Claims:

1. A composition for use in a method of delivering a biologically active cargo material to the gastrointestinal tract, wherein the composition comprises amorphous magnesium-substituted calcium phosphate (AMCP), which entraps a biologically active cargo material, thereby enabling the cargo material to be delivered to a site of interest in the gastrointestinal tract.

2. A composition for use in a method of treating or preventing a condition by delivering a biologically active cargo material to the gastrointestinal tract, wherein the composition comprises amorphous magnesium-substituted calcium phosphate (AMCP) which entraps the biologically active cargo material, thereby enabling the cargo material to be delivered to a site of interest in the gastrointestinal tract.

3. The composition for use in a method of treatment of claim 1 or claim 2, wherein

(a) the magnesium-substituted calcium phosphate is amorphous as determined by X-ray diffraction; and/or

(b) the X-ray diffraction pattern of the amorphous magnesium-substituted calcium phosphate is broad and diffuse with a maximum at 25 degree 2 theta; and/or

(c) the X-ray diffraction pattern of the amorphous magnesium-substituted calcium phosphate lacks one or more peaks associated with the X-ray diffraction pattern of crystalline hydroxyapatite.

4. The composition for use in a method of treatment of any one of claims 1 to 3, wherein the amorphous magnesium-substituted calcium phosphate is capable of dispersing to form nanoparticles that are capable of uptake by cells in the gastrointestinal tract, optionally wherein the nanoparticles are capable of uptake by gut mucosal immune cells.

5. The composition for use in a method of treatment of claim 4, wherein the cells in the gastrointestinal tract are antigen-presenting immune cells present in the gut.

6. The composition for use in a method of treatment of any one of the preceding claims, wherein the composition delivers the biologically active cargo material to Peyer's patches or to Mesenteric Lymph Nodes (MLN).

7. The composition for use in a method of treatment of any one of the preceding claims, wherein the composition is for oral administration, nasogastric administration or rectal administration, optionally wherein the composition is encapsulated for oral administration.

8. The composition for use in a method of treatment of any one of the preceding claims, wherein

(a) the amorphous magnesium-substituted calcium phosphate is capable of dispersing to form nanoparticles that are capable of uptake by CD11b positive cells and/or CD11c positive cells; and/or

(b) amorphous magnesium-substituted calcium phosphate is capable of dispersing to form nanoparticles that are capable of uptake by dendritic cells and/or macrophages.

9. The composition for use in a method of treatment of any one of the preceding claims, wherein

(a) the amorphous magnesium-substituted calcium phosphate is for use in a method of treating an autoimmune disease, cancer, food allergies and/or intolerances; and/or

(b) the amorphous magnesium-substituted calcium phosphate is for use in a method of treating or preventing inflammatory bowel disease; and/or

(c) the amorphous magnesium-substituted calcium phosphate is for use in a method of treating or preventing Crohn's disease or coeliac disease; and/or

(d) the amorphous magnesium-substituted calcium phosphate is for use in a method of vaccinating a subject and the biologically active cargo molecule is a therapeutic vaccine composition.

10. The composition for use in a method of treatment of claim 9, wherein

(i) the therapeutic vaccine composition is for the treatment or prevention of cancer such as Myeloid Leukaemia; or

(ii) the therapeutic vaccine composition is for the treatment or prevention an autoimmune diseases, wherein the vaccine composition is capable of inducing tolerance towards autoimmune T cell and auto-antibody responses, optionally wherein the autoimmune condition is multiple sclerosis; or

(iii) the therapeutic vaccine composition is for the treatment or prevention of inflammatory bowel disease, optionally wherein the inflammatory bowel disease is Crohn's disease or coeliac disease; or

(iv) the therapeutic vaccine composition is for the treatment or prevention of type 1 diabetes; or

(v) the therapeutic vaccine composition is for the treatment or prevention Systemic Lupus Erythematosus (SLE).

11. The composition for use in a method of treatment of any one of the preceding claims, wherein the cargo material is a cargo molecule or cargo nanoparticle.

12. The composition for use in a method of treatment of any one of the preceding claims, wherein

(a) the amorphous magnesium-substituted calcium phosphate comprises aggregated nanoparticles that are capable of dispersing to deliver the biologically active cargo molecule to the site of interest, optionally wherein the nanoparticles are metal-based nanoparticles or metal oxo-hydroxide based nanoparticles; and/or

(b) the amorphous magnesium-substituted calcium phosphate is a silent delivery platform that does not cause an adjuvant response to the amorphous magnesium-substituted calcium phosphate at the site of interest that differs substantially to the response to the biologically active cargo material alone; and/or

(c) the amorphous magnesium-substituted calcium phosphate is a silent delivery platform that does not cause a direct transcriptional response to the amorphous magnesium-substituted calcium phosphate at the site of interest; and/or

(d) the amorphous magnesium-substituted calcium phosphate is stabilised by the magnesium ions and/or the biologically active cargo molecule.

