CLAIMS

1. Use of i) a prebiotic mixture comprising one or more human milk oligosaccharides, ii) at least one probiotic strain of bacterium, wherein the at least one probiotic strain comprises *B. longum* subsp. *infantis*; and iii) at least one butyrate producing strain of bacterium, wherein the at least one butyrate producing strain comprises one or more of *Agathobacter rectalis, Anaerobutyricum hallii, Anaerostipes caccae, Blautia producta , Clostridium innocuum, Clostridium leptum, Faecalibacterium prausnitzii, Anaerobutyricum soehngenii, Roseburia hominis,* or *Roseburia intestinalis* in the manufacture of a medicament for treating or preventing a disease, disorder, or condition associated with one or more of inflammation, immune dysfunction, cancer, allergy, or dysbiosis of the intestinal microbiome in a subject in need thereof.

2. The use of claim 1, wherein the prebiotic mixture comprises one or more of 2'-fucosyllactose, 3-fucosyllactose, difucosyllactose, 3'-sialyllactose, 6'-sialyllactose, Lacto-N-tetraose, Lacto-N-neo-tetraose, Lacto-N-fucopentaose I, Lacto-N-fucopentaose II, Lacto-N-fucopentaose III, Sialyl-lacto-N-tetraose a, Sialyl-lacto-N-tetraose b, Sialyl-lacto-N-tetraose c, Lacto-N-difuco-hexaose I, Lacto-N-difuco-hexaose II, Lacto-N-hexaose, para-Lacto-N-hexaose, Disialyllacto-N-tetraose, Fucosyl-Lacto-N-hexaose, Difucosyl-Lacto-N-hexaose a, Difucosyl-Lacto-N-hexaose b, lactodifucotetraose, 6'galactosyllactose, 3'galactosyllactose, 3-Sialyl-3-fucosyllactose, Sialylfucosyllacto-N-tetraose, Sialyllacto-N-fucopentaose V, disialyl-lacto-n-fucopentaose II, disialyl-lacto-n-fucopentaose V, Lacto-N-neo-difucohexaose II, 3-Fucosyl-sialylacto-N-tetraose c, para-Lacto-N-neohexose, Lacto-N-octaose, Lacto-N-neooctaose, Lacto-N-neohexaose, Lacto-N-fucopentaose V, iso-Lacto-N-octaose, para-Lacto-N-octaose, Lacto-decaose, or Sialyl-lacto-N-fucopentaose I.

3. The use of claim 1 or claim 2, wherein the prebiotic mixture comprises one or more of 2'-fucosyllactose, 3-fucosyllactose, 3'-sialyllactose, 6'-sialyllactose, lacto-N-tetraose, lacto-N-difucohexaose I, lactodifucotetraose, lacto-N-fucopentaose I, sialylacto-N-tetraose c, sialylacto-N-tetraose b, or disialyllacto-N-tetraose.

4. The use of any of claims 1-3, wherein the prebiotic mixture comprises one or more of 2'-fucosyl-lactose, 3-fucosyllactose, 3’-sialyllactose, 6'-sialyllactose, Lacto-N-tetraose, lacto-N-neotetraose, or difucosyllactose.

5. The use of any of claims 1-4, wherein the prebiotic mixture comprises one or more of 2'-fucosyllactose, 3-fucosyllactose, Lacto-N-tetraose, or lacto-N-neotetraose.

6. The use of any of claims 1-5, wherein the prebiotic mixture comprises one or both of 2'-fucosyllactose and lacto-N-neotetraose.

7. The use of any of claims 1-6, wherein the prebiotic mixture comprises at least 10, at least 25, at least 50, at least 100, or at least 150 human milk oligosaccharides.

8. The use of any of claims 1-7, wherein the prebiotic mixture comprises 2'-fucosyllactose, 3-fucosyllactose, 3’-sialyllactose, 6'-sialyllactose, lacto-N-tetraose, lacto-N-difucohexaose I, lactodifucotetraose, lacto-N-fucopentaose I, sialylacto-N-tetraose c, sialylacto-N-tetraose b, and disialyllacto-N-tetraose.

