
Whole grains, dietary fibre, and health

Definitions: Dietary Fibre

1) Non-digestible polysaccharides that are intrinsic and intact in plants

2) National regulations and international trade agreements define fibre as follows:

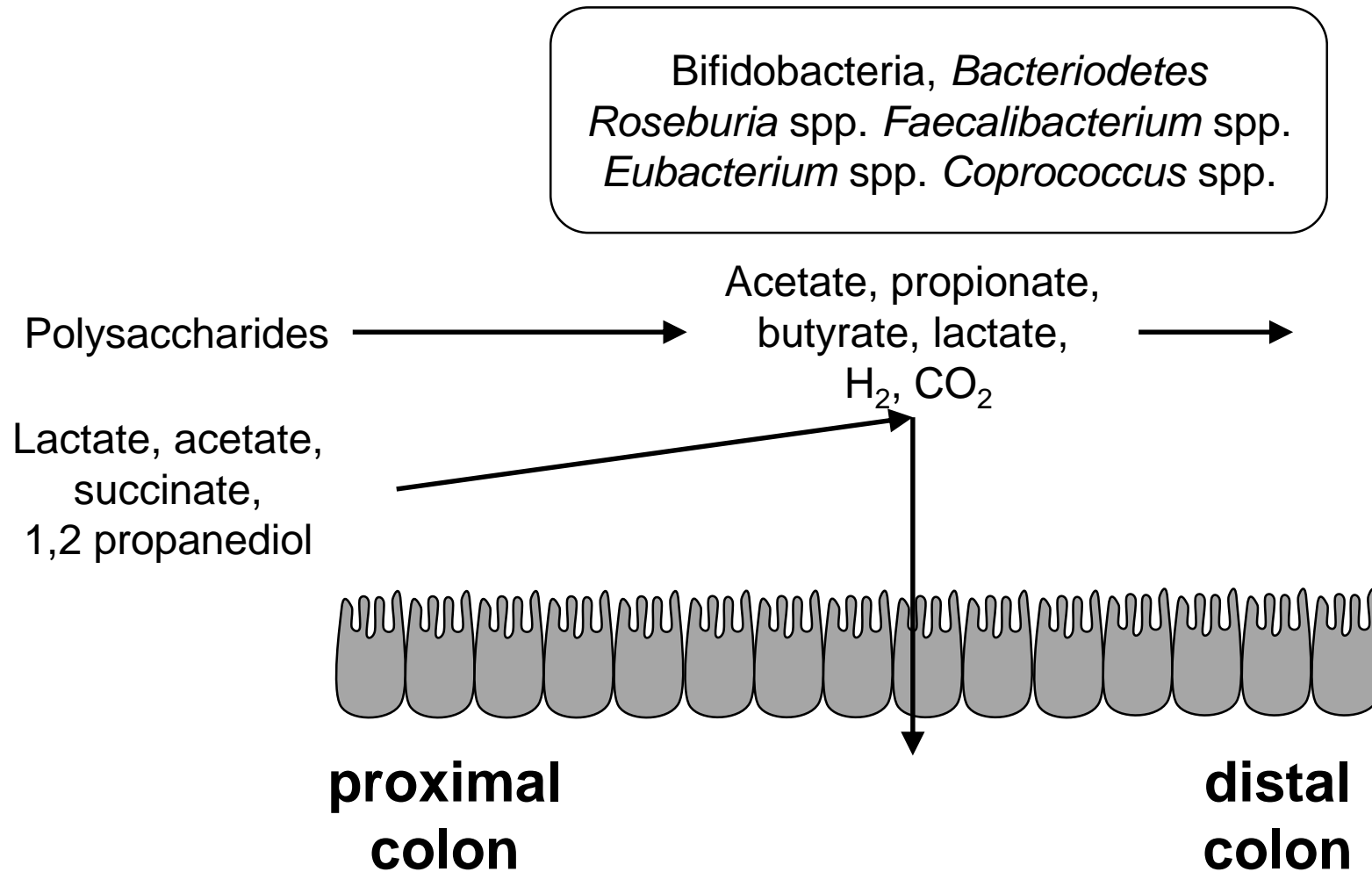
Carbohydrate polymers with ten or more monomers, which are not hydrolysed by enzymes in the small intestine of humans.

