We claim:

1. A composition comprising Vitamin A, or a Vitamin A derivative or metabolite thereof, an oligosaccharide (OS), and optionally *Bifidobacterium* or activated *Bifidobacterium*.

2. The composition of claim 1, wherein the composition further comprises an intact protein source or breakdown products rich in threonine, N-acetyl-thronine, gamma-glutamylthreonine, or a combination thereof.

3. Use of a composition in the manufacture of a medicament for preventing and/or treating an autoimmune disease, preventing and/or treating an allergy, elevating and/or stimulating regulatory T-cell (Tregs) and/or B cells, increasing efficiency of antigen recognition in a subject, increasing efficiency of gene therapy and/or a vaccine, maintaining integrity of alimentary canal mucosal membrane during chemotherapy, protecting intestinal barrier integrity during chemotherapy or radiation treatment, stimulating mucin production, preventing and/or treating cancer, wherein the use comprises that:

Vitamin A, or a Vitamin A derivative or metabolite thereof, or a source thereof, an oligosaccharide (OS), and optionally Bifidobacterium, and optionally a protein enriched for threonine and/or threonine, N-acetyl threonine and/or gammaglutamylthreonine, is to be administered to a subject.

4. The use of claim 3, wherein the autoimmune disease is asthma, atopy, Type I diabetes, inflammatory bowel disease or celiac disease, and

wherein the inflammatory bowel disease (IBD) is ulcerative colitis (UC) or Crohn’s Disease; or

wherein the subject is suffering from a hyperinflammatory gut; or

wherein the allergy is a food allergy or atopy; or

wherein the subject is a mammal, and

wherein the mammal is a human, cow, pig, rabbit, goat, sheep, cat, dog, horse, llama, or camel, or

wherein the mammal is an infant, or

wherein the mammal is a nursing infant mammal; or

wherein the subject is a human.

5. The use of any one of claims 3-4, wherein the use delivers 1–10,000 International Units vitamin A per day; or wherein the use delivers 1-2,000 International Units vitamin A per day.

6. The use of any one of claims 3-5, wherein the elevation of the regulatory T-Cells (Tregs) results in the suppression of deleterious T-helper (Th) cells; or

wherein the elevation of the regulatory T-Cells (Tregs) results in a decrease in inflammatory markers, and

wherein the inflammatory markers are IL-8, IL-6, TNF-a, IL-10 INF gamma, INF alpha, or a combination thereof, or

wherein the inflammatory markers are decreased by at least 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85% or 90%; or

wherein function of immune system in the subject is enhanced subsequent to administration of said bacteria, said MMO, or both, and

wherein enhancement in the function of the immune system improves: vaccine response, mucosal innate or adaptive immunity, and/or improving homeostasis of innate and adaptive immunity systemically, or

wherein the function of the immune system is demonstrated by enhanced antibody titers in response to a vaccine, improved mucus production, increased T regulatory and B regulatory cell populations or increased sIgA production in gut leading to protection against pathogenic bacteria, and

optionally wherein the improvement or increase is statistically significant, or

wherein the increase is about 20, 30, 40, 50, 60, 70, 80, or 90%.

7. The use of any one of claims 3-6, wherein the subject is already colonized by a *Bifidobacterium* species as measured by *Bifidobacterium* species CFU/gram of feces or CFU/µg DNA ; or

wherein colonization by *Bifidobacterium* species in the subject is increased by at least 1-10 CFU/gram of feces; or

wherein the subject is not colonized by a *Bifidobacterium* species as measured by *Bifidobacterium* species CFU/gram of feces.

8. The use of any one of claims 3-7, wherein the dosage of retinoic acid, or a source thereof, oligosaccharide (OS), *Bifidobacterium* , or combinations thereof, is in an amount effective to maintain the *Bifidobacterium* level at least 10^6, at least 10^8 CFU/gram of feces or 10^8 CFU/μg DNA or alternatively the relative abundance of *Bifidoabcteriaceae* in the microbiome of at least 10%, at least 20%, at least 30%, at least 50%, at least 60%, at least 70% at least 80% at least 90% or alternatively, monitor by gene abundance of BLON 2175, BLON 2175 and/or Blon 2177; or

wherein the *Bifidobacterium* is to be administered to the subject on a daily basis comprising from 0.1 billion to 500 billion CFU of bacteria/day; or

wherein the *Bifidobacterium* is to be administered on a daily basis can include from 1 billion to 100 billion CFU/day or from 5 billion to 20 billion CFU/day; or

wherein the *Bifidobacterium* is to be administered on a daily basis for at least 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, or 30 days out to 365 days; or

wherein the *Bifidobacterium* is to be administered on a daily basis for about 1-5 days, 6-10 days, 11-15 days, 16-20 days, 21-25 days, or 26-30 days.

9. The use of any one of claims 3-8, wherein the oligosaccharide is to be administered in a solid or liquid form; or

wherein the oligosaccharide is to be administered in an amount of from about 0.1–50 g/day; or

wherein the oligosaccharide is to be administered in an amount of from about 2–30 g/day or 3–10 g/day; or

wherein the oligosaccharide (OS) comprises at least about 15%, at least 25%, at least 50%, at least 75% at least 95% of the subject's total dietary fiber.