9. The use of any of claims 1-8, wherein the prebiotic mixture is, is derived from, or comprises a concentrated human milk permeate, wherein the concentrated human milk permeate is obtained by a process comprising the steps of ultra-filtering human skim milk to obtain human milk permeate and concentrating the human milk oligosaccharide content of the human milk permeate.

10. The use of claim 9, wherein the human skim milk is obtained from human milk pooled from at least 25, 50, or 100 individual donors.

11. The use of any of claims 1-10, wherein the subject has, is suspected of having, or is at risk of having one or more of obesity, type II diabetes, a chronic inflammatory disease, an autoimmune disease, an infection, an infectious disease domination, bowel resection, a condition associated with chronic diarrhea, irritable bowel syndrome (IBS), inflammatory bowel disease

(IBD), short bowel syndrome (SBS), celiac disease, small intestinal bacterial overgrowth (SIBO), gastroenteritis, leaky gut syndrome, pouchitis, gastric lymphoma, bacterial, viral, or parasitic infection or overgrowth, infection by drug-resistant bacteria, cancer, or graft versus host disease.

12. The use of any of claims 1-11, wherein the probiotic strain and/or the butyrate producing strain of bacterium is to be administered in an amount of at least 1×10^2, 1×10^3, 1×10^4, 1×10^5, 1×10^6, 5×10^6, 1×10^7, 5×10^7, 1×10^8, 5×10^8, 1×10^9, 1×10^{10}, 5×10^{10}, 5×10^{11}, or 1×10^{12} colony forming units (CFU) per day.

13. The use of any of claims 1-12, wherein the probiotic strain and/or the butyrate producing strain of bacterium is to be administered in an amount of between 1×10^7 and 1×10^{10} colony forming units (CFU) per day.

14. The use of any of claims 1-13, wherein the prebiotic mixture is to be administered in an amount of at least 100 mg, 500 mg, 1 g, 2 g, 3 g, 4 g, 5 g, or 10 g total human milk oligosaccharides per day.

15. The use of any of claims 1-14, wherein the prebiotic mixture is to be administered in an amount of between 100 mg and 50 g, 500 mg and 25 g, 1 g and 5 g, 2 g and 3 g, 3 g and 6 g, 5 g and 10 g, 8 g and 10 g, 10 g and 20 g, 15 g and 20 g, or 17 g and 19 g of total human milk oligosaccharides per day.

16. A method of preparing a bacteriotherapy, the method comprising collecting, harvesting, or isolating at least one bacterium from a mixture of bacteria,

wherein the mixture of bacteria is, originates from, or is obtained from a stool sample from a healthy donor,

wherein the healthy donor was administered a prebiotic mixture comprising human milk oligosaccharides and a probiotic strain comprising *B. longum* subsp. *infantis*, wherein the probiotic strain is capable of consuming the prebiotic mixture within less than four weeks prior to collection of the stool sample.

17. The method of claim 16, wherein the at least one bacterium comprises a plurality of bacteria that comprises two or more bacterial species, subspecies, or strains.

18. The method of any of claims 16 or 17, wherein the at least one bacterium is collected, harvested, or isolated from the cultured mixture of bacteria by a method comprising one or more of gradient purification, differential centrifugation, solvent treatment, heat treatment, acid treatment, immunoprecipitation, or antibiotic selection.

19. The method of any of claims 16-18, wherein the prebiotic mixture comprises at least 2, at least 5, at least 10, at least 25, at least 50, at least 100, or at least 150 human milk oligosaccharides, optionally at least 25 human milk oligosaccharides.

20. The method of any of claims 16-19, wherein one or both of the prebiotic mixture and the probiotic strain are administered to the donor on the same days for at least 3, 5, 7, 14, 21, or 28 consecutive days prior to the collection of the stool sample.