disorders, obesity, or low diversity in dietary intake. The *Bifidobacterium* is preferably selected from *B. longum, B. pseudocatanulatum, B. adolescentis, B. animalis* (e.g., *B. animalis* subsp. *animalis*, *B. animalis* subsp. *lactis*), *B. longum* subsp. *longum, B. pseudolongum,* and *B. breve*, and more preferably, the *B. longum* is *B. longum* subs. *infantis*. The mammalian milk sources may be human, caprine, porcine, ovine, equine, or bovine, and preferably, the bovine source is from bovine colostrum. The MMO may be from whey, whey mother liquor, whey powder, whey permeates, and/or the mammalian milk oligosaccharide may be fucosylated, sialylated or be derivatives thereof. In particular, the MMO may comprise 2'-fucosyllactose, 3'-fucosyllactose, difucosyllactose, lacto-N-fucosylpentose I, lacto-N-fucosylpentose II, lacto-N-fucosylpentose III, lacto-N-fucosylpentose V, 3'-sialyllactose, 6'-sialyllactose, 3'-sialyl-3-fucosyllactose, sialyllacto-N-tetraose, 3'-sialyllactoseamin, and 6'-sialyllactosamine, produced synthetically and purified or isolated from natural sources or recombinant microorganisms. The *Bifidobacterium* is typically provided in a daily dose of from 10 million to 1 trillion cfu, preferably 10 million to 100 billion cfu, and more preferably from 4 billion to 50 billion cfu. The MMO is provided in a daily dose of from 1 to 60 g, preferably from 2 to 40 g.

[0010a] Disclosed is a composition described herein for use in treating gastrointestinal dysbiosis by providing a patient with said composition for at least 5 days.

[0010b] In one aspect, the present disclosure refers to use of of mammalian milk oligosaccharides (MMO) and a *Bifidobacterium* capable of internalizing said MMO prior to its hydrolysis, in the manufacture of a medicament for treating gastrointestinal dysbiosis in a patient consuming a complex diet with diverse sources of dietary fiber, wherein said patient's diet is to be changed diet to a low fiber diet, or a diet having essentially no dietary fiber other than MMO

[0011] Some examples of the instant disclosure include compositions comprising a MMO and a microorganism wherein the MMO induces a change in the microorganism such that the MMO then becomes an energy source for the organism, and when ingested by a mammal, the induced or activated microorganism provides a benefit to the gut of that mammal. Additional examples involve the maintenance of the induced microorganism in the gut of the mammal by maintaining the dietary supply of MMOs or other glycans that are selective for that microorganism. A further example involves the subsequent clearance of the microorganism from the gut by the cessation of the supply of the MMO to the mammal.

[0012] In one mode of this disclosure, the MMO and the bifidobacteria are provided in a dry form which may also be enrobed in a material that would provide enteric protection. In another mode, the MMO and the bifidobacteria are encapsulated, and the capsule may further comprise an enteric coating such as a coating that is not disrupted by passage through the stomach. In another mode, the MMO is provided as a solution and the bifidobacteria is provided as an enteric-coated powder, tablet, or capsule.

[0013] In yet another mode, the method of this disclosure further comprises administering *Lactobacillus* or *Pediococcus* contemporaneously with the composition. The *Lactobacillus* may

CLAIMS

1. Use of mammalian milk oligosaccharides (MMO) and a *Bifidobacterium* capable of internalizing said MMO prior to its hydrolysis, in the manufacture of a medicament for treating gastrointestinal dysbiosis in a patient consuming a complex diet with diverse sources of dietary fiber, wherein said patient's diet is to be changed diet to a low fiber diet, or a diet having essentially no dietary fiber other than MMO.
2. The use of claim 1, wherein the use further comprises identifying said patient, wherein said patient comprises a dysbiotic microbiome demonstrated by presence in the patient of inflamed bowel and/or a bacterial overgrowth of opportunistic pathogens and/or overt pathogens.
3. The use of claim 1, wherein the gastrointestinal dysbiosis is associated with inflammation, wherein inflammation is associated with Irritable Bowel Syndrome, Crohn's Disease, or Ulcerative colitis, Irritable Bowel Disease, or Short Gut Syndrome; or

   wherein the gastrointestinal dysbiosis is associated with infection, wherein infection is associated with bacterial or viral overgrowth, bacterial induced diarrhea, or antibiotic treatment; or

   wherein the gastrointestinal dysbiosis is associated with metabolic disorders, wherein metabolic disorder is associated with eating disorders, autism, obesity, or low diversity in dietary intake.

4. The use of claim 1, wherein the low fiber diet comprises a daily amount of dietary fiber less than 10 g/day, 5 g/day, or 1 g/day; and/or

   wherein the complex diet with diverse sources of dietary fiber comprises dietary fiber other than MMO.

