 375 380

Asn Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr
385 390 395 400

Pro Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu
405 410 415

Tyr Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp
420 425 430

Ala Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro
435 440 445

Pro Ser Met
450

<210> 68
<211> 1353
<212> DNA
<213> Artificial Sequence

<220>
<223> Coding sequence encoding Fusion protein comprising Brachyury protein Isoform 1 plus addition of 42 nucleotides from Gene FPV 088 and an atc

<400> 68
atgagtaaga aacaagtaaa aactcaaagt aaatgtaata atatcatgag ctcccctggc 60
accgagagcg cgaggaaagag cctgcagtac cgagtggacc acctgctgag cgccgtggag 120
aatgagctgc aggcgggag cgagaagggc gacccacag agcgcgaact gcgcgtgggc 180
ctggaggaga gcgagctgtg gctgcgcttc aaggagctca ccaatgagat gatcgtgacc 240
aagaacggca ggaggatgtt tccggtgctg aaggtgaacg tgtctggcct ggacccaac 300
gccatgtact ccttcctgct ggacttcgtg gcggcggaca accaccgtg gaagtacgtg 360
aacggggaat gggtgccggg gggcaagccg gagccgcagg cgcccagctg cgtctacatc 420
caccgact cgcccaactt cggggccac tggatgaagg ctcccgtctc cttcagcaaa 480
gtcaagctca ccaacaagct caacggaggg ggccagatca tgctgaactc cttgcataag 540
tatgagctc gaatccacat agtgagagtt gggggtccac agcgcagatg caccagccac 600
tgcttccctg agaccagtt catagcggtg actgcttata agaacgagga gatcacagct 660
cttaaaatta agtacaatcc atttgcaaaa gctttccttg atgcaaagga aagaagtgat 720
caciaagaga tgatggagga acccgagac agccagcaac ctgggtactc ccaatggggg 780
tggcttcttc ctggaaccag caccgtttgt ccacctgcaa atcctcatcc tcagtttggg 840

ggtgccctct ccctcccctc cacgcacagc tgtgacaggt acccaaccct gaggagccac	900
cggtcctcac cctaccccag cccctatgct catcggaaca attctccaac ctattctgac	960
aactcacctg catgtttatc catgctgcaa tcccatgaca attggtccag ccttggaatg	1020
cctgcccac cagcatgct ccccgtagc cacaatgcca gccacctac cagctccagt	1080
cagtaccca gcctgtggtc tgtgagcaac ggcgccgtca ccccgggctc ccaggcagca	1140
gccgtgtcca acgggctggg ggcccagttc ttccggggct ccccgcgca ctacacaccc	1200
ctcacccatc cggtctcggc gccctcttcc tcgggatccc cactgtacga aggggcggcc	1260
gcggccacag acatcgtgga cagccagtac gacgccgag cccaaggccg cctcatagcc	1320
tcatggacac ctgtgtcgcc accttccatg tga	1353

<210> 69
 <211> 1350
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Coding sequence encoding Fusion protein comprising Brachyury protein Isoform 1 plus addition of 42 nucleotides from Gene FPV 088 and an atc, without Brachyury atg start codon

<400> 69	
atgagtaaga aacaagtaaa aactcaaagt aaatgtaata atatcagctc ccctggcacc	60
gagagcgcgg gaaagagcct gcagtaccga gtggaccacc tgctgagcgc cgtggagaat	120
gagctgcagg cgggcagcga gaagggcgac cccacagagc gcgaactgcg cgtgggcctg	180
gaggagagcg agctgtggct gcgcttcaag gagctcacca atgagatgat cgtgaccaag	240
aacggcagga ggatgtttcc ggtgctgaag gtgaacgtgt ctggcctgga cccaacgcc	300
atgtactcct tcctgctgga cttcgtggcg gcggacaacc accgctggaa gtacgtgaac	360
ggggaatggg tgccgggggg caagccggag ccgcaggcgc ccagctgcgt ctacatccac	420
cccgactcgc ccaacttcgg ggcccactgg atgaaggctc ccgtctcctt cagcaaagtc	480
aagctcacca acaagctcaa cggagggggc cagatcatgc tgaactcctt gcataagtat	540
gagcctcgaa tccacatagt gagagtggg ggtccacagc gcatgatcac cagccactgc	600
ttccctgaga ccagttcat agcggtgact gcttatcaga acgaggagat cacagctctt	660
aaaattaagt acaatccatt tgcaaaagct ttccttgatg caaaggaaag aagtgatcac	720