Purified and synthetic carbohydrates are included in the definition if they have a benefit to human health.

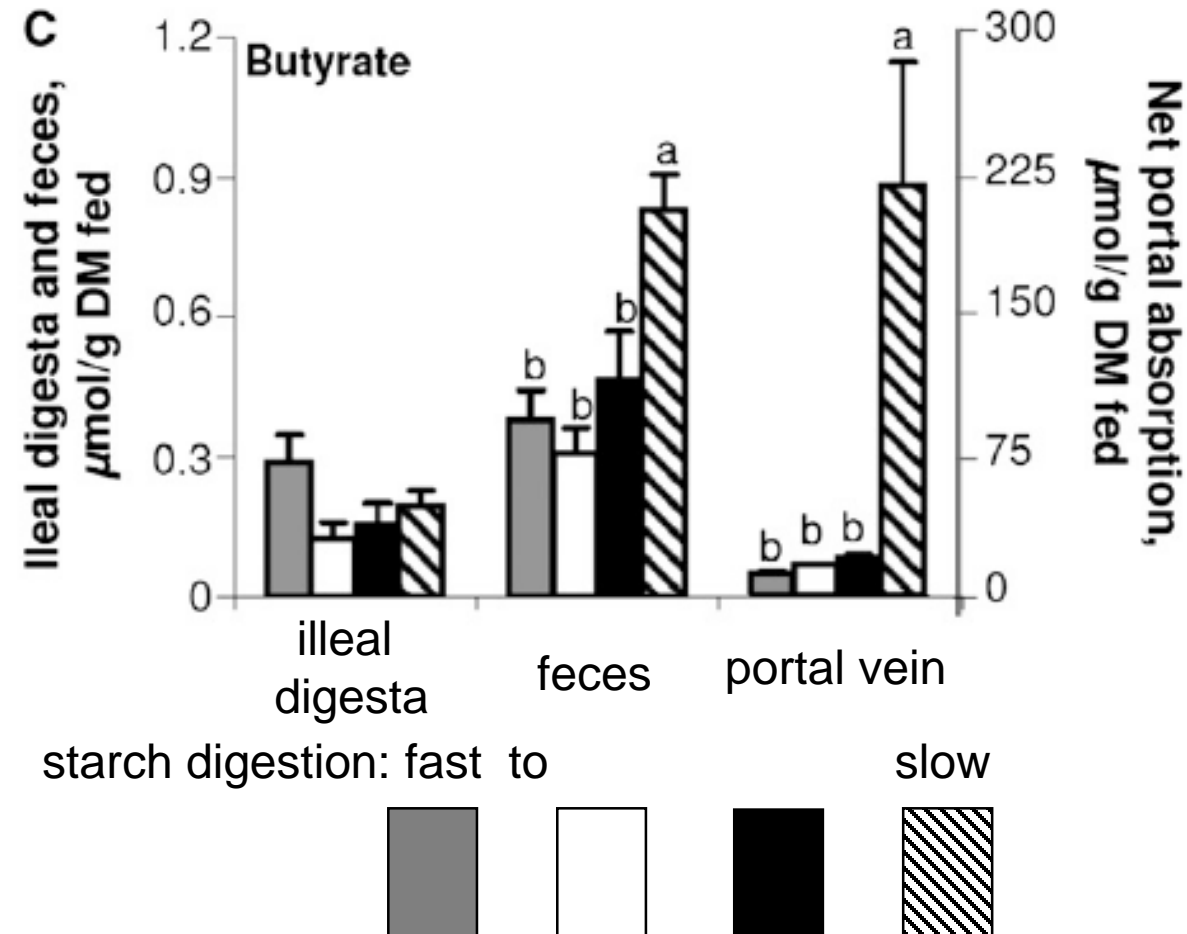
Many jurisdictions (Canada, U.S.) include purified or synthetic oligosaccharides with a degree of polymerization greater than 3.

