

## Claims

- [Claim 1] An alphavirus replicon vector comprising, a polynucleotide which encodes alphavirus non-structural proteins nsp1, nsp2, nsp3 and nsp4, and a polypeptide comprising a cytokine.
- [Claim 2] The alphavirus replicon vector of claim 1, wherein the cytokine is a lymphokine, monokine, chemokine, or interleukin.
- [Claim 3] The alphavirus replicon vector of claim 1, wherein the cytokine is an interleukin.
- [Claim 4] The alphavirus replicon vector of claim 3, wherein the interleukin is interleukin-12 (IL-12).
- [Claim 5] The alphavirus replicon vector of any one of claims 1-4, wherein the cytokine is fused to a transmembrane domain.
- [Claim 6] The alphavirus replicon vector of claim 5, wherein the transmembrane domain is derived from Influenza Hemagglutinin (HA) or TLR4.
- [Claim 7] The alphavirus replicon vector of claim 5 or 6, wherein the transmembrane domain is fused to the cytokine by a linker.
- [Claim 8] The alphavirus replicon vector of claim 7, wherein the linker is IgG4CH3.
- [Claim 9] The alphavirus replicon vector of any one of claims 1-8, which comprises a promoter, 5' UTR, polynucleotide encoding alphavirus non-structural proteins nsp1, nsp2, nsp3 and nsp4, SG promoter, a gene of interest encoding the polypeptide comprising a cytokine, 3'UTR and poly A tail.
- [Claim 10] The alphavirus replicon vector of any one of claims 1-9, wherein the polypeptide comprising a cytokine has the amino acid sequence of SEQ ID NO: 14 or 18.
- [Claim 11] The alphavirus replicon vector of any one of claims 1-10, wherein the alphavirus is a CHIKV or VEEV.
- [Claim 12] The alphavirus replicon vector of claims 11, wherein the CHIKV is CHIKV strain 37997 or strain OPY-1.
- [Claim 13] The alphavirus replicon vector of claims 12, wherein the VEEV is VEEV strain TC-83.
- [Claim 14] A composition comprising  
(i) a pharmaceutically acceptable carrier, and  
(ii) a vector of any one of claims 1-13.
- [Claim 15] The composition of claim 14, wherein the pharmaceutically acceptable carrier is a delivery vehicle and the alphavirus replicon vector is en-

- capsulated in the delivery vehicle.
- [Claim 16] The composition of claim 15, wherein the delivery vehicle is a particle consisting of alphavirus structural proteins or a lipid delivery system.
- [Claim 17] The composition of claim 16, wherein the alphavirus structural proteins comprise a capsid and at least one envelope proteins and the capsid has one or more alterations in the Nuclear Localization Signal (NLS).
- [Claim 18] The particle of claim 16, wherein the alphavirus structural proteins comprise at least one envelope protein E3 which comprises one or more alterations at the furin site in the E3 protein.
- [Claim 19] The composition comprising a lipid nanoparticle and the alphavirus replicon vector of any one of claims 1-13, wherein The alphavirus replicon vector is encapsulated in the lipid nanoparticle.
- [Claim 20] A vaccine comprising the alphavirus replicon vector, particle or composition according to any one of Claims 1-19.
- [Claim 21] A method of treating and/or immunizing against cancer or inflammatory disease in a subject, which comprises administering an effective amount of The alphavirus replicon vector or composition of any one of Claims 1-18 to the subject in need thereof.
- [Claim 22] Use of The alphavirus replicon vector or composition of any one of claims 1-18 for the manufacture of a medicament for treating and/or immunizing against cancer or inflammatory disease.
- [Claim 23] The alphavirus replicon vector or composition of any one of claims 1-18 for use in treating and/or immunizing against cancer or inflammatory disease.