aaagagatga tggaggaacc cggagacagc cagcaacctg ggtactccca atgggggtgg 780
 cttcttcctg gaaccagcac cgtttgtcca cctgcaaadc ctcatcctca gtttggaggt 840
 gccctctccc tcccctccac gcacagctgt gacaggtacc caaccctgag gagccaccgg 900
 tcctcaccct accccagccc ctatgctcat cggaacaatt ctccaaccta ttctgacaac 960
 tcacctgcat gtttatccat gctgcaatcc catgacaatt ggtccagcct tggaatgcct 1020
 gcccatccca gcatgctccc cgtgagccac aatgccagcc cacctaccag ctccagtcag 1080
 taccacagcc tgtggtctgt gagcaacggc gccgtcacc cgggctccca ggcagcagcc 1140
 gtgtccaacg ggctgggggc ccagttcttc cggggctccc ccgcgcacta cacaccctc 1200
 acccatccgg tctcggcgcc ctcttcctcg ggatccccac tgtacgaagg ggcggccgcg 1260
 gccacagaca tcgtggacag ccagtagcac gccgcagccc aaggccgcct catagcctca 1320
 tggacacctg tgtcgccacc ttccatgtga 1350

<210> 70

<211> 450

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
SEQ ID NO:68

<400> 70

Met Ser Lys Lys Gln Val Lys Thr Gln Ser Lys Cys Asn Asn Ile Met
1 5 10 15

Ser Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val
20 25 30

Asp His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu
35 40 45

Lys Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser
50 55 60

Glu Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr
65 70 75 80

Lys Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser Gly
85 90 95

Leu Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala
100 105 110

Asp Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly Gly
115 120 125

Lys Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp Ser
130 135 140

Pro Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser Lys
145 150 155 160

Val Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu Asn
165 170 175

Ser Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly Gly
180 185 190

Pro Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe Ile
195 200 205

Ala Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys
210 215 220

Tyr Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp
225 230 235 240

His Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr
245 250 255

Ser Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Leu Cys Pro Pro
260 265 270

Ala Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr
275 280 285

His Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser Pro

290

295

300

Tyr Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser Asp
 305 310 315 320

Asn Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp Ser
 325 330 335

Ser Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His Asn
 340 345 350

Ala Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val
 355 360 365

Ser Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser Asn
 370 375 380

Gly Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr Pro
 385 390 395 400

Leu Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr
 405 410 415

Glu Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala
 420 425 430

Ala Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro
 435 440 445

Ser Met
 450

<210> 71

<211> 449

<212> PRT

<213> Artificial Sequence

<220>

<223> Fusion protein comprising Brachyury protein Isoform 1 encoded by
 SEQ ID NO:69