<https://www.canada.ca/en/health-canada/services/publications/food-nutrition/labelling-advertising-dietary-fibre-food-products.html>

Carbohydrate digestion in the large intestine



Starch digestion in swine: comparison of ileal cannulated and portal vein catheterized swine



- interim summary – Health effects of short chain fatty acids

General health benefits of carbohydrates with low small intestinal digestibility

Low cariogenicity

Reduced caloric content (60 – 75% of glucose)

Adverse health effects of FODMAPS and prebiotic carbohydrates

Induction of osmotic diarrhea by oligosaccharides when oligosaccharide load exceeds ~ 0.3 g / kg bodyweight

Excessive gas formation and intestinal bloating after rapid intestinal fermentation of carbohydrates

Health benefits related to microbial production of short chain fatty acids

Intestinal motility

Energy supply and proliferation of colonic mucosal cells

Satiety, glucose homeostasis and insulin sensitivity

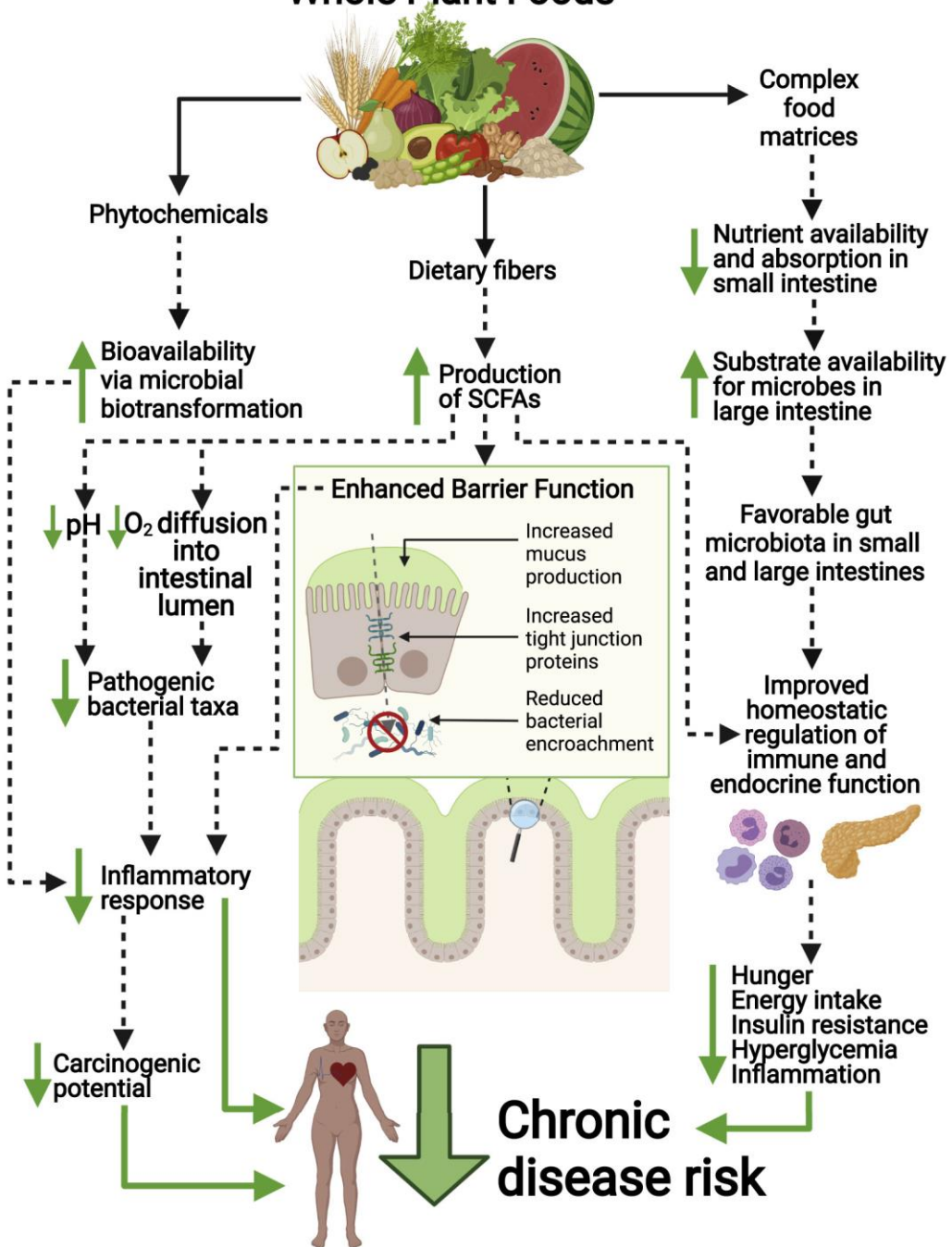
Interaction with G protein-coupled receptors GPR41, GPR43, and GPR109A mediates immune-modulation and improved epithelial barrier function

