CLAIMS

What is claimed is:

1. A food and/or feed additive product grown under chemoautotrophic conditions comprising:

a consortium of chemoautotrophic and photoautotrophic bacteria and heterotrophic microbes, the consortium including

chemoautotrophic bacteria from the genera *Cupriavidus,* or *Methylococcus*,

photoautotrophic bacteria from the genera *Rhodobacter, Rhodospirillum, Rhodopseudomonas, or Arthrospira*, and

heterotrophic microbes from the genera *Bacillus, Bacteroides, Bifidobacterium, Lactobacillus, Lactococcus, Leuconostoc, Paracoccus, Pediococcus*, *Propionibacterium or Streptococcus.*

2. A method for producing a food and/or feed additive product, the method comprising:

providing a consortium of chemoautotrophic and photoautotrophic bacteria and heterotrophic microbes within a system, the system including a fermentation vessel filled with an aqueous medium comprising the consortium, the fermentation vessel having an input port into which gaseous substrates are introduced into the aqueous medium, the fermentation vessel further having an exhaust port through which gases exit the fermentation vessel, wherein the aqueous medium comprises inorganic anions and inorganic cations, and wherein the aqueous medium contains a concentration of no more than 0.05% of each of

added sugars, yeast extract, tryptone, and/or organic carbon compounds, the consortium including

chemoautotrophic bacteria from the genera *Cupriavidus, Rhodococcus* or *Methylococcus*,

photoautotrophic bacteria from the genera *Rhodobacter*, *Rhodospirillum*, *Rhodopseudomonas*, or *Arthrospira*, and

heterotrophic microbes from the genera of *Bacillus, Bacteroides, Bifidobacterium, Lactobacillus, Lactococcus, Leuconostoc, Paracoccus, Pediococcus*, *Propionibacterium*, or *Streptococcus*;

introducing a first gaseous substrate into the input port, the first gaseous substrate including carbon predominantly in the form of single-carbon atom molecules;

introducing a second gaseous substrate into the aqueous medium, the second gaseous substrate including predominantly hydrogen gas (H_2) or methane gas (CH_4) or a mixture thereof, wherein either of the first or second substrates additionally includes oxygen gas (O_2); and

harvesting cells of the bacteria from the system to generate a biomass product that has enhanced nutritional value compared to the biomass that the same chemoautorophic microbes would produce if grown alone.