<400> 71

Met Ser Lys Lys Gln Val Lys Thr Gln Ser Lys Cys Asn Asn Ile Ser
 1 5 10 15

Ser Pro Gly Thr Glu Ser Ala Gly Lys Ser Leu Gln Tyr Arg Val Asp
 20 25 30

His Leu Leu Ser Ala Val Glu Asn Glu Leu Gln Ala Gly Ser Glu Lys
 35 40 45

Gly Asp Pro Thr Glu Arg Glu Leu Arg Val Gly Leu Glu Glu Ser Glu
 50 55 60

Leu Trp Leu Arg Phe Lys Glu Leu Thr Asn Glu Met Ile Val Thr Lys
 65 70 75 80

Asn Gly Arg Arg Met Phe Pro Val Leu Lys Val Asn Val Ser Gly Leu
 85 90 95

Asp Pro Asn Ala Met Tyr Ser Phe Leu Leu Asp Phe Val Ala Ala Asp
 100 105 110

Asn His Arg Trp Lys Tyr Val Asn Gly Glu Trp Val Pro Gly Gly Lys
 115 120 125

Pro Glu Pro Gln Ala Pro Ser Cys Val Tyr Ile His Pro Asp Ser Pro
 130 135 140

Asn Phe Gly Ala His Trp Met Lys Ala Pro Val Ser Phe Ser Lys Val
 145 150 155 160

Lys Leu Thr Asn Lys Leu Asn Gly Gly Gly Gln Ile Met Leu Asn Ser
 165 170 175

Leu His Lys Tyr Glu Pro Arg Ile His Ile Val Arg Val Gly Gly Pro
 180 185 190

Gln Arg Met Ile Thr Ser His Cys Phe Pro Glu Thr Gln Phe Ile Ala
 195 200 205

Val Thr Ala Tyr Gln Asn Glu Glu Ile Thr Ala Leu Lys Ile Lys Tyr
 210 215 220

Asn Pro Phe Ala Lys Ala Phe Leu Asp Ala Lys Glu Arg Ser Asp His
 225 230 235 240

Lys Glu Met Met Glu Glu Pro Gly Asp Ser Gln Gln Pro Gly Tyr Ser
 245 250 255

Gln Trp Gly Trp Leu Leu Pro Gly Thr Ser Thr Leu Cys Pro Pro Ala
 260 265 270

Asn Pro His Pro Gln Phe Gly Gly Ala Leu Ser Leu Pro Ser Thr His
 275 280 285

Ser Cys Asp Arg Tyr Pro Thr Leu Arg Ser His Arg Ser Ser Pro Tyr
 290 295 300

Pro Ser Pro Tyr Ala His Arg Asn Asn Ser Pro Thr Tyr Ser Asp Asn
 305 310 315 320

Ser Pro Ala Cys Leu Ser Met Leu Gln Ser His Asp Asn Trp Ser Ser
 325 330 335

Leu Gly Met Pro Ala His Pro Ser Met Leu Pro Val Ser His Asn Ala
 340 345 350

Ser Pro Pro Thr Ser Ser Ser Gln Tyr Pro Ser Leu Trp Ser Val Ser
 355 360 365

Asn Gly Ala Val Thr Pro Gly Ser Gln Ala Ala Ala Val Ser Asn Gly
 370 375 380

Leu Gly Ala Gln Phe Phe Arg Gly Ser Pro Ala His Tyr Thr Pro Leu
 385 390 395 400

Thr His Pro Val Ser Ala Pro Ser Ser Ser Gly Ser Pro Leu Tyr Glu
 405 410 415

Gly Ala Ala Ala Ala Thr Asp Ile Val Asp Ser Gln Tyr Asp Ala Ala
 420 425 430

Ala Gln Gly Arg Leu Ile Ala Ser Trp Thr Pro Val Ser Pro Pro Ser
435 440 445

Met

<210> 72
<211> 1516
<212> DNA
<213> Artificial Sequence

<220>
<223> Expression Cassette found in mBN345 - Promoter + cDNA encoding
Fusion protein comprising Brachyury (L254V) Protein

<400> 72
atccgtacag gtttgtttct gaaattcact ttgtaagata cataattaac aaattcaggg 60
ggaaaaatct ttacaaaatt agtatagaag ctatagatat atcaaaaggt agacaacaaa 120
taatcagaac ctaatttttt tatcaaaaaa ttaaaatata aataaaatga aaaataactt 180
gtatgaagaa aaaatgaaca tgagtaagaa aagctcccct ggcaccgaga gcgcgggaaa 240
gagcctgcag taccgagtgg accacctgct gagcgccgtg gagaatgagc tgcaggcggg 300
cagcgagaag ggcgacccca cagagcgcgga actgcgcgtg ggcctggagg agagcgagct 360
gtggctgcgc ttcaaggagc tcaccaatga gatgatcgtg accaagaacg gcaggaggat 420
gtttccggtg ctgaaggatga acgtgtcttg cctggacccc aacgccatgt actccttcct 480
gctggacttc gtggcggcgg acaaccaccg ctggaagtac gtgaacgggg aatgggtgcc 540
ggggggcaag ccggagccgc aggcgcccag ctgcgtctac atccaccccg actcgcccaa 600
cttcggggcc cactggatga aggctcccgt ctccttcagc aaagtcaagc tcaccaacaa 660
gctcaacgga gggggccaga tcatgctgaa ctccttgcac aagtatgagc ctcgaatcca 720
catagtgaaga gttgggggtc cacagcgcat gatcaccagc cactgcttcc ctgagaccca 780
gttcatagcg gtgactgctt atcagaacga ggagatcaca gctcttaaaa ttaagtacaa 840
tccatttgca aaggcttttc ttgatgcaaa ggaaagaagt gatcacaaag agatgatgga 900
ggaacccgga gacagccagc aacctgggta ctcccaatgg gggtggcttc ttcctggaac 960
cagcaccgtt tgtccacctg caaatcctca tcctcagttt ggaggtgccc tctccctccc 1020
ctccacgcac agctgtgaca ggtaccaaac cctgaggagc caccggtcct caccctaccc 1080