10. The use as defined in any one of claims 3-9 in the manufacture of a medicament for use in combinatorial therapy for preventing and/or treating an autoimmune disease, preventing and/or treating an allergy, elevating and/or stimulating regulatory T-cell (Tregs) and/or B cells, increasing efficiency of antigen recognition in a subject, increasing efficiency of gene therapy and/or a vaccine, maintaining integrity of alimentary canal mucosal membrane during chemotherapy, protecting intestinal barrier integrity during chemotherapy or radiation treatment, stimulating mucin production, preventing and/or treating cancer,

wherein said medicament is to be administered to the subject in combination with a first composition comprising retinoic acid and an oligosaccharide; and

wherein the first composition is to be administered several times a day, optionally 1-6 times a day, or

wherein the first composition is to be administered for at least 1-365 days; or

wherein said medicament is to be administered to the subject in combination with a second composition comprising *Bifidobacterium*, and

wherein the second composition is to be administered daily, or

wherein the second composition is to be administered for at least 1-365 days; or

wherein said medicament is to be administered to the subject in combination with the first composition comprising retinoic acid, or a source thereof and an oligosaccharide followed by the second composition comprising *Bifidobacterium*; or

wherein said medicament is to be administered to the subject in combination with a third composition comprising retinoic acid, oligosaccharide, and *Bifidobacterium*.

11. The use of any one of claims 3-10, wherein the Vitamin A, or a Vitamin A derivative or metabolite thereof, or a source thereof, is to be administered several times a day for at least 1-30 days; or

wherein the oligosaccharide is to be administered several times a day for at least 1-30 days; or

wherein the *Bifidobacterium* is to be administered on a daily basis for at least 1-30 days; or

wherein the Vitamin A, or a Vitamin A derivative or metabolite thereof, or a source thereof, oligosaccharide, and *Bifidobacterium* are to be administered to the subject in a composition for use on a daily basis for at least 1-30 days; or

wherein the Vitamin A, or a Vitamin A derivative or metabolite thereof, or a source thereof and oligosaccharide are to be administered to the subject several times a day for at least 1-30 days followed by *Bifidobacterium* on a daily basis for at least 1-30 days.

12. The composition of any one of claims 1-2, or the use of any one of claims 3-11, wherein the vitamin A is retinol, retinal, retinoic acid, a provitamin A carotenoid, or a combination thereof, and

wherein the provitamin A carotenoid is alpha-carotene, beta-carotene, gamma-carotene, xanthophyll beta-cryptoxanthin, or a combination thereof.

13. The composition of any one of claims 1-2 or claim 12, or the use of any one of claims 3-12, wherein the composition comprises 1–100 μmol/l vitamin A; or

wherein the composition comprises about 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, or 100 μmol/l vitamin A; or

wherein the composition comprises about 1–100, 5–50, 25–75, 10–100, 30–60, or 75–100 μmol/l vitamin A.

14. The composition of any one of claims 1-2 or claims 12-13, or the use of any one of claims 3-13, wherein the oligosaccharide (OS) comprises a one or more oligosaccharides with 2 to 10 residues (DP2–10 oligosaccharides), and

wherein at least one of the oligosaccharides has a Type I or a II core, or at least one of each; or

wherein the oligosaccharide (OS) comprises a one or more of DP3–10 oligosaccharides having 3-10 sugar residues structures found in mammalian milk; or

wherein the oligosaccharide is derived from a plant, fungus, animal, insect, or crustacean; or

wherein the oligosaccharide is sourced from a fungi, insect, crustacean or plant-derived oligosaccharide, optionally pre-digested from the source polysaccharide, and

wherein the plant-derived oligosaccharides are between 2 and 10 sugar residues (DP2-DP10), between 3 and 10 sugar residues (DP3-DP10), between 5 and 10 sugar resides (DP5-DP10), or up to DP20, or greater than DP30; or

wherein the plant-derived oligosaccharide is from orange peels, cocoa hulls, olive pomace, tomato skins, grape pomace, corn silage, or a mixture thereof; or

wherein the oligosaccharide is from carrots, peas, broccoli, onions, tomatoes, peppers, rice, wheat, oats, bran, oranges, cocoa, olives, apples, grapes, sugar beets, cabbage, corn, soy, shrimp, mushroom, or a mixture thereof; or

wherein the oligosaccharide is pre-digested polysaccharides from orange peels, shrimp, mushroom, cocoa hulls, olive pomace, tomato skins, grape pomace, corn silage, or a mixture thereof; or

wherein the oligosaccharide comprises galactooligosaccharide (GOS), fructoligosaccharide (FOS) or xylooligosaccharide (XOS); or

wherein the oligosaccharide is a mammalian milk oligosaccharide (MMO), and

wherein the mammalian milk oligosaccharide (MMO) comprises oligosaccharide molecules found in human milk oligosaccharides (HMO), bovine milk oligosaccharides(BMO), bovine colostrum oligosaccharides (BCO), goat milk oligosaccharides (GMO), or a combination thereof, or