Reduced luminal pH and pathogen exclusion

Improved iron absorption

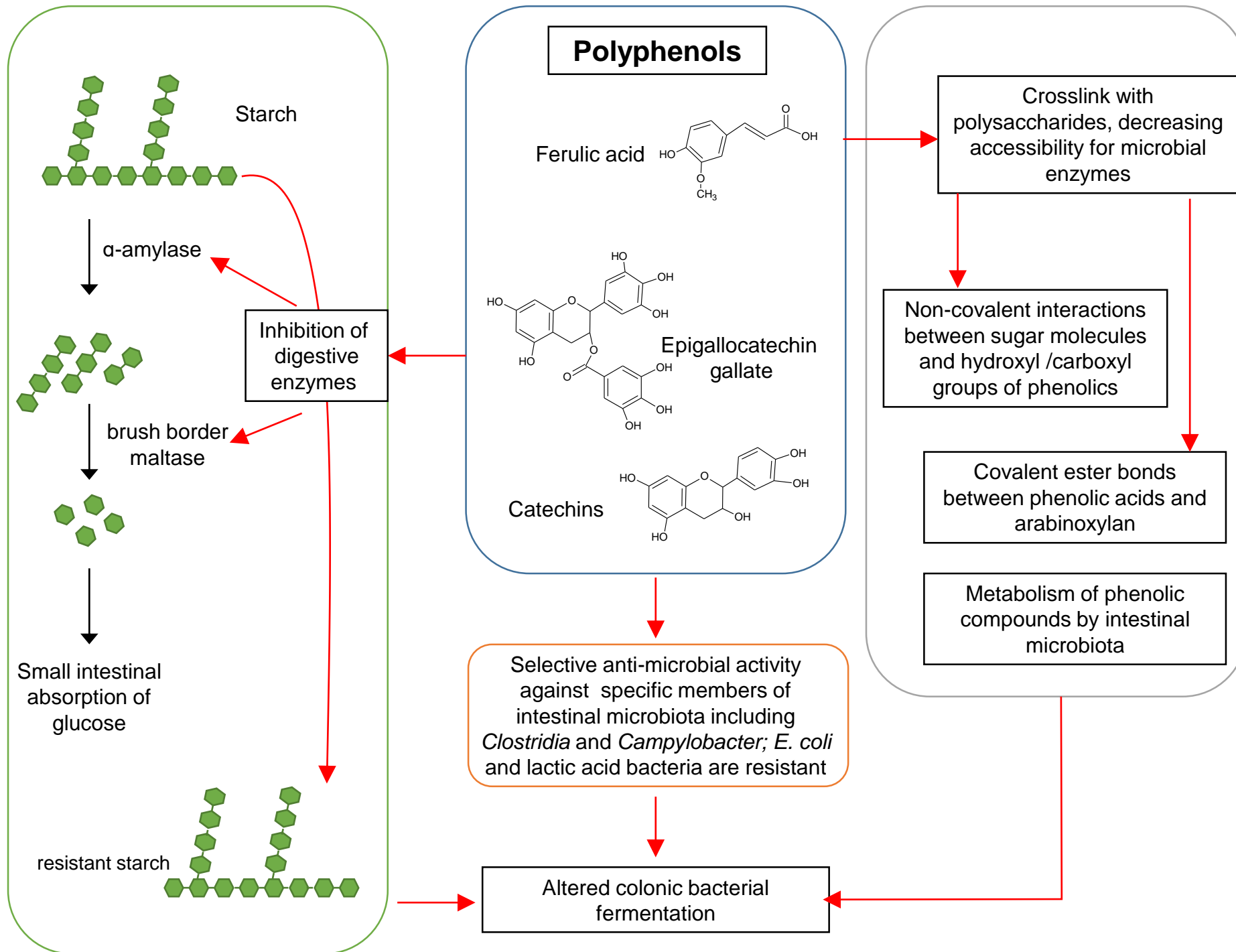
BUT: few of the clinical trials that used isolated or synthetic dietary fibre documented beneficial health outcomes, or consistently improved clinical markers for chronic disease