cagccccctat gctcatcgga acaattctcc aacctattct gacaactcac ctgcatgttt	1140
atccatgctg caatcccatg acaattgggc cagccttgga atgcctgccc atcccagcat	1200
gctccccgtg agccacaatg ccagcccacc taccagctcc agtcagtacc ccagcctgtg	1260
gtctgtgagc aacggcgccg tcaccccggt ctcccaggca gcagccgtgt ccaacgggct	1320
gggggcccag ttcttcgggt gctccccgc gcactacaca cccctcacc atccggtctc	1380
ggcgccctct tcctcgggat cccactgta cgaaggggcg gccgcggcca cagacatcgt	1440
ggacagccag tacgacgccg cagcccaagg ccgcctcata gcctcatgga cacctgtgtc	1500
gccaccttcc atgtga	1516

<210> 73

<211> 1552

<212> DNA

<213> Artificial Sequence

<220>

<223> Expression Cassette found in mBN355 - Promoter + cDNA encoding
Fusion protein comprising Brachyury (L254V) Protein

<400> 73

atccgtacag gtttgtttct gaaattcact ttgtaagata cataattaac aaattcaggg	60
ggaaaaatct ttacaaaatt agtatagaag ctatagatat atcaaaaggt agacaacaaa	120
taatcagaac ctaatttttt tatcaaaaaa ttaaaatata aataaaatga aaaataactt	180
gtatgaagaa aaaatgaaca tgagtaagaa acaagtaaaa actcaaagta aatgtaataa	240
tatcatgagc tcccctggca ccgagagcgc gggaaagagc ctgcagtacc gagtggacca	300
cctgctgagc gccgtggaga atgagctgca ggcgggcagc gagaagggcg accccacaga	360
gcgcgaactg cgcgtgggccc tggaggagag cgagctgtgg ctgcgcttca aggagctcac	420
caatgagatg atcgtgacca agaacggcag gaggatgttt ccggtgctga aggtgaacgt	480
gtctggcctg gacccaacg ccatgtactc cttcctgctg gacttcgtgg cggcggacaa	540
ccaccgctgg aagtacgtga acggggaatg ggtgccgggg ggcaagccgg agccgcaggc	600
gcccagctgc gtctacatcc accccgactc gcccaacttc ggggcccact ggatgaaggc	660
tcccgctctc ttcagcaaag tcaagctcac caacaagctc aacggagggg gccagatcat	720
gctgaactcc ttgcataagt atgagcctcg aatccacata gtgagagttg ggggtccaca	780
gcgcatgatc accagccact gttccctga gaccagttc atagcgggtga ctgcttatca	840

gaacgaggag atcacagctc ttaaaattaa gtacaatcca ttgcaaagg ctttccttga	900
tgcaaaggaa agaagtgatc acaaagagat gatggaggaa cccggagaca gccagcaacc	960
tgggtactcc caatgggggt ggcttcttcc tggaaccagc accgtttgtc cacctgcaaa	1020
tcctcatcct cagtttggag gtgccctctc cctcccctcc acgcacagct gtgacaggta	1080
cccaaccctg aggagccacc ggtcctcacc ctaccccagc ccctatgctc atcggaacaa	1140
ttctccaacc tattctgaca actcacctgc atgtttatcc atgctgcaat cccatgacaa	1200
ttggtccagc cttggaatgc ctgcccaccc cagcatgctc cccgtgagcc acaatgccag	1260
cccacctacc agctccagtc agtaccaccc cctgtggtct gtgagcaacg gcgccgtcac	1320
cccgggctcc caggcagcag ccgtgtccaa cgggctgggg gccagttct tccggggctc	1380
ccccgcgcac tacacacccc tcacccatcc ggtctcggcg ccctcttcct cgggatcccc	1440
actgtacgaa ggggcggccg cggccacaga catcgtggac agccagtacg acgccgcagc	1500
ccaaggccgc ctcatagcct catggacacc tgtgtcgcca cttccatgt ga	1552

<210> 74

<211> 1464

<212> DNA

<213> Artificial Sequence

<220>

<223> Expression Cassette found in mBN343 - Promoter + cDNA encoding
Fusion protein comprising Brachyury (L254V) Protein