wherein the mammalian milk oligosaccharide (MMO) comprises one or more selected from lacto-N-biose, N-acetylactosamine, lacto-N-triose, lacto-N-neotetrose, lacto-N-tetrose, N-acetyllactosamime, lacto-N-neotetraose, lacto-N-tetraose,

fucosyllactose, lacto-N-fucopentose, lactodifucotetrose, sialyllactose, disialyllactone-N-tetrose, 2'-fucosyllactose, 3'-sialyllactoseamine, 3'-fucosyllactose, 3'-sialyl-3-fucosyllactose, 3'-sialyllactose, 6'-sialyllactosamine, 6'-sialyllactose, difucosyllactose, lacto-N-fucosylpentose I, lacto-N-fucosylpentose II, lacto-N-fucosylpentose III, lacto-N-fucosylpentose V, sialyllacto-N-tetraose, their derivatives, or combinations thereof; or

wherein the oligosaccharide (OS) comprises a human milk oligosaccharide (HMO); or

wherein the oligosaccharide contains at least one Type II core; or

wherein the oligosaccharide contains at least one Type I core.

15. The composition of any one of claims 1-2 or claims 12-14, or the use of any one of claims 3-14, wherein the composition provides a total dietary intake of oligosaccharide in an amount of 0.001-100 grams per day; or

wherein the composition for use provides a total oligosaccharide daily intake regardless of delivery form or dosing regime in an amount of 0.1-50 grams per day; or

wherein the oligosaccharide is in an amount of 1-20 grams, 3-20 grams, or 5-10 grams per unit dose; or

wherein the oligosaccharide is in an amount of 10, 15, 20, 25, 30, 35, 40, 45, or 50 grams; or

wherein the composition further comprises galactooligosaccharide (GOS), fructooligosaccharide (FOS) or xylooligosaccharide (XOS).

16. The composition of any one of claims 1-2 or claims 12-15, or the use of any one of claims 3-15, wherein the *Bifidobacterium* is *Bifidobacterium adolescentis, Bifidobacterium animalis, Bifidobacterium animalis* subsp. *animalis, Bifidobacterium animalis* subsp. *lactis, B. bifidum, Bifidobacterium breve, Bifidobacterium catenulatum, , Bifidobacterium longum* subsp. *infantis, B. pseudocatanulatum, Bifidobacterium pseudolongum*, activated *B. longum* subsp. *infantis*, activated *B. breve* or a combination thereof.

17. The composition of any one of claims 1-2 or claims 12-16, or the use of any one of claims 3-16, wherein the *B. infantis* has a functional H5 cluster; or

wherein the composition further comprises isolated *B. infantis* activated cell membranes comprising exopolysaccharides and/or solute binding proteins, and

wherein *B.infantis* cell surface has increased exopolysaccharide and solute binding proteins.

18. The composition of any one of claims 1-2 or claims 12-17, or the use of any one of claims 3-17, wherein the composition comprises *Bifidobacterium* in an amount of 0.1–500 billion Colony Forming Units (CFU) per gram of composition; or

wherein the composition comprises *Bifidobacterium* in an amount of 1–100 billion Colony Forming Units (CFU) or 5–20 billion Colony Forming Units (CFU) per gram of composition or Colony Forming Units per µg DNA; or

wherein the *Bifidobacterium* is in an amount of 1, 5, 15, 20, 25, 30, 35, 40, 45, or 50 billion Colony Forming Units (CFU) per gram of composition.

19. The composition of any one of claims 1-2 or claims 12-18, or the use of any one of claims 3-18, wherein the composition is in the form of a dry powder or a dry powder suspending in an oil; or

wherein the composition is spray dried or freeze-dried, and

wherein the composition is freeze-dried in presence of a cryoprotectant; or

wherein the composition further comprises a stabilizer, and

wherein the stabilizer is a flow agent, or

wherein the stabilizer is a cryoprotectant; or

wherein the cryprotectant is glucose, lactose, raffinose, sucrose, trehalose, adonitol, glycerol, mannitol, methanol, polyethylene glycol, propylene glycol, ribitol, alginate, bovine serum albumin, carnitine, citrate, cysteine, dextran, dimethyl sulphoxide, sodium glutamate, glycine betaine, glycogen, hypotaurine, peptone, polyvinyl pyrrolidone, taurine, mammalian milk oligosaccharides, polysaccharides or a combination thereof.

20. The composition of any one of claims 1-2 or claims 12-19, or the use of any one of claims 3-19, wherein the composition is a pharmaceutical composition, dietary supplement, nutritional product, food product, probiotic, and/or prebiotic; or

wherein the composition is formulated as a unit dose medicament; or

wherein the composition is formulated as a capsule, packet, sachet, foodstuff, lozenge, tablet, optionally an effervescent tablet, enema, suppository, dry powder, dry powder suspended in an oil, chewable composition, syrup, or gel; or

wherein the composition is a nutritional product, and

wherein the product is a food product, dietary supplement, infant formula, or pharmaceutical product.