5. The use of claim 1, comprising that the MMO and the *Bifidobacterium* are to be administered contemporaneously with changing the patient's diet for at least 5 days.

6. The use of claim 1, wherein the *Bifidobacterium* is selected from the group consisting of *B. longum* subsp. *longum, B. longum* subsp. *infantis, B. pseudocatanulatum,* and *B. breve*.

7. The use of claim 1, wherein the *Bifidobacterium* is to be administered per a daily dose of from 1 million to 100 billion cfu, 10 million to 1 trillion cfu, 10 million to 100 billion cfu, or 4 billion to 50 billion cfu; and/or

wherein the use further comprises that *Bifidobacterium* and/or *Lactobacillus* is to be administered, optionally wherein the *Bifidobacterium* is selected from the group consisting of *B. longum subsp. longum, B. animalis, B. catenulatum, B. pseudolongum,* and *B. pseudocatanulatum,* and the *Lactobacillus* is selected from the group consisting of *L. plantarum, L. antri, L. brevis, L. coleohominis, L. fermentum, L. gasseri, L. johnsonii, L. pentosus, L. sakei, L. salivarius, L. casei, L. rhamnosus (e.g., LGG), L. acidophilus, L. curvatus, L. reuteri, L. mucosae,* and *L. crispatus*.

8. The use of claim 1, wherein the *Bifidobacterium* is activated by its interaction with the MMO.

9. The use of claim 1, wherein the MMO is from a mammalian milk sourced from human, bovine, equine, or caprine sources; or

wherein the MMO is from a recombinant microorganism or chemical synthesis.

10. The use of claim 1, wherein the MMO is selected from the group consisting of 2'-fucosyllactose, 3-fucosyllactose, difucosyllactose, lacto-N-fucosylpentaose I, lacto-N-fucosylpentaose II, lacto-N-fucosylpentaose III, lacto-N-fucosylpentaose V, 3'-sialyllactose, 6'-sialyllactose, 3'-sialyl-3-fucosyllactose, sialyllacto-N-tetraose, N-acetylgalactosamine, 6'-sialyllactosamine, lacto-N-tetraose, Lacto-N-neotetraose and combinations thereof, wherein these oligosaccharides may optionally be synthetically produced and purified.

11. The use of claim 1, wherein the MMO comprises human or bovine milk oligosaccharides (BMO or HMO) and fucosylated glycans (SPF) and/or sialylated glycans (SPS), wherein the SPF and/or SPS are not of milk origin, optionally wherein the ratio of HMO:SPF is from 20:1 to 1:5 or that of BMO: SPF is from 20:1 to 1:5 or the ratio of HMO:SPS is from 20:1 to 1:5 or that of BMO: SPS is from 20:1 to 1:5.

12. The use of claim 1, wherein the MMO is to be administered per a daily dose of 1 to 60g, 2 to 40g, or 1 to 20g.

13. The use of claim 1, wherein the MMO is to be administered at a ratio of from 0.01 to 10g of MMO per billion cfu of the *Bifidobacterium*, or from 0.1 to 1g of MMO per billion cfu of the *Bifidobacterium*.

14. The use of claim 1, wherein the use comprises that a composition comprising the MMO and the *Bifidobacterium* is to be administered,
wherein the composition is in the form of a powder, a capsule or a tablet; or

wherein the composition is formulated to provide a daily ration sufficient to support intestinal microbiome of the patient with a body weight greater than 10 kg.

15. The use of claim 1, wherein the patient is a child, an adolescent, an adult or a geriatric.

16. The use of claim 1, wherein the MMO and the *Bifidobacterium* to be administered contemporaneously with changing the patient's diet results in restoration of gut barrier function in the patient.

17. The use of claim 1, wherein the MMO and the *Bifidobacterium* to be administered contemporaneously with changing the patient's diet results in a simple microbiome in a patient's gut, wherein the simple microbiome comprises a single genus of *Bifidobacterium* present at values greater than 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, or 90% of total bacterial cells present in the patient's gut.

18. The use of claim 1, wherein the MMO and the *Bifidobacterium* to be administered contemporaneously with changing the patient's diet results in colonization of *Bifidobacterium* in a patient's gut, wherein the colonization of *Bifidobacterium* in the patient's gut can be reversed by withdrawal of the MMO to be administered.

19. The use of claim 1, wherein the use further comprises that GOS polymers enriched in DP-4 and DP-5 are to be administered.

20. The use of claim 1, wherein the use further comprises reducing numbers of gut bacteria associated with breakdown of dietary fiber with 20 or more carbohydrate residues in the patient,

wherein reduction of said gut bacteria comprises a clean-out pretreatment with a colonoscopy preparation and a reduction of the patient's total dietary intake of non-MMO; or

wherein reduction of said gut bacteria comprises a pretreatment with an orally active antibiotic and a reduction of the patient's total dietary intake of non-MMO.