<400> 74

taatgtatag aactaattta taataaacat agtaaatatg ggtaacttct taatagccat	60
aattaaaatt gaaaaaaaaa tatkattata aaacgtaaac gaacaaaaaa cattaattga	120
tcccccccct gtctcccccc tccagattga gcaatcatga gctcccctgg caccgagagc	180
gcgggaaaga gcctgcagta ccgagtggac cacctgctga gcgccgtgga gaatgagctg	240
caggcgggca gcgagaaggc cgaccccaca gagcgcaaac tgcgcgtggg cctggaggag	300
agcgagctgt ggctgcgctt caaggagctc accaatgaga tgatcgtgac caagaacggc	360
aggaggatgt ttccgggtgt gaaggtgaac gtgtctggcc tggaccccaa cgccatgtac	420
tccttcctgc tggacttcgt ggcggcggac aaccaccgct ggaagtacgt gaacggggaa	480
tgggtgccgg ggggcaagcc ggagccgcag gcgccagct gcgtctacat ccaccccgac	540

tcgccaact tcggggccca ctggatgaag gctcccgtct ccttcagcaa agtcaagctc	600
accaacaagc tcaacggagg gggccagatc atgctgaact ccttgcataa gtatgagcct	660
cgaatccaca tagtgagagt tgggggtcca cagcgcatga tcaccagcca ctgcttcctt	720
gagaccagcgc tcatagcggc gactgcttat cagaacgagg agatcacagc tcttaaaatt	780
aagtacaatc catttgcaaa ggcttttcctt gatgcaaagg aaagaagtga tcacaaagag	840
atgatggagg aacccggaga cagccagcaa cctgggtact cccaatgggg gtggcttctt	900
cctggaacca gcaccgtttg tccacctgca aatcctcatc ctgagtttgg aggtgccctc	960
tccctcccct ccacgcacag ctgtgacagg tacccaacct tgaggagcca ccggtcctca	1020
ccctacccca gcccctatgc tcatcggaac aattctccaa cctattctga caactcacct	1080
gcatgtttat ccatgctgca atcccatgac aattgggtcca gccttggaat gcctgcccac	1140
cccagcatgc tccccgtgag ccacaatgcc agcccaccta ccagctccag tcagtacccc	1200
agcctgtggc ctgtgagcaa cggcgccgtc accccgggct cccaggcagc agccgtgtcc	1260
aacgggctgg gggcccagtt cttccggggc tccccgcgc actacacacc cctcacccat	1320
ccggtctcgg cgccctcttc ctgaggatcc cactgtacg aaggggcggc cgcggccaca	1380
gacatcgtgg acagccagta cgacgccga gcccaaggcc gcctcatagc ctcatggaca	1440
cctgtgtcgc caccttccat gtga	1464

<210> 75
 <211> 1478
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Expression Cassette found in mBN344 - Promoter + cDNA encoding
 Fusion protein comprising Brachyury (L254V) Protein

<400> 75	
tatccgtaca ggtttgtttc tgaaattcac tttgtaagat acataattaa caaattcagg	60
gggaaaaatc ttacaaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa	120
ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaaatc atgagctccc	180
ctggcaccga gagcgcgagg aagagcctgc agtaccgagt ggaccacctg ctgagcgccg	240
tggagaatga gctgcaggcg ggcagcgaga agggcgaccc cacagagcgc gaactgcgcg	300
tgggcctgga ggagagcgag ctgtggctgc gcttcaagga gctcaccaat gagatgatcg	360

tgaccaagaa cggcaggagg atgtttccgg tgctgaaggt gaacgtgtct ggcctggacc	420
ccaacgccat gtactccttc ctgctggact tcgtggcggc ggacaaccac cgctggaagt	480
acgtgaacgg ggaatgggtg ccggggggca agccggagcc gcaggcgccc agctgcgtct	540
acatccaccc cgactcgccc aacttcgggg cccactggat gaaggctccc gtctccttca	600
gcaaagtcaa gtcaccaac aagctcaacg gagggggcca gatcatgctg aactccttgc	660
ataagtatga gcctcgaatc cacatagtga gagttggggg tccacagcgc atgatcacca	720
gccactgctt ccctgagacc cagttcatag cggtgactgc ttatcagaac gaggagatca	780
cagctcttaa aattaagtac aatccatttg caaaggcttt ccttgatgca aaggaaagaa	840
gtgatcacia agagatgatg gaggaacccg gagacagcca gcaacctggg tactcccaat	900
gggggtggct tcttcctgga accagcaccg tttgtccacc tgcaaatcct catcctcagt	960
ttggagggtgc cctctccctc ccctccacgc acagctgtga caggtacca accctgagga	1020
gccaccggtc ctcaccctac cccagcccct atgctcatcg gaacaattct ccaacctatt	1080
ctgacaactc acctgcatgt ttatccatgc tgcaatccca tgacaattgg tccagccttg	1140
gaatgcctgc ccatcccagc atgctccccg tgagccacaa tgccagccca cctaccagct	1200
ccagtcagta cccagcctg tggctctgtga gcaacggcgc cgtcaccccg ggctcccagg	1260
cagcagccgt gtccaacggg ctggggggccc agttcttccg gggctcccc gcgcactaca	1320
caccctcac ccatccggtc tcggcgccct cttcctcggg atccccactg tacgaagggg	1380
cggccgcggc cacagacatc gtggacagcc agtacgacgc cgcagcccaa ggccgcctca	1440
tagcctcatg gacacctgtg tcgccacctt ccatgtga	1478

