CLAIMS

1. An immunogenic composition comprising at least two antigenic determinants, wherein the antigenic determinants are derived from at least two proteins selected from ABC-T, PavA and ZmpB of a *Streptococcus pneumoniae* bacterium.

2. An immunogenic composition comprising a genetic construct or constructs encoding at least two antigenic determinants, wherein the antigenic determinants are derived from at least two proteins selected from ABC-T, PavA and ZmpB of a *Streptococcus pneumoniae* bacterium.

3. An immunogenic composition comprising at least one antigenic determinant and a genetic construct or constructs encoding at least one different antigenic determinant, wherein the antigenic determinants are derived from at least two proteins selected from ABC-T, PavA and ZmpB of a *Streptococcus pneumoniae* bacterium.

4. An immunogenic composition as claimed in any of claims 1 to 3, wherein the antigenic determinants are derived from all three of the proteins ABC-T, PavA and ZmpB of a *Streptococcus pneumoniae* bacterium.

5. An immunogenic composition as claimed in any of the preceding claims, wherein the antigenic determinant derived from ABC-T comprises or consists of the protein sequence SEQ ID NO:1, or an immunologically effective fragment thereof or an immunologically effective analog of the sequence or fragment thereof; and/or
wherein the antigenic determinant derived from PavA comprises or consists of the protein sequence SEQ ID NO:2, or an immunologically effective fragment thereof or an immunologically effective analog of the sequence or fragment thereof; and/or
wherein the antigenic determinant derived from ZmpB comprises or consists of the protein sequence SEQ ID NO:3, or an immunologically effective fragment thereof or an immunologically effective analog of the sequence or fragment thereof.

6. An immunogenic composition as claimed in any of the preceding claims further comprising an immunostimulatory agent, preferably wherein the immunostimulatory agent is an adjuvant.

7. An immunogenic composition as claimed in claim 6, wherein the adjuvant comprises one or more materials selected from materials having a stimulatory effect on Toll-Like Receptors (TLR), cytosolic pattern recognition receptors (PRRs) such as nucleotide-binding oligomerization domain (NOD)-like receptors (NLRs), C-type lectin receptors (CLRs), nucleic acid-sensing receptors such as retinoic acid-inducible gene I (RIG-I), or nutrient sensors such as mTOR and GCN2; materials acting on at least one of the following pathways: MyD88/TLR-signalling pathways, cGAS–stimulator of interferon genes (STING) pathway, NF-κB pathway, any stress, cell death and tissue damage pathways (such as necrosis/necroptosis, apoptosis, autophagy) resulting in release of damage-associated molecular patterns (DAMPs) such as nucleic acids, uric acid, ATP and proteins that activate the innate immune system, any signalling pathways resulting in immune cell recruitment or epigenetic changes that maintain the innate immune system at an alarming state for extended periods i.e. a memory-like state; materials having the property to induce inflammasome activation ensued by cell differentiation to a CD4+ Th2 (interleukin-4), Th1 (Interferon-gamma)- or Th17(IL17A)-mediated immunity; immune potentiators; polysaccharide-based materials acting on the IL-1β, CLRs and TNF-α signalling pathways); delivery systems and mucosal adjuvants.