Whole Plant Foods



Health benefits of whole grains / whole plant foods

<https://doi.org/10.1016/j.chom.2022.04.016>



Health effects of whole grain rye sourdough bread

**whole rye flour
+
sourdough
+
whole grains
+
long, low temperature baking
= low GI bread
(e.g. pumpernickel)**



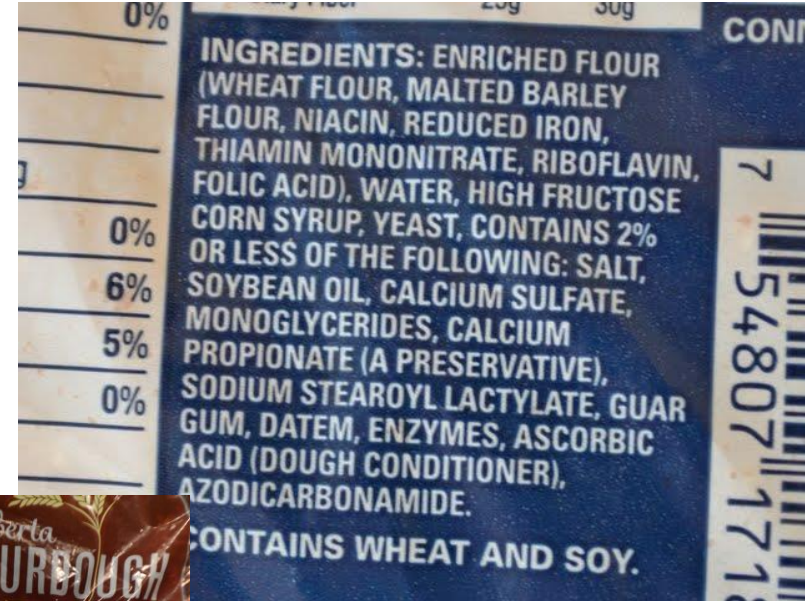
Use of sourdough for whole grain and „clean label“; minimally processed formulations

1900: Flour, water, salt

2010: Flour, water, sugar, salt, yeast, vital gluten, acetate, propionate, ascorbic acid, cystein, guar gum, sodium-stearoyllactylate, mono- and diglycerides, amylase, xylanase