<210> 76

<211> 1486

<212> DNA

<213> Artificial Sequence

<220>

<223> Expression Cassette found in mBN354 - Promoter + cDNA encoding
Fusion protein comprising Brachyury (L254V) Protein

<400> 76

atccgtacag gtttgtttct gaaattcact ttgtaagata cataattaac aaattcaggg	60
---	----

ggaaaaatct ttacaaaatt agtatagaag ctatagatat atcaaaaggt agacaacaaa	120
---	-----

taatcagaac ctaatTTTTT tatcaaaaaa ttaaaatata aataaaatga aaaataactt	180
gagctcccct ggcaccgaga gcgcgggaaa gagcctgcag taccgagtgg accacctgct	240
gagcgccgtg gagaatgagc tgcaggcggg cagcgagaag ggcgaccca cagagcgca	300
actgcgcgtg ggcctggagg agagcgagct gtggctgcgc ttcaaggagc tcaccaatga	360
gatgatcgtg accaagaacg gcaggaggat gtttccggtg ctgaaggatga acgtgtctgg	420
cctggacccc aacgccatgt actccttcct gctggacttc gtggcggcgg acaaccaccg	480
ctggaagtac gtgaacgggg aatgggtgcc ggggggcaag ccggagccgc aggcgcccag	540
ctgcgtctac atccaccccg actcgcccaa cttcggggcc cactggatga aggctcccgt	600
ctccttcagc aaagtcaagc tcaccaacaa gctcaacgga gggggccaga tcatgctgaa	660
ctccttgcat aagtatgagc ctcgaatcca catagtgaga gttgggggtc cacagcgcat	720
gatcaccagc cactgcttcc ctgagacca gttcatagcg gtgactgctt atcagaacga	780
ggagatcaca gctcttaaaa ttaagtacaa tccatttgca aaggctttcc ttgatgcaaa	840
ggaaagaagt gatcacaag agatgatgga ggaaccgga gacagccagc aacctgggta	900
ctcccaatgg ggggtggcttc ttcctggaac cagcaccgtt tgtccacctg caaatcctca	960
tcctcagttt ggaggtgccc tctccctccc ctccacgcac agctgtgaca ggtacccaac	1020
cctgaggagc caccggtcct caccctacc cagcccctat gctcatcgga acaattctcc	1080
aacctattct gacaactcac ctgcatgttt atccatgctg caatcccatg acaattggtc	1140
cagccttgga atgcctgccc atcccagcat gctccccgtg agccacaatg ccagcccacc	1200
taccagctcc agtcagtacc ccagcctgtg gtctgtgagc aacggcgccg tcaccccggg	1260
ctcccaggca gcagccgtgt ccaacgggct gggggcccag ttcttccggg gctccccgc	1320
gcactacaca cccctcacc atccggtctc ggcgccctct tcctcgggat cccactgta	1380
cgaaggggcg gccgcggcca cagacatcgt ggacagccag tacgacgccg cagcccaagg	1440
ccgcctcata gcctcatgga cacctgtgtc gccaccttcc atgtga	1486

<210> 77

<211> 182

<212> DNA

<213> Artificial Sequence

<220>

<223> Promoter Sequence with nucleotides 5' of Gene FPV 088 + 15

nucleotides

<400> 77
tatccgtaca ggtttgtttc tgaaattcac tttgtaagat acataattaa caaattcagg 60
gggaaaaatc ttacaaaat tagtatagaa gctatagata tatcaaaagg tagacaacaa 120
ataatcagaa cctaattttt ttatcaaaaa attaaaatat aaataaaatg aaaaataact 180
tg 182