8. An immunogenic composition as claimed in claim 6 or claim 7, wherein the adjuvant comprises one or more materials selected from bacterial proteins and/or polysaccharide materials such as capsules and analogs thereof, toxin/toxoid and analogs thereof, TLR ligands and analogues thereof, agonists such as Pam3CSK4, Pam2CSK4, MPLA (LPS derivative), CpG, PolyI:C, CpG motifs; microparticles and nanoparticles such as chitosan or beta-glucans, flagellin, poly(lactic-co-glycolic acid) or PLGA-poly- l-lysine/poly-gamma-glutamic acid (PLGA-PLL/gammaPGA), or made of lipid-based backbone co-formulated with any other immunostimulatory agents such as monophosphoryl lipid A (MPLA), polyethylene glycol (PEG), oligomannose, Poly(I:C), extracellular vesicles (EV), such as outer membrane vesicles (OVM); oil-based encapsulation or emulsion-based systems, including water-in-oil, oil-in-water and thermo reversible oil-in-water emulsions such as Montanide ISA-51, Montanide ISA-720 and analogs thereof, alum or aluminium salt adjuvants, liposomes, virosomes, archeosomes, outer-membrane vesicles, niosomes, saponins, and immunostimulating complexes (ISCOMs), polymeric particles, cytokines including proinflammatory cytokines such as IFN-γ, IL-1, IL-2, IL-4, IL-12, IL-17A/F, GM-CSF and MPI, virus-like particles (VLPs), bacterial components such as detoxified variant of LPS such as Monophosphoryl lipid A (MPL), muramyl dipeptide (MDP lipophilic and hydrophobic), QS21, PLGA, CT, liposome-based cationic adjuvant formulation e.g. CAF 01-09 (composed of Span80, polyoxyethylene cetyl-stearylether, mannitol,

squalene) and analogs composed of cholesterol, phosphatidylcholine and phosphatidylserine, or alpha-Gal ceramide, NOD-like receptor protein 3 (NLRP3) inflammasome, Apoptosis-associated speck-like protein containing a CARD (ASC), NLR-family CARD domain-containing protein 4 (NLRC4) inflammasome, Absent in melanoma 2 (AIM2) inflammasome, dsRNA: Poly(I:C), Poly-IC:LC, Monophosphoryl lipid A (MPL), LPS, Flagellin, Imidazoquinolines: imiquimod (R837), resiquimod (848), CpG oligodeoxynucleotides (ODN), Muramyl dipeptide (MDP), Saponins (QS-21), bacterial molecules or derivatives including polysaccharide capsules and analogs thereof, toxin/toxoid and analogs thereof, unmethylated DNA (CpGs) and analogs thereof, cytokines such as IL-2, IL-12, TNF-α, and granulocyte–macrophage colony-stimulating factor (GM-CSF), chemokines such as RANTES (regulated on activation, normal T cell expressed and secreted), macrophage inflammatory protein (MIP)-1α, costimulatory or adhesion molecules such as CD80, lymphocyte function-associated antigen-3 and polyarginine tails, polysaccharide-based materials with properties similar to those presented by chitosan, such as CpG-delta Inulin, cochleates, virus-like particles (VLP), microparticulates such as virosomes, PLA (polylactic acid), PLG (poly[lactide-coglycolide]), Cholera toxin (CT) derivatives, and Heat-labile enterotoxin (LTK3 and LTR72).

9. An immunogenic composition as claimed in any of claims 6 to 8, wherein the adjuvant comprises one or more materials selected from TLR agonists, agents capable of inducing a CD4+ T-cell mediated immune response (particularly with a Th1- and/or Th17-differentiated profile), oil-in-water emulsions, water-in-oil emulsions, agents acting on the MyD88/TLR-signalling pathway, agents acting on the cGAS-stimulator of interferon genes (STING) pathway and particulate polysaccharide materials; preferably wherein the adjuvant comprises a combination of a TLR agonist and an agent capable of acting on the MyD88/TLR-signalling pathway or the cGAS-stimulator of interferon genes (STING) pathway; for example a combination of CpG with chitosan and/or beta glucan.

10. An immunogenic composition as claimed in any of the preceding claims further including one or more additional antigenic determinants from a *Streptococcus pneumoniae* bacterium that is encapsulated or conjugated selected from the group comprising pneumococcal surface protein A (PspA), pneumococcal choline-binding protein A (PcpA), secreted 45-KDa protein Usp45-hydrolase (PcsB), serine/threonine protein kinase (StkP), peptide permease enzyme, manganese ABC transporter (PsaA), pneumolysin D (PlyD), pneumolysin toxoid (dPly), choline-binding proteins A (CbpA) and D (CbpD), histidine triad protein D (PhtD), histidine triad protein E (PhtE), histidine triad protein A (PhtA), histidine triad protein B (PhtB);

pneumococcal serine-threonine uptake protein A (PiuA), protein cell wall separation (PcsB), pneumococcal serine-threonine kinase (StkP) and analogs, plasmin and fibronectin-binding protein A (PfbB), SP0148, SP1912 and SP2108, SP0785, SP1500 and SP2216.

