

ROLE OF THE GUT BACTERIA



Our Good Bacteria

- In a perfect world, we would all have a proper ratio of good bacteria
- And what could this proper ratio do for us?
- The knowledge of the connections between our gut bacteria and the functions in our body is growing
- And how all this helps us maintain our health



Here Is The Issue

- Most research involves a specific strain or strains and both researchers and supplement companies who use the strains in a supplement will tell you the same thing
- Only the strain studied can work for the purpose studied
- This is not true
- They cannot tell what strains in you do the same thing
- And they cannot tell you other strains do not do the same thing - it is far too complicated
- So do not buy into this



The Role of Good Bacteria

- Lactose Intolerance: Converts lactose to lactic acid
- Improving Immune Function and Preventing Infections: improve immune function by increasing the number of IgA-producing plasma cells, increasing or improving phagocytosis as well as increasing the proportion of T lymphocytes and Natural Killer cells
- *Helicobacter pylori* and antibiotic associated diarrhea (AAD)



- Diarrhea: Good bacteria can help with several forms gastroenteritis (inflammation of the intestines due to virus or infection) including reducing both the duration of illness and the frequency of stools.
- Fermented milk (such as yogurt, kefir) reduce the duration of symptoms.
- Diarrhea (AAD) due to an imbalance in good bacteria caused by antibiotics
- Another consequence of antibiotic therapy leading to diarrhea is overgrowth of potentially pathogenic organisms such as *Clostridium difficile*.



- Probiotic treatment might reduce the incidence and severity of AAD as indicated in several meta-analyses.
- For example, treatment with probiotic formulations including *Lactobacillus rhamnosus* may reduce the risk of antibiotic-associated diarrhea, improve stool consistency during antibiotic therapy
- Taking probiotics with antibiotics has been shown to help with AAD and it prevents bad bacteria from gaining in numbers
- Superinfection resulting from antibiotic administration is the disease pseudomembranous enterocolitis caused by *Clostridium difficile*

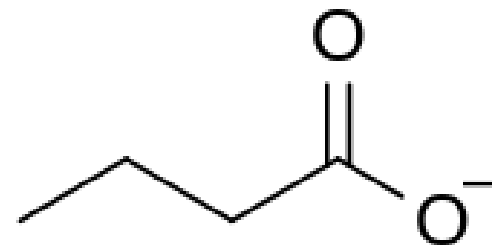
C. Diff

- Antibiotics such as clindamycin, ampicillin, or cephalosporin kill many bacteria do not kill C. Diff
- C. Diff is small in numbers but it flourishes in the absence of competition. It produces a toxin that stimulates the secretion of a pseudomembrane by intestinal cells which must be treated with vancomycin or be surgically removed or patient will die
- Probiotics can prevent C.Diff
- Yeast such as *Candida albicans* and fungi can also produce superinfections when bacteria is eliminated by antibiotics.



Good Bacteria and Carbs

- Lower levels of good bacteria changes carbohydrate metabolism
- Carbohydrate fermentation produces short chain fatty acids(SCFA) (butyrate, propionate and acetate)
- SCFA are fermented from resistant starch and fiber
- Large intestines produces the most SCFA
- Low levels of good bacteria decreased short-chain fatty acid production and absorption and increases osmotic diarrhea (too much water) as a result.



Good Bacteria

- Improves mineral absorption and can help correct malabsorption of trace minerals
- Prevents the growth of harmful bacteria where we are stressed
- Reduces Inflammation: modulate inflammatory and hypersensitivity responses, due to the regulation of cytokine function
- Provides non–immunological protection against infection
- Stimulates the immune system to mature at birth and keep its balance
- Regulates and primes the immune system throughout life



Irritable Bowel Syndrome (IBS) and Colitis

- This may play a role in IBS, IBD and Colitis
- Symptom-based diagnosis characterized by chronic abdominal pain, discomfort, bloating, and alteration of bowel habits. As a functional bowel disorder, IBS has no known organic cause.
- Onset of IBS is more likely to occur after an infection (post-infectious, IBS-PI), a stressful life event, or onset of maturity.
- The most common theory is that IBS is a disorder of the interaction between the brain and the gastrointestinal tract, although there may also be abnormalities in the gut flora or the immune system.