2021: Flour, water, salt

https://youtu.be/e8Ub_o6CUZM

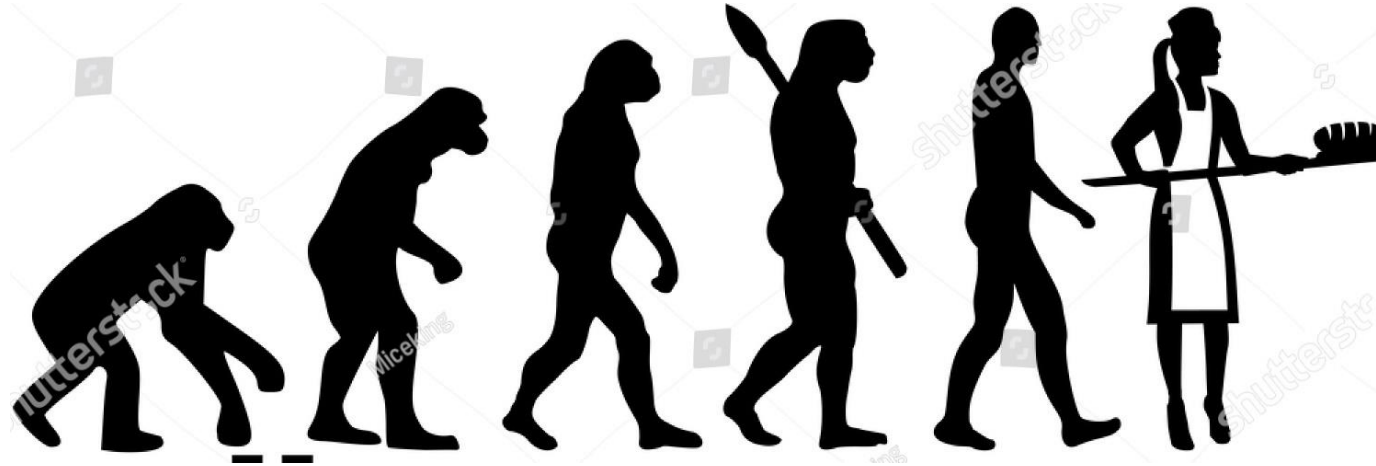


Tradition

Innovation

Knowledge

Summary



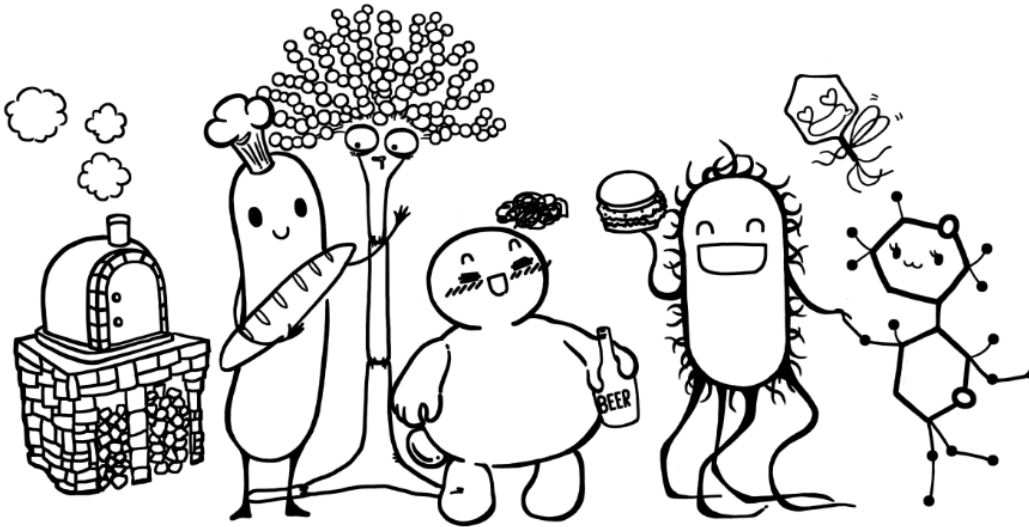
Hunter and gatherer → Agriculture → Industrialisation → Knowledge economy

Sourdough = Information to produce better and healthier bread

Acknowledgements

The team...

University of Alberta



Food microbiology lab 2-50

By: Lingxiao...

...You for your attention