CLAIMS

We claim:

1. An expression cassette for expression of a coding sequence, the expression cassette comprising:
 - a. a promoter comprising a nucleic sequence having at least 70% identity to any one of SEQ ID NOs: 1-10, and 77; and
 - b. a coding sequence operably linked to the promoter;wherein expression of the coding sequence is controlled by the promoter.
2. The expression cassette of claim 1, wherein the promoter comprises a nucleic acid sequence having at least 75%, 80%, 85%, or 90% identity to any one of SEQ ID NOs: 1-10, and 77.
3. The expression cassette of claims 1-2, wherein the promoter is selected from a nucleic acid sequence capable of hybridizing to anyone of SEQ ID NOs:1-10, and 77.
4. The expression cassette of claim 1-3, wherein the expression cassette is not an expression cassette that naturally occurs in the genome of a poxvirus.
5. The expression cassette of claims 1-4, wherein the promoter comprises a nucleic acid sequence having at least 70% identity to any one of SEQ ID NO:4 and SEQ ID NO:5.
6. The expression cassette of claims 1-4, wherein the promoter comprises a nucleic acid sequences selected from the group consisting of SEQ ID NO:4 and SEQ ID NO:5.
7. The expression cassette of claims 1-4, wherein the promoter is SEQ ID NO:9, or a subsequence thereof.
8. The expression cassette of claim 7, wherein the subsequence is selected from SEQ ID NOs: 4 and 5.
9. The expression cassette of claims 1-8, wherein the coding sequence encodes for at least one: (a) therapeutic protein or peptide, antigen, antigenic epitope, antisense RNA, tumor-associated antigen or epitope, or ribozyme.
10. The expression cassette of claims 1-8, wherein the coding sequence encodes for at least one tumor-associated antigen (TAA).

11. The expression cassette of claims 1-10, wherein the coding sequence encodes for at least one TAA selected from CEA, MUC-1, PAP, PSA, HER-2, survivin, tyrosine related protein 1 (tyrp1), tyrosine related protein 2 (tyrp2), Brachyury antigen, or combinations thereof.

12. The expression cassette of claims 1-11, wherein the coding sequence encodes for a brachyury antigen.

13. The expression cassette of claim 12, wherein the brachyury antigen is Brachyury L254V.

14. The expression cassette of claim 12, wherein the coding sequence comprises a nucleic acid sequence encoding a brachyury antigen selected from the group consisting of: SEQ ID NO: 11 and SEQ ID NO:13.

15. The expression cassette of claim 12, wherein the coding sequence is selected from the group consisting of: SEQ ID NO: 12, SEQ ID NO:14, and SEQ ID NO:15.

16. The expression cassette of claims 1-11, wherein the coding sequence comprises a nucleic acid encoding for a brachyury antigen selected from the group consisting of: SEQ ID NOs: 11, 13, 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63 66-67, 70, and 71.

17. The expression cassette of claims 1-11, wherein the coding sequence comprises a nucleic acid encoding for a brachyury antigen selected from the group consisting of: SEQ ID NOs: 13, 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42, and 43.

18. The expression cassette of claims 1-11, wherein the coding sequence comprises a nucleic acid encoding for a brachyury antigen selected from the group consisting of: SEQ ID NOs: 26-27, 30-31, 38-39, 42, and 43.

19. The expression cassette of claims 1-11, wherein the coding sequence comprises a nucleic acid having at least 70% identity to nucleic acid selected from the group consisting of: SEQ ID NOs: 24-25, 28-29, 36-37, 40, and 41.

20. The expression cassette of claims 1-11, wherein the coding sequence comprises a nucleic acid having at least 70% identity to SEQ ID NOs: 25 or 29, or a subsequence thereof.

21. The expression cassette of claims 1-11, wherein the coding sequence comprises a nucleic acid having at least 70% sequence identity to a nucleic acid selected from the group consisting of: 12, 14-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69.

22. An expression cassette comprising a nucleic acid selected from the group consisting of: SEQ ID NOs: 72-76.

23. An expression cassette comprising a nucleic acid selected from the group consisting of: SEQ ID NO:72, SEQ ID NO: 73, and SEQ ID NO:74.

24. A promoter for enhancing expression of a coding sequence, the promoter comprising or consisting of a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-10, and 77, or a derivative sequence of any one of SEQ ID NOs: 1-10, and 77, wherein the derivative has one or more substitutions, deletions, and/or insertions, and wherein the derivative sequence is active as a poxvirus promoter and/or active in a poxvirus infected cell.

