CLAIMS

1. A vaccine comprising a vector, wherein the vector comprises an expression cassette comprising a nucleic acid sequence under operable control of a first promoter, wherein the nucleic acid sequence encodes a fusion protein comprising, from N-terminus to C-terminus:
    a) N-terminal secretion signal sequence of a secreted or a first membrane-bound protein;
    b) an antigen from a non-enveloped virus;
    c) a transmembrane domain of a second membrane-bound protein,
    wherein the antigen is a Piscine Myocarditis Virus (PMCV) ORF-1 antigen.

2. The vaccine of claim 1, wherein said first protein is selected from the group consisting of Intereferon a, Interferon b, Interferon c, Interferon d, Interferon gamma, interleukine-2, interleukine 4, interleukine-12 Hemagglutinin (HE) protein of Infectious salmon anemia virus (ISAV), viral hemorrhagic septicemia virus G-protein and the fusion protein of Atlantic Salmon Paramyxovirus, and said second protein is independently selected from the group consisting of Hemagglutinin (HE) protein of Infectious salmon anemia virus (ISAV), viral hemorrhagic septicemia virus G-protein and the fusion protein of Atlantic Salmon Paramyxovirus

3. The vaccine of claim 1 wherein the first membrane-bound protein is identical to the second membrane-bound protein.

4. The vaccine of claim 3, wherein said membrane bound protein is viral hemorrhagic septicemia virus G-protein (VHSV-G).

5. The vaccine of claim 4, wherein said N-terminal secretion signal sequence is at least 90% identical to SEQ ID NO: 7 or 48, or wherein said secretion signal sequence comprises a portion of SEQ ID NO: 48 or a sequence at least 90% identical to SEQ ID NO: 48, wherein said portion comprises SEQ ID NO: 7 or a sequence that is at least

90% identical to SEQ ID NO: 7, optionally wherein at least half of differing amino acids in said N-terminal secretion signal are conservative substitutions.

6. The vaccine of any one of claims 1-5, wherein said transmembrane domain is at least 90% identical to SEQ ID NO: 8 or 49, or wherein said transmembrane fragment comprises a portion of SEQ ID NO: 49 or a sequence at least 90% identical to SEQ ID NO: 49, wherein said portion comprises SEQ ID NO: 8 or a sequence that is at least 90% identical to SEQ ID NO: 8, optionally wherein at least half of differing amino acids in said transmembrane domain are conservative substitutions.

7. The vaccine of any one of claims 1-6, wherein the antigen comprises SEQ ID NO: 1 or a sequence that it at least 90% identical to SEQ ID NO: 1.

8. The vaccine of any one of claims 1-6, wherein the PMCV ORF-1 antigen comprises a protein comprising, from N- to C- terminus:

a. a sequence that is at least 90% identical, or at least 91% identical, or at least 92% identical, or at least 93% identical, or at least 94% identical, or at least 95% identical, or at least 96% identical, or at least 97% identical, or at least 98% identical, or at least 99% identical, or 100% identical to SEQ ID NO: 34 or SEQ ID NO: 35, and

b. an amino acid sequence that is at least 95%, 96%, 97%, 98%, 99%, or 100% identical to any one of SEQ ID NOs: 25-33,

wherein,

i) said amino acid sequence lacks SEQ ID NO: 15 or a sequence at least 90% identical to SEQ ID NO: 15; and/or

ii) compared to SEQ ID NO: 1, said protein comprises an internal deletion that is at least four consecutive amino acids long.

9. The vaccine of claim 8, wherein said protein includes the sequence that is at least 95% identical to SEQ ID NO: 25, and lacks SEQ ID NO: 14 or a sequence that is at least 90% identical to SEQ ID NO: 14, optionally wherein said protein:

    a) lacks SEQ ID NO: 15 or a sequence that is at least 90% identical to SEQ ID NO: 15;

    b) lacks SEQ ID NO: 5 or a sequence that is at least 90% identical to SEQ ID NO: 5; and/or

    c) lacks SEQ ID NO: 5 or a sequence that is at least 90% identical to SEQ ID NO: 5 and lacks SEQ ID NO: 4 or a sequence that is at least 90% identical to SEQ ID NO: 4.

