

# Sustainable Food Processing Inspired by Nature

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Table S1 lists several examples of how food processing inspired by nature using enzymes or cultures can offer solutions for four global nutrition and health issues: 1. Ageing, where the majority of the population is over 50 years of age in more than 70% of developed countries; 2. Malnutrition, where poor maternal and child nutrition is the underlying cause of three to five million deaths per year, and malnutrition is

responsible for approximately one third of the disease burden in children younger than five years; 3. Overweightness, obesity, and associated diseases that lead to an epidemic of metabolic diseases and an exponentially growing cost for health care; and 4. Allergy, where forecast studies estimate that 50% of people will suffer from symptoms of various allergies in the next 20 years (<http://www.who.int/en/>).

Table S1. Examples of enzymatically treated or fermented food providing solutions to four global challenges in health and nutrition. Note: The below list serves as illustration to the statements in this perspective paper, without the pretention to be complete.

Health challenge	Enzymatically treated or fermented food and health benefit	Refs
Allergy / Intolerance	Protease for protein hydrolyzed food to alleviate symptoms of cow milk allergy, gluten intolerance, and/or peanut allergy.	[1]
	Lipases for hydrolysis of natural fats to optimize the release of mono-, diglycerides and fatty acids.	[2]
	Lactases or lactose converting enzymes to reduce symptoms of lactose intolerance, and/or to produce prebiotic lactulose and epilactose by isomerization (cellobiose-epimerase).	[3]
	Probiotics and/or probiotic fermented foods to reduce symptoms for several allergies, including pollen allergy, cedar pollen allergy, and eczema.	[4]
Malnutrition	Amidohydrolase (e.g. asparaginase) to prevent or reduce undesirable food-borne process contaminants like Maillard-generated acrylamide as demonstrated for many food applications (e.g. French fries and bakery products).	[5]
	Phytase and phytic acid complexes to increase bioavailability of iron and zinc.	[6]

	Probiotics and/or probiotics containing fermented foods to prevent and reduce episodes of diarrhea.	[7]
	Cultures for fermenting foods to increase concentration of nutrients like essential amino acids, vitamins, and SCFAs.	[8]
	Cultures for fermented foods to detoxify or degrade undesirable compounds (trypsin inhibitors, mycotoxins, allergens).	[9]
	Probiotics for oral cavity-reduction.	[10]
<b>Overweight and obesity and other lifestyle diseases</b>	Carbohydrases (e.g. glucanotransferases) to produce dietary fibers or slow digestible sugars for lower calories and/or better blood glucose management.	[11]
	Carbohydrases (e.g. glucanotransferases, lactases) to increase sweetness without increasing calories.	[12]
	Lipases for enzymatically catalyzed hydrolysis of natural fats to optimize the release of mono- , diglycerides and fatty acids and as more natural alternative for chemically catalyzed esterification of free fatty acids and glycerol resulting in reduction of added emulsifiers by in-situ formation of emulsifiers.	[2]
	Probiotics and/or probiotic fermented foods interfering lipid and carbohydrate metabolisms to reduce cardiovascular risk factors like hypercholesterolemia, hypertension.	[13], [14]
	Cultures for fermented foods producing exopolysaccharides to reduce fat and calories by in-situ generation of creaminess and texture.	[15]
	Glucose generating (dairy) starter cultures to increase sweetness without increasing calories.	[16]
<b>Ageing</b>	Proteases for protein hydrolysis creating amino acids as flavor precursors or taste-active compounds to increase taste and palatability of food, as solution to reduced appetite. Also to improve digestibility and to balance digestive and absorption problems.	[17]
	Proteases for protein hydrolysis to improve digestibility and to balance digestive and absorption problems.	[17]
	Carbohydrases for controlled degradation of starch by amylases and glucosidases to obtain a defined molecular weight distribution for reducing viscosity and softening of food textures as solution to problems with chewing and dysphagia.	[11]
	Cultures for making fermented foods to increase the level of B, C & K vitamins to support cognitive fitness.	[18]
	Cultures for making fermented foods to enhance the palatability of food, as solution to reduced appetite. Also to improve digestibility and to balance digestive and absorption problems.	[18]

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