Claims

1. The use of composition comprising a polymersome carrier having a circumferential membrane of an amphiphilic polymer and an immunogen integrated into the circumferential membrane of the amphiphilic polymer of the polymersome carrier, wherein the immunogen is a membrane-associated protein or lipid antigen, in the manufacture of a pharmaceutical composition for eliciting in a subject an immune response to an immunogen.

2. The use of claim 1, wherein the composition is to be injected into a subject.

3. The use of claim 2, wherein the composition is to be injected into the subject via intradermal, intraperitoneal, subcutaneous, intravenous, or intramuscular, or non-invasive administration.

4. The use of any of claims 1 to 3, wherein

the membrane-associated protein is a transmembrane protein, G protein-coupled receptor, neurotransmitter receptor, kinase, porin, ABC transporter, ion transporter, acetylcholine receptor, or cell adhesion receptor.

5. The use of any of claims 1 to 4, wherein the immunogen is a synthetic lipid.

6. The use of any of claims 1 to 4 wherein the immunogen is a natural lipid.

7. The use of any one of claims 1 to 6, wherein the amphiphilic polymer comprises a diblock or a triblock (A-B-A or A-B-C) copolymer.

8. The use of claim 7, wherein the amphiphilic polymer comprises at least one monomer unit of a carboxylic acid, an amide, an amine, an alkylene, a dialkylsiloxane, an ether or an alkylene sulphide.

9. The use of claim 8, wherein the amphiphilic polymer is a polyether block selected from the group consisting of an oligo(oxyethylene) block, a poly(oxyethylene) block, an

oligo(oxypropylene) block, a poly(oxypropylene) block, an oligo(oxybutylene) block and a poly(oxybutylene) block.

10. The use of claim 9, wherein the amphiphilic polymer is a poly(butadiene)-poly(ethylene oxide) (PB-PEO) diblock copolymer.

11. The use of claim 10, wherein the PB-PEO diblock copolymer comprises 5-50 blocks PB and 5-50 blocks PEO.

12. The use of any one of claims 1 to 11, wherein the polymersome carrier contains one or more compartments.

13. The use of claim 12, wherein each one of the one or more compartments encapsulates at least one of peptide, protein, and nucleic acid.

14. The use of claim 13, wherein the at least one of peptide, protein, and nucleic acid is immunogenic.

15. The use of any one of claim 12 to 14, wherein each one of the one or more compartments is comprised of a same or different amphiphilic polymer.

16. The use of claim 15, wherein two or more different immunogens are integrated into the circumferential membrane of the amphiphilic polymer.

17. The use of any one of claims 12 to 16, wherein the polymersome carrier contains more than one compartment, wherein the compartments comprise an outer block copolymer vesicle and at least one inner block copolymer vesicle, wherein the at least one inner block copolymer vesicle is encapsulated inside the outer block copolymer vesicle.

18. The use of claim 17, wherein the outer block copolymer vesicle is a polymersome formed of a copolymer selected from the group consisting of poly[styrene-*b*-poly(L-isocyanoalanine(2-thiophen-3-yl-ethyl)amide)] (PS-PIAT), poly(butadiene)-poly(ethylene oxide)

(PBD-PEO), poly(ethylene oxide)-poly(caprolactone) (PEO-PCL), poly(ethyl ethylene)-poly(ethylene oxide) (PEE-PEO), poly(ethylene oxide)-poly(lactic acid) (PEO-PLA), poly(isoprene)-poly(ethylene oxide) (PI-PEO), poly(2-vinylpyridine)-poly(ethylene oxide) (P2VP-PEO), poly(ethylene oxide)-poly(N-isopropylacrylamide) (PEO-PNIPAm), poly(styrene)-poly(acrylic acid) (PS-PAA), poly(ethylene glycol)-poly(propylene sulfide) (PEG-PPS), poly(2-methyloxazoline)-poly(dimethylsiloxane)-poly(2-methyloxazoline) (PMOXA-PDMS-PMOXA), poly(ethylene oxide)-poly(dimethylsiloxane)-poly(2-methyloxazoline) (PEO-PDMS-PMOXA), and poly (methylphenylsilane)-poly(ethylene oxide) (PMPS-PEO-PMPS-PEO-PMPS).

19. The use of claim 17 or 18, wherein the at least one inner block copolymer vesicle is a polymersome formed of a copolymer selected from the group consisting of poly[styrene-*b*-poly(L-isocyanoalanine(2-thiophen-3-yl-ethyl)amide)] (PS-PIAT), poly(butadiene)-poly(ethylene oxide) (PBD-PEO), poly(ethylene oxide)-poly(caprolactone) (PEO-PCL), poly(ethyl ethylene)-poly(ethylene oxide) (PEE-PEO), poly(ethylene oxide)-poly(lactic acid) (PEO-PLA), poly(isoprene)-poly(ethylene oxide) (PI-PEO), poly(2-vinylpyridine)-poly(ethylene oxide) (P2VP-PEO), poly(ethylene oxide)-poly(N-isopropylacrylamide) (PEO-PNIPAm), poly(styrene)-poly(acrylic acid) (PS-PAA), poly(ethylene glycol)-poly(propylene sulfide) (PEG-PPS), poly(2-methyloxazoline)-poly(dimethylsiloxane)-poly(2-methyloxazoline) (PMOXA-PDMS-PMOXA), poly(ethylene oxide)-poly(dimethylsiloxane)-poly(2-methyloxazoline) (PEO-PDMS-PMOXA), and poly(methylphenylsilane)-poly(ethylene oxide) (PMPS-PEO-PMPS-PEO-PMPS).

20. The *in vitro* use of a composition in antibody discovery, vaccine discovery, or targeted delivery, wherein the composition comprises a polymersome carrier having a circumferential

membrane of an amphiphilic polymer and an immunogen integrated into the circumferential membrane of the amphiphilic polymer of the polymersome carrier, wherein the immunogen is a membrane-associated protein or lipid antigen.