10. The vaccine of claim 8, wherein said protein includes the sequence that is at least 95% identical to SEQ ID NO: 26 and lacks SEQ ID NO: 14 or a sequence that is at least 90% identical to SEQ ID NO: 14, optionally wherein said protein:

    a) lacks SEQ ID NO: 15 or a sequence that is at least 90% identical to SEQ ID NO: 15

    b) lacks SEQ ID NO: 5 or a sequence that is at least 90% identical to SEQ ID NO: 5; and/or

    c) lacks SEQ ID NO: 24 or a sequence that is at least 90% identical to SEQ ID NO: 24.

11. The vaccine of claim 8, wherein said protein includes the sequence that is at least 95% identical to SEQ ID NO: 27, and lacks SEQ ID NO: 14 or a sequence that is at least 90% identical to SEQ ID NO: 14, optionally wherein said protein:

    a) lacks SEQ ID NO: 15 or a sequence that is at least 90% identical to SEQ ID NO: 15;

    b) lacks SEQ ID NO: 3 or a sequence that is at least 90% identical to SEQ ID NO: 3; and/or

    c) lacks SEQ ID NO: 24 or a sequence that is at least 90% identical to SEQ ID NO: 24.

12. The vaccine of claim 8, wherein said protein includes the sequence that is at least 90% identical to SEQ ID NO: 28, optionally wherein said protein:

    a) lacks SEQ ID NO: 4 or a sequence that is at least 90% identical to SEQ ID NO: 4;

    b) lacks SEQ ID NO: 3 or a sequence that is at least 90% identical to SEQ ID NO: 3; and/or

    c) lacks SEQ ID NO: 24 or a sequence that is at least 90% identical to SEQ ID NO: 24.

13. The vaccine of claim 8, wherein said protein:

a) comprises SEQ ID NO: 29 or a sequence at least 95%, or 96%, or 97% or 98% or 99% identical thereto;

b) comprises SEQ ID NO: 30 or a sequence at least 95%, or 96%, or 97% or 98% or 99% identical thereto, optionally wherein said protein lacks SEQ ID NO: 24 or a sequence that is at least 90% identical to SEQ ID NO: 24;

c) comprises SEQ ID NO: 31 or a sequence at least 95%, or 96%, or 97% or 98% or 99% identical thereto, optionally wherein said protein lacks at least one of SEQ ID NO: 3 or SEQ ID NO: 24, or an amino acid sequence that is at least 90% identical to SEQ ID NO: 3 or SEQ ID NO: 24;

d) comprises SEQ ID NO: 32 or a sequence at least 95%, or 96%, or 97% or 98% or 99% identical thereto, optionally wherein said protein lacks at least one of SEQ ID NO: 14 or SEQ ID NO: 15, or an amino acid sequence that is at least 90% identical to SEQ ID NO: 14 or SEQ ID NO: 15;

e) comprises SEQ ID NO: 33 or a sequence at least 95%, or 96%, or 97% or 98% or 99% identical thereto, optionally wherein said protein lacks SEQ ID NO: 24 an amino acid sequence that is at least 90% identical to SEQ ID NO: 24;

f) lacks SEQ ID NO: 23 or a sequence that is at least 90% identical to SEQ ID NO: 23;

g) lacks SEQ ID NO: 22 or a sequence that is at least 90% identical to SEQ ID NO: 22;

h) comprises SEQ ID NO: 15 or a sequence at least 90% identical thereto and any one of SEQ ID NOs 4, 5, 25, 26 27, 29, 30, 32, (or an amino acid sequence that is at least 90% identical to SEQ ID NO: 4, 5, 25, 26 27, 29, 30, or 32) wherein, compared to SEQ ID NO: 1, said protein comprises an internal deletion that is at least four consecutive amino acids long, and, optionally, wherein said protein comprises a linker in place of said internal deletion; or

i) lacks SEQ ID NO: 13 or a sequence that is at least 90% identical to SEQ ID NO: 13 and contains SEQ ID NO: 25 or a sequence at least 95%, or 96%, or 97% or 98% or 99% identical to SEQ ID NO: 25.