13. The composition for use in a method of treatment of any one of the preceding claims, wherein the ratio of Mg: Ca in the amorphous magnesium-substituted calcium phosphate is at least 1:25, more preferably at least 1:20, more preferably at least 1:10, more preferably at least 1:5, more preferably at least 1:4 and most preferably 1:3.

14. The composition for use in a method of treatment of any one of the preceding claims, the amorphous magnesium-substituted calcium phosphate composition comprises a plurality of cargo molecules, optionally wherein the amorphous magnesium-substituted

calcium phosphate composition comprises two or more different cargo molecules or wherein the amorphous magnesium-substituted calcium phosphate composition comprises three or more different cargo molecules.

15. The composition for use in a method of treatment of claim 14, wherein the amorphous magnesium-substituted calcium phosphate composition comprises a therapeutic vaccine component and an immunostimulatory agent or a tolerance inducing agent.

16. The composition for use in a method of treatment of any one of the preceding claims, wherein the biologically active cargo material is a therapeutic cargo molecule or the biologically active cargo material is a nutraceutical cargo molecule.

17. The composition for use in a method of treatment of any one of the preceding claims, wherein

(a) the cargo material is selected from the group consisting of protein antigens, bioactive cytokines, peptidoglycans, low molecular weight organic molecules and nanoparticles; and/or

(b) the cargo materials are selected from the group consisting of peptidoglycan, peptidoglycan subunits including muramyl dipeptide, autoantigens, vaccine compositions, nucleic acid sequences, molecules to restore PD-L1 expression to target cell, tissue or cell homogenates/suspensions/supernatants, nutrients, dietary supplements, proteins, protein antigens including peptide sequences and allergens; and/or

(c) the cargo material is a nutrient, a nanoparticle, therapeutic molecule, vaccine, a nucleic acid molecule, such as DNA or RNA.

18. The composition for use in a method of treatment of any one of the preceding claims, wherein the composition is used to deliver cargo molecules to cells *ex vivo*, wherein the *ex vivo* cells comprising delivered cargo molecules are for re-introduction into a recipient and/or wherein cells affected by the *ex vivo* cells transfected with cargo are for re-introduction into a recipient.

19. The composition for use in a method of treatment of any one of the preceding claims, wherein amorphous magnesium-substituted calcium phosphate composition is porous for entrapping the cargo molecules; and/or wherein the nanoparticles of

amorphous magnesium-substituted calcium phosphate have mean diameters in a range between 20 nm and 350 nm, optionally wherein at least 75% of the nanoparticles of amorphous magnesium-substituted calcium phosphate have a mean diameter in the range.

20. A composition for use in a method of diagnosis or imaging, wherein the composition comprises amorphous magnesium-substituted calcium phosphate (AMCP), wherein the amorphous magnesium-substituted calcium phosphate entraps a detectable moiety, wherein the amorphous magnesium-substituted calcium phosphate the composition is capable of delivering the cargo material to a site of interest in the gastrointestinal tract.

21. The composition for use in an *in vivo* method of diagnosis of claim 20, wherein the amorphous magnesium-substituted calcium phosphate the composition is capable of delivering the cargo material to a site of interest in the gastrointestinal tract, optionally wherein the detectable moiety comprises nanoparticles, such as metal-based nanoparticles or metal oxo-hydroxide nanoparticles.

22. A process for producing amorphous magnesium-substituted calcium phosphate compositions that contain entrapped biologically active cargo material, the process comprising:

(a) providing a solution comprising calcium ions (Ca^{2+}), magnesium ions (Mg^{2+}) and a solution comprising phosphate ions (PO_4^{2-}), wherein one or both of the solutions comprise one or more biologically active cargo materials;

(b) mixing the solution comprising calcium ions (Ca^{2+}), magnesium ions (Mg^{2+})with the solution comprising phosphate ions (PO_4^{2-}) to precipitate amorphous magnesium-substituted calcium phosphate in which the biologically active cargo material is entrapped;

(c) recovering the amorphous magnesium-substituted calcium phosphate; and

(d) optionally washing and drying the amorphous magnesium-substituted calcium phosphate.

23. The process of claim 22, wherein:

(a) the solution comprising calcium ions (Ca^{2+}), magnesium ions (Mg^{2+}) and biologically active cargo molecules is buffered at a pH of at least 8.0; and/or

(b) the biologically active cargo material increases the stability of the amorphous magnesium-substituted calcium phosphate to conversion to crystalline phases of calcium phosphate as compared to corresponding compositions that do not include entrapped cargo material; and/or

(c) the washing and drying step comprises re-slurrying the composition in acetone and drying the washed composition using centrifugation, optionally wherein the washing and drying steps are repeated twice; and/or

(d) the pH during steps (a) and/or (b) is greater than 8.0; and/or

(e) the buffer is Tris, HEPES, BICINE, TRICINE or a citric acid buffer, or an amino acid such as lysine or glycine.

24. The process of claim 22 or claim 23, further comprising formulating the amorphous magnesium-substituted calcium phosphate as a pharmaceutical composition.