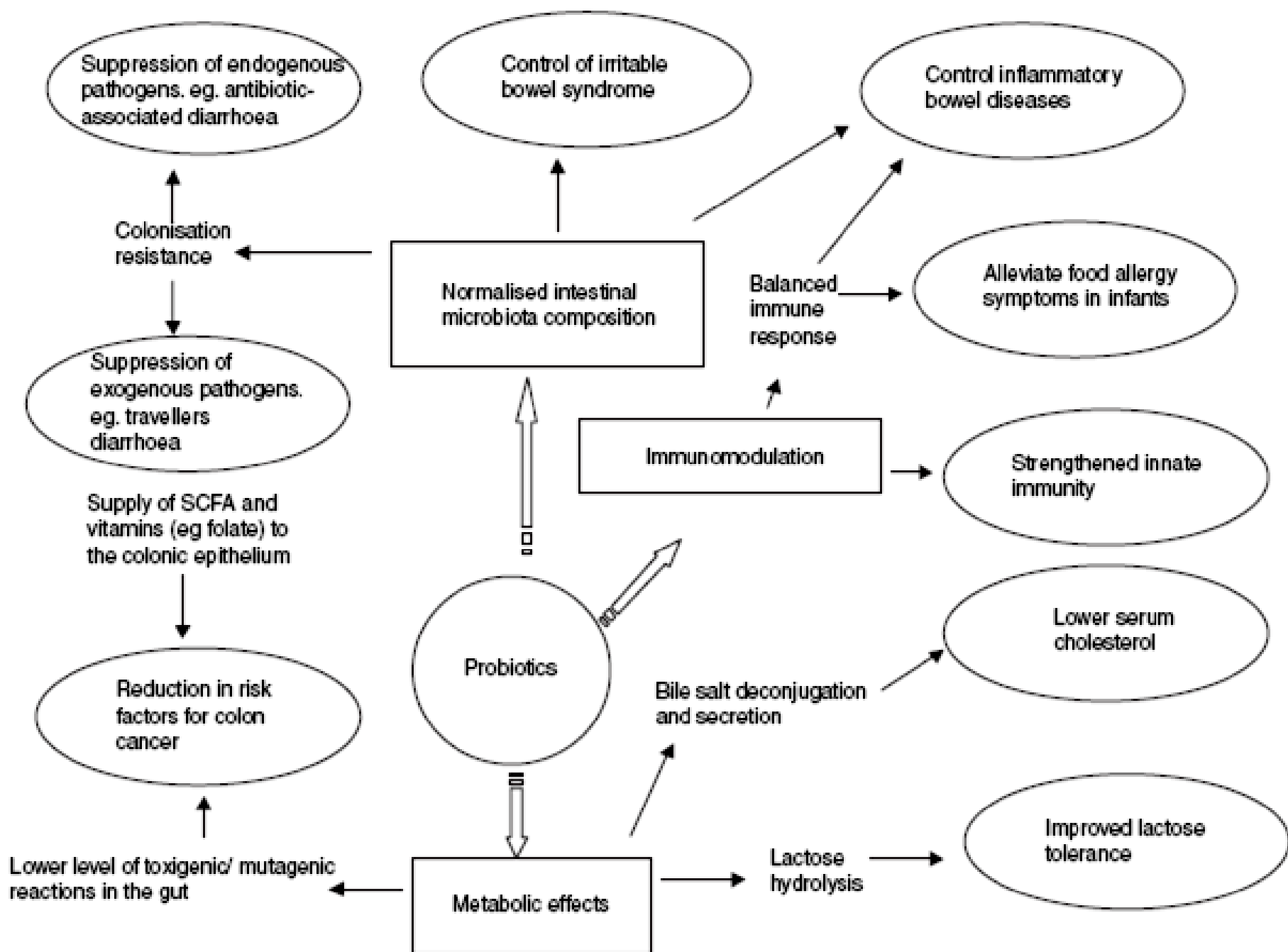


Figure 1 Various health benefits from probiotics consumption.