14. The vaccine according to claim 8, wherein said protein comprises SEQ ID NO: 11, 12, or 46 or a sequence that is at least 90%, or at least 91%, or at least 92%, or at least 93%, or at least 94%, or at least 95%, or at least 96%, or at least 97%, or at least 98%, or at least 99%, or 100% identical to SEQ ID NO: 11 or SEQ ID NO: 12 or SEQ ID NO: 46, optionally wherein at least 50%, or at least 60%, or at least 70%, or at least 80% or at least 90% or at least 95% or 100% of amino acids differing from SEQ ID NO: 11 or SEQ ID NO: 12 or SEQ ID NO: 46 are conservative substitutions.
15. The vaccine according to claim 8, wherein said protein comprises SEQ ID NO: 9, 10 or 47 or a sequence that is at least 90%, or at least 91%, or at least 92%, or at least 93%, or at least 94%, or at least 95%, or at least 96%, or at least 97%, or at least 98%, or at least 99% identical to SEQ ID NO: 9, SEQ ID NO: 10, or SEQ ID NO: 47, optionally wherein at least 50%, or at least 60%, or at least 70%, or at least 80% or at least 90% or at least 95% or 100% of amino acids differing from SEQ ID NO: 9 or SEQ ID NO: 10 or SEQ ID NO: 47 are conservative substitutions.
16. The vaccine of claim 1, wherein:

    a) the nucleic acid sequence comprises SEQ ID NO: 16;

    b) the first promoter is cytomegalovirus (CMV) immediate-early enhancer and promoter; and/or

    c) the vector is a plasmid vector.

17. The vaccine of any one of claims 1 to 16, further comprising a nucleic acid sequence encoding salmon interferon, wherein said salmon interferon is set forth in SEQ ID NO: 6 or 50 or a sequence at least 95% identical to SEQ ID NO: 6 or 50.
18. The vaccine of claim 17, wherein:

    a) said nucleic acid sequence is 65-90% identical to SEQ ID NO: 18 or 65-90% identical to SEQ ID NO: 19 and wherein codon frequency is preserved in said nucleic acid sequence;

    b) said nucleic acid sequence is 70-79% identical to SEQ ID NO: 18 or SEQ ID NO: 19;

c) said amino acid sequence is at least 98% identical to SEQ ID NO: 6 or SEQ ID NO: 50;

d) the expression cassette is at least 90% or 95% identical to SEQ ID NO: 20 or SEQ ID NO: 17; and/or

e) said nucleic acid sequence encoding salmon interferon is under operable control of a second promoter, optionally wherein said second promoter is cytomegalovirus (CMV) immediate-early enhancer and promoter.

19. A vaccine according to any one of claims 1 to 18 for use in a method of protecting a salmonid against infection.

20. The vaccine for use of claim 19, wherein:

a) said vector comprises the expression cassette that comprises the nucleic acid sequence encoding the antigen, wherein the antigen is a non-enveloped virus, optionally wherein the non-enveloped virus is PMCV;

b) said salmonid weighs between 15 and 200 grams or between 40 and 110 grams; and/or

c) said salmonid is Atlantic salmon (*Salmo salar*), rainbow trout (*Oncorhynchus mykiss*), or Coho Salmon (*Oncorhynchus kisutch*), optionally wherein said salmonid is *Salmo salar*.