25. A promoter for enhancing expression of a coding sequence, the promoter comprising or consisting of a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-10, and 77, or a subsequence thereof.

26. A promoter for enhancing expression of a coding sequence, the promoter comprising or consisting of a nucleic acid sequence having at least 70% identity to SEQ ID NO:9, or a subsequence thereof.

27. The promoter of claim 26, wherein the subsequence is selected from the group consisting of SEQ ID NOs: 3-8.

28. A synthetic nucleic acid having at least 70% identity to a nucleic acid encoding for a brachyury antigen selected from the group consisting of: SEQ ID NOs: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71, or a subsequence thereof.

29. A synthetic nucleic acid selected from the group consisting of: 16-17, 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45, 48-49, 52-53, 56-57, 60-61, 64-65, 68, and 69, or a subsequence thereof.

30. A synthetic protein selected from the group consisting of: 18-19, 22-23, 26-27, 30-31, 34-35, 38-39, 42-43, 46-47, 50-51, 54-55, 58-59, 62-63, 66-67, 70, and 71, or a subsequence thereof.

31. A vector comprising the expression cassette of claims 1-23, the promoter of claims 24-27, the nucleic acid of claims 28-29, and/or the protein of claim 30.

32. The vector of claim 31, wherein the vector is a plasmid.

33. The vector of claim 31, wherein the vector is a recombinant virus.

34. The vector of claim 33, wherein the recombinant virus is a poxvirus.
35. The vector of claim 34, wherein the poxvirus is an avipoxvirus.
36. The vector of claim 35, wherein the avipoxvirus is a fowlpox virus.
37. The vector of claims 31-36, wherein the expression cassette is inserted into a deletion site of the poxvirus genome.
38. The vector of claims 31-35, wherein the expression cassette is inserted into an intergenic region of the poxviral genome.
39. The vector of claims 33-34, wherein the vector is an orthopoxvirus.
40. The vector of claim 39, wherein the orthopoxvirus is selected from a vaccinia virus, a modified Ankara Virus (MVA), or MVA-BN.
41. A vaccine, medicament, or pharmaceutical composition comprising: a) an expression cassette according to any one of claims 1-23, b) a promoter of claims 24-27, c) a nucleic acid of claims 28-29, d) a protein of claim 30, or e) a vector according to any one of claims 31-40.
42. A cell comprising: a) an expression cassette according to any one of claims 1-23, b) a promoter of claims 24-27, c) a nucleic acid of claims 28-29, d) a protein of claim 30, or e) a vector according to any one of claims 31-40.
43. A method for introducing a coding sequence into a target cell comprising introducing into the target cell a) an expression cassette according to any one of claims 1-23, b) a promoter of claims 24-27, c) a nucleic acid of claims 28-29, or d) a vector according to any one of claims 31-40.
44. A method for producing a peptide, protein, or virus comprising infection of a host cells with a a) an expression cassette according to any one of claims 1-23, b) a promoter of claims 24-27, c) a nucleic acid of claims 28-29, or d) a vector according to any one of claims 31-40.
45. A method for expressing a nucleic acid comprising:
- providing an expression vector or virus comprising a) an expression cassette according to any one of claims 1-23, b) a promoter of claims 24-27, c) a nucleic acid of claims 28-29; and
 - subjecting the expression vector or virus to conditions conducive to expression of the expression cassette, the promoter, or the nucleic acid.

46. Use of a) an expression cassette according to any one of claims 1-23, b) a promoter of claims 24-27, c) a nucleic acid of claims 28-29, d) a protein of claim 30, or e) a vector according to any one of claims 31-40 in the preparation of a medicament preferably a vaccine.

47. Use of a) an expression cassette according to any one of claims 1-23, b) a promoter of claims 24-27, c) a nucleic acid of claims 28-29, d) a protein of claim 30, or e) a vector according to any one of claims 31-40 for expressing a nucleic acid.

48. An a) an expression cassette according to any one of claims 1-23, b) a promoter of claims 24-27, c) a nucleic acid of claims 28-29, d) a protein of claim 30, or e) a vector according to any one of claims 31-40 for use as a medicament preferably a vaccine.

49. An a) an expression cassette according to any one of claims 1-23, b) a promoter of claims 24-27, c) a nucleic acid of claims 28-29, or d) a vector according to any one of claims 31-40 for use in a method for introducing a coding sequence into a target cell