Other Functions

- Essential to organ development – including the intestines, liver, heart and lungs
- Facilitates a wide variety of metabolic functions and can affect:
 - metabolic diseases
 - mental disease and mental health
 - CVD and various mechanisms
 - Cholesterol lowering
 - Helps with lowering blood pressure



A lot of the research has focused on comparing germ-free mice to normal mice

Other Functions

- Drives intestinal mucosal cell turnover, and maintenance of villi and cell lining wall structure
- Increases development and physical size of lymph system and systemic and mesenteric lymph nodes.
- Regulates physiology:
 - Increases cardiac output, and oxygen consumption
 - Increases intestinal motility, secretion, and absorption
- Reduces food intake by regulating appetite and satiety

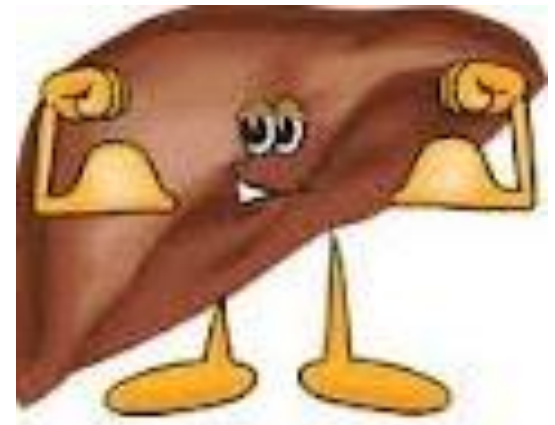
GIT

- Keeps the gut closed including making sure there are tight junctions
- Helps reduce the adherence of pathogenic bacteria to the colon wall by preventing access to receptor sites
- Reduces the secretion of E.coli
- Produces anti-bacterial and anti microbial agents
- Stimulates enzyme production
- Increase the production of mucous and mucin (involved in cell-signaling and forming chemical barriers against pathogens)
- Deconjugation of bile so it can be absorbed and sent back to the liver

Three Ways to Detox

- Biotransformation is the process of changing one chemical to another (transformed) by a chemical reaction within the body
- It is a method used to de-activate harmful substances or convert substances to something useful to the body or prepared the substance for detoxification

- 1) Liver detoxification**
- 2) Cellular detoxification**
- 3) Enteric microflora detoxification**



Detoxification Continued...

- The liver performs Phase I and Phase II and forms liver conjugates which attach to bile and travel to the intestines
- Most of the bile detaches in the ileum and is transported back to the liver – good bacteria essential for this
- Intestinal Flora Epithelial Phase I & II
- Enterocytes and colonocytes (epithelial cells have also have capability of both Phase I and II activity.
- Production of P450 enzymes functionality of gut is considered to approach that of the liver

Detoxification and Toxin Production

- The microflora can detoxify and positively transform many substances:
- Heavy metals (by binding and by enhancing excretion from the body)
- Detoxes elements like BPA, prevent the formation of nitrosamines and can protect against HCA-Compounds
- Biotransformation of plant polysaccharides releasing lignases and phyto-estrogens (iso-flavones) by colon bacteria (help prevent colon and breast cancer)



Biotransformation



- Release of quercetin by bacterial β -galactosidase from fruit carbohydrates. Quercetin & rutin have been shown to be powerful anti-mutagens, anti-cancer and chemoprotective
- Plant polyphenols such as those contained in grape skin/seed extracts are only absorbed in the colon following interaction with microflora
- Evidence that depending on the type of bacteria , release of dietary glucosinolates (isothiocyanates) found in cruciferous has effect of regulating cytochrome P450 enzymes in liver and have anti-cancer benefits

Gut Brain Role

- Breaks down exorphins (substances having opiate-like activity) – which play a role in autism and ADHD
- Increases and regulates serotonin production
- Blunts sensory nerves – helps with pain reduction
- Aids cognitive function although how is not known.
- Produces anti-depressive effects – this involves multiple mechanisms but it is unknown exactly how this works



Metabolic Physiology Role:

- Prevents obesity – maintains energy balance, act as an anti-inflammatory, regulates gut hormones
- Stroke recovery
- T-reg cell stimulation and regulation
- Maintain and enhance the normal function of the intestinal mucosa:
 - Prevents leaky gut, SIBO

Summary of Function

- Provides non-immunological protection against infection
 - candidiasis, AAD, C. Diff
- Provides capability to alter the microbiome population
 - IBS, IBD, obesity etc
- Stimulates maturation and balancing of the immune system at birth
 - allergy, colitis,
- Regulates and primes the immune system throughout life-infection, anti auto-immune, anti –inflammatory

Summary of Function

- Facilitates a wide variety of metabolic functions in the body – heart, lung, metabolism
 - SCFA production – leaky gut, IBS, IBD
 - Detoxification – mercury toxicity
 - Brain-gut - produces precursor metabolites - serotonin - reduced anxiety
 - lowers cholesterol
 - CVD risk reduction

This is just the beginning of our understanding