CLAIMS

What is claimed is:

1. Use of bacterial metabolites for the manufacture of a composition for improving the composition of the gut microbiome and metabolic profile of a pediatric subject, the composition comprising:

a. up to 7 g/100 kCal of a protein or protein equivalent;

b. up to 7 g/100 kCal of a fat or lipid;

c. at least 5 g/100 kCal of a carbohydrate;

d. bacterial metabolites, wherein the bacterial metabolites comprise indoleacetate, 5-amino valerate, phenyllactate, homovanillate, N,N-dimethylglycine, hippurate, benzoate or combinations thereof, at a level of 0.5 mg/100 kcal to 500 mg/100 kcal; and

e. either a probiotic or a prebiotic composition, or both.

2. The use of claim 1, which comprises both a probiotic and a prebiotic composition.

3. The use of claim 1, wherein the bacterial metabolites further comprise at least one additional metabolite selected from the group consisting of acetate and propionate.

4. The use of claim 1, wherein the probiotic comprises *Lactobacillus rhamnosus* GG (ATCC number 53103) in an amount of from 1×10^4 cfu/100 kcal to 1.5×10^{10} cfu/100 kcal.

5. The use of claim 1, which comprises 0.1 g/100 kCal to 1 g/100 kCal of a prebiotic composition comprising polydextrose and galacto-oligosaccharide.

6. The use of claim 1, which further comprises at least 5 mg/100 kCal of a long chain polyunsaturated fatty acid,

7. The use of claim 1, wherein the protein source comprises lactoferrin at a level of 10 mg/100 kCal to 200 mg/100 kCal.

8. The use of claim 1, wherein the nutritional composition is an infant formula or a growing up milk.

9. Use of bacterial metabolites for the manufacture of a nutritional composition for improving the composition of the gut microbiome and metabolic profile of a pediatric subject, the nutritional composition comprising:

a. up to 7 g/100 kCal of a protein or protein equivalent;

b. up to 7 g/100 kCal of a fat or lipid;

c. at least 5 g/100 kCal of a carbohydrate;

d. bacterial metabolites, wherein the bacterial metabolites in the nutritional composition comprise homovanillate, N,N-dimethylglycine, hippurate, benzoate, or combinations thereof, at a level of 0.5 mg/100 kcal to 500 mg/100 kcal; and

e. either a probiotic or a prebiotic composition, or both.

10. The use of claim 9, wherein the nutritional composition comprises both a probiotic and a prebiotic composition.

11. The use of claim 9, wherein the bacterial metabolites in the nutritional composition further comprise at least one additional metabolite selected from the group consisting of acetate and propionate.

12. The use of claim 9, wherein the bacterial metabolites in the nutritional composition further comprise indoleacetate, 5-amino valerate, phenyllactate, or combinations thereof.

13. The use of claim 1, wherein the bacterial metabolites further comprise at least one metabolite selected from the group consisting of 6-beta-hydroxylithocholate, hyocholate, glycohyocholate, hyodeoxycholate, taurohyodeoxycholic acid, glycohyodeoxycholic acid, equol, 3,4-Dihydroxyphenyl acetic acid (DOPAC), 5-(3',4'-Dihydroxyphenyl)-γ-valerolactone, gamma-aminobutyric acid (GABA), noradrenaline, serotonin, dopamine, and acetylcholine.

14. The use of claim 9, wherein the bacterial metabolites further comprise at least one metabolite selected from the group consisting of 6-beta-hydroxylithocholate, hyocholate, glycohyocholate, hyodeoxycholate, taurohyodeoxycholic acid, glycohyodeoxycholic acid, equol, 3,4-Dihydroxyphenyl acetic acid (DOPAC), 5-(3',4'-Dihydroxyphenyl)-γ-valerolactone, gamma-aminobutyric acid (GABA), noradrenaline, serotonin, dopamine, and acetylcholine.