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 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 diet with sources of dietary fiber other than MMO, wherein said patient's diet is to be to a diet comprising a daily amount of dietary fiber other than MMO of less than 30 g/day, 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.

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 diet with sources of dietary fiber other than MMO, wherein said patient's diet is to be changed to a diet comprising a daily amount of dietary fiber other than MMO of less than 30 g/day, or a diet having essentially no dietary fiber other than MMO.

2. The use of claim 1, wherein said patient has a dysbiotic gastrointestinal microbiome and comprises intestinal inflammation caused by the dysbiotic gastrointestinal microbiome.

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 diet comprises a daily amount of dietary fiber other than MMO of less than 10 g/day, 5 g/day, or 1 g/day.

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

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 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 GOS polymers enriched in DP-4 and DP-5 are to be administered.