1. A method of producing a picornavirus-like particle (PVLP) in a plant comprising:

a) introducing a first nucleic acid comprising a first regulatory region active in the plant operatively linked to a nucleotide sequence encoding a picornavirus polyprotein comprising one or more structural protein, into the plant, portion of the plant, or a plant cell;

b) introducing a second nucleic acid comprising a second regulatory region active in the plant and operatively linked to a second nucleotide sequence encoding one or more picornavirus 3C or 3CD protease into the plant, portion of the plant, or a plant cell;

c) incubating the plant, portion of the plant, or plant cell under conditions that permit the expression of the first and second nucleic acid, thereby producing the PVLP and;

d) harvesting the plant and purifying the PVLPs.

2. The method of claim 1, wherein the ratio of introduced amounts of the first nucleic acid relative to the second nucleic acid is between 20:1 and 0.5:1.

3. The method of claim 1, wherein the picornavirus polyprotein is P1.

4. The method of claim 1, wherein the picornavirus polyprotein comprises structural proteins VP0, VP1, VP2, VP3, VP4, or a combination thereof.

5. The method of claim 1, wherein the picornavirus is selected from the group of Aphthovirus, Avihepatovirus, Cardiovirus, Enterovirus, Erbovirus, Hepatovirus, Kobuvirus, Parechovirus, Sapelovirus, Senecavirus, Teschovirus and Tremovirus.

6. The method of claim 1, wherein the picornavirus is Enterovirus 71 or poliovirus.

7. The method of claim 1, wherein in the step of introducing (step a), the nucleic acid is transiently expressed in the plant.

8. The method of claim 1, wherein, in the step of introducing (step a), the nucleic acid is stably expressed in the plant.

9. A method of producing a Picornavirus-like particle (PVLP) in a plant, portion of a plant or plant cell comprising:

a) providing a plant, portion of a plant or plant cell comprising a first nucleic acid comprising a first regulatory region active in the plant operatively linked to a first nucleotide sequence encoding a picornavirus polyprotein comprising one or more structural protein and a second nucleic acid comprising a second regulatory region active in the plant operatively linked to a second nucleotide sequence encoding one or more picornavirus 3C or 3CD protease;

b) incubating the plant, portion of the plant or plant cell under conditions that permit the expression of the nucleic acids, thereby producing the PVLP and,

c) harvesting the plant and purifying the PVLPs.

10. A PVLP produced by the method of claim 1.

11. A composition comprising a therapeutically effective amount of the PVLP of claim 10 for inducing an immune response in a subject and a pharmaceutically acceptable carrier.

12. The PVLP of claim 10 for use in inducing immunity to a picornavirus infection in a subject.

13. The use of the PLVP of claim 10 in the manufacture of a medicament for the treatment of a picornavirus infection in a subject.

14. A polyclonal antibody prepared using the PVLP as described in claim 10.

15. The method of claims 1 or 9, wherein the first nucleic acid sequence comprises the first regulatory region operatively linked with a one or more than one comovirus enhancer, the nucleotide sequence encoding the polyprotein, and one or more than one amplification element, and a third nucleic acid encoding a replicase is introduced into the plant or portion of the plant.

16. The method of claim 1 or 9, wherein the second nucleic acid does not comprise one or more than one amplification element or one or more comovirus enhancer.

CLAIMS

1. A method of producing a picornavirus-like particle (PVLP) in a plant, a portion of a plant, or a plant cell comprising:

a) introducing a first nucleic acid and a second nucleic acid into the plant, portion of the plant, or the plant cell,

the first nucleic acid comprising a first regulatory region active in the plant operatively linked to a nucleotide sequence encoding a picornavirus polyprotein comprising structural protein VP1, VP3 and VP0, or VP1, VP3, VP2 and VP4; and

the second nucleic acid comprising a second regulatory region active in the plant and operatively linked to a second nucleotide sequence encoding one or more than one picornavirus 3C or 3CD protease;

b) incubating the plant, portion of the plant, or plant cell under conditions that permit the expression of the first and second nucleic acids to produce a picornavirus polyprotein and the one or more than one picornavirus 3C or 3CD protease, the picornavirus polyprotein being processed into structural proteins VP1, VP3 and VP0, or VP1, VP2, VP3 and VP4, thereby producing the PVLP and;

c) harvesting the plant, the portion of the plant, or plant cell and purifying the PVLPs.

2. The method of claim 1, wherein the ratio of introduced amounts of the first nucleic acid relative to the second nucleic acid is between 20:1 and 0.5:1.

3. The method of claim 1, wherein the picornavirus polyprotein is P1.

4. The method of claim 1, wherein the picornavirus is selected from the group of Aphthovirus, Avihepatovirus, Cardiovirus, Enterovirus, Erbovirus, Hepatovirus, Kobuvirus, Parechovirus, Sapelovirus, Senecavirus, Teschovirus and Tremovirus.

5. The method of claim 1, wherein the picornavirus is Enterovirus 71 or poliovirus.

6. The method of claim 1, wherein in the step of introducing (step a), the nucleic acid is transiently expressed in the plant.

7. The method of claim 1, wherein, in the step of introducing (step a), the nucleic acid is stably expressed in the plant.

8. A method of producing a Picornavirus-like particle (PVLP) in a plant, portion of a plant or plant cell comprising:

a) providing the plant, portion of the plant or plant cell comprising a first nucleic acid comprising a first regulatory region active in the plant operatively linked to a first nucleotide sequence encoding a picornavirus polyprotein comprising structural protein VP1, VP3 and VP0, or VP1, VP2, VP3 and VP4 and a second nucleic acid comprising a second regulatory region active in

the plant operatively linked to a second nucleotide sequence encoding one or more than one picornavirus 3C or 3CD protease;

b) incubating the plant, portion of the plant or plant cell under conditions that permit the expression of the nucleic acids to produce the picornavirus polyprotein and the one or more than one picornavirus 3C or 3CD protease, the picornavirus polyprotein being processed into structural proteins VP1, VP3 and VP0, or VP1, VP2, VP3 and VP4, thereby producing the PVLP and,

c) harvesting the plant, the portion of the plant, or plant cell and purifying the PVLPs.

9. A PVLP produced by the method of claim 5.

10. A composition comprising a therapeutically effective amount of the PVLP of claim 9 for use in inducing an immune response against Enterovirus 71 or poliovirus in a subject and a pharmaceutically acceptable carrier.

11. The use of PVLP of claim 9 in the preparation of a medicament for inducing immunity to a Enterovirus 71 or poliovirus infection in a subject.

12. The use of the PLVP of claim 9 in the manufacture of a medicament for the treatment of a Enterovirus 71 or poliovirus infection in a subject.

13. A polyclonal antibody prepared using the PVLP as described in claim 9.

14. The method of claims 1 or 8, wherein the first nucleic acid sequence comprises the first regulatory region operatively linked with a one or more than one comovirus enhancer, the nucleotide sequence encoding the polyprotein, and one or more than one amplification element, and a third nucleic acid encoding a replicase is introduced into the plant or portion of the plant.

15. The method of claim 1 or 8, wherein the second nucleic acid does not comprise one or more than one amplification element or one or more comovirus enhancer.

16. A composition comprising the PVLP of claim 9 and a pharmaceutically acceptable carrier for inducing an immune response against Enterovirus 71 or poliovirus in a subject.