11. An immunogenic composition as claimed in any of the preceding claims that is a liquid, suspension, tablet or spray or is lyophilized.

12. An immunogenic composition as claimed in any of the preceding claims that is delivered by means of the group comprising virus-like particles (VLPs), outer-membrane vesicles (OMVs), liposomes, immune stimulating complexes (ISCOMs), polymeric, non-degradable, biodegradable materials, natural polymeric compounds, starch, alginates, cellulose, biosynthetic materials, Poly beta-hydroxybutyrate (PHB), co-polymers, Polylactic acid (PLA), polyurethane, Poly(lactic-glycolic acid) (PLGA), Polymethyl methacrylate resin (PMMA), probiotics, *Lactobacilli* and *Bifidobacteria* species; viral vector systems; modified Vaccinia virus Ankara (MVA), poxviruses, adenoviruses and bacteriophages.

13. A vaccine comprising an immunogenic composition according to any of claims 1 to 5.

14. A vaccine as claimed in claim 13, including one or more of the features of any of claims 6 to 12.

15. ~~A method of treating or preventing a *Streptococcus pneumoniae* bacterium infection in an individual comprising administering~~ Use of a sufficient amount of the immunological composition of any of claims 1 to 12 or the vaccine of claims 13 and 14, in the manufacture of a medicament for ~~to~~ treating or preventing ~~the~~ a *Streptococcus pneumoniae* bacterium infection in an individual in need thereof.

16. ~~A method of immunising against a *Streptococcus pneumoniae* bacterium infection in an individual comprising administering~~ Use of an effective amount of the immunological composition of any of claims 1 to 12 or the vaccine of claims 13 and 14, in the manufacture of a medicament for immunising against a *Streptococcus pneumoniae* bacterium infection in an individual ~~to an individual~~ in need thereof.

17. ~~A method~~The use as claimed in claim 15 or claim 16 wherein the immunological composition or vaccine is to be administered orally, nasally, by inhalation or by injection.

18. ~~A method~~The use as claimed in claim 17, wherein the administration is by a route selected from the group comprising intravenous, intraperitoneal, intramuscular, intracavity, subcutaneous intradermally, intranasally and inhalation.

19. An immunological composition according to any of claims 1 to 12 or a vaccine according to claim 13 or claim 14 for use in the treatment or prevention of a *Streptococcus pneumoniae* bacterium infection in an individual and/or for immunising against a *Streptococcus pneumoniae* bacterium infection in an individual and/or diagnosing or screening for a *Streptococcus pneumoniae* bacterium infection in an individual.

20. A kit comprising an immunogenic composition according to any of claims 1 to 12 or a vaccine according to claim 13 or claim 14, and means to administer the immunogenic composition or vaccine to an individual.

21. ~~A method of treating or preventing a *Streptococcus pneumoniae* bacterium infection in an individual or immunising against a *Streptococcus pneumoniae* bacterium infection in an individual comprising administering~~ Use of a sufficient amount of at least one antigenic determinant derived from a protein selected from ABC-T, PavA and ZmpB of a *Streptococcus pneumoniae* bacterium in the manufacture of a medicament for treating or preventing a *Streptococcus pneumoniae* bacterium infection in an individual or immunising against a *Streptococcus pneumoniae* bacterium infection in an individual, by~~and~~ simultaneous~~ly~~ or subsequent~~ly administering~~ co-administration with a sufficient amount of least one antigenic determinant derived from a protein selected from a different one of ABC-T, PavA and ZmpB of a *Streptococcus pneumoniae* bacterium.