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VITAMINS, MINERALS AND THE GUT



Healthy Gut

Slide 2

Nutrients

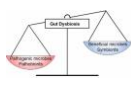
- Looking at individual nutrients that are involved with gut health can be misleading
- This is not about taking individual nutrients
- It supports more a whole food diet or multi nutrients approach
- Research is basically bits and pieces but there is enough to indicate all bases should be covered



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Dysbiosis

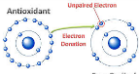
- 80 person study – 50 normal, 30 with dysbiosis found those with dysbiosis had lower levels of B vitamins, zinc, and magnesium
- What role "bad" bacteria is playing is not fully understood – if they are utilizing them or causing them to be excreted is not fully known or missing good bacteria is the reason
- Some indication that nutrients have relationship with good bacteria, some even promote the growth of specific strains
- Therefore, deficiency of nutrients could also be a factor in developing dysbiosis



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Oxidative Stress

- We know gut bacteria plays a role in regulating inflammation
- Oxidative stress – factor for inflammation
- nother role for gut bacteria is to protect us from oxidative stress
- Recent studies of extreme endurance athletes show that oxidative stress affects the gut lining and microbiota levels
- However, going from no exercise to moderate improves microbiota levels.



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Oxidative Stress

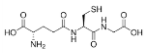
- Many bacteria (especially good bacteria) are anaerobic so oxygen is harmful to them
- Preliminary research shows that antioxidants have the ability to keep bacteria alive
- However, gut bacteria have the ability to potentiate antioxidants (both phytonutrients and vitamins and minerals)
- Bacteria has many survival options



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Antioxidants

- Superoxide dismutase (SOD), glutathione peroxidase, and catalase are the enzymes involved in protecting cells from the damaging effects of oxidative stress
- Complex relationship exists between gut bacteria, amino acids need to produce these enzymes and minerals such as zinc, iron and manganese
- For example – glycine deficiency has been noted in diseases such as diabetes, obesity and fatty liver disease.



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Antioxidants

- Glycine is one of three amino acids needed for glutathione production
- There are specific bacteria that consume glycine which can limit glycine and glutathione levels in the gut (and in the body as well)
- Butyrate increases glutathione
- Gut bacteria regulates glutathione metabolism and levels in the gut and body
- Always looking at a balance of strains – both good and bad

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EFAs

- Omega 6 helps promote healthy cell membranes and can help regulate inflammation in the gut and body.
- Omega 3 can counter inflammation in the gut and body. EFAs aid in gut health repair, improve bowel function and play a role in protecting the gut lining.
- Quality of Omega 3 and 6 is important as easily prone to oxidative stress so ingesting EFAs that are not exposed air, light and heat
- Antioxidants protect EFAs



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EFAs

- Also help repair the gut from the effects of colitis and other gastrointestinal issues.
- Appears to be some communication between gut bacteria and EFAs to the benefit of the good gut bacteria and the immune system
- One experiment showed that Omega 3 increased butyrate producing bacteria

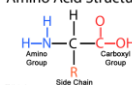


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Amino Acids

- Important for many functions
- Gut bacteria produce many amino acids and facilitate their absorption into the body
- Aid the extraction of amino acids from food
- Deficiency of gut bacteria can be a factor of amino acid deficiency and related conditions

Amino Acid Structure



The diagram shows the general structure of an amino acid. A central carbon atom (alpha carbon) is bonded to four groups: a hydrogen atom (H) above, an amino group (H-N-H) to the left, a carboxyl group (C=O and C-OH) to the right, and a side chain (R) below. Labels with arrows point to each part: 'Amino Group' for the H-N-H, 'Side Chain' for the R group, and 'Carboxyl Group' for the C=O and C-OH.

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Vitamins

- Act as catalyst in the body
- Similar roles seem to be occurring in their relationship with gut bacteria
- Gut bacteria makes a number of vitamins, which in turn play a role in supporting the functions attributed to the good bacteria
- Several vitamins promote the production of good bacteria strains
- Specific nutrients have relationships with specific strains



The diagram is a circular chart with a central yellow circle. Around it are various colored segments, each containing an icon of a different vitamin (e.g., A, B, C, D, E, K) and a small illustration of a bacterium, representing the relationship between specific vitamins and gut bacteria.

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Vitamin D

- Cell receptors in the gut for vitamin D
- Researchers believe that it communicates with our gut bacteria, and may play a regulatory role.
- It also helps reduce inflammation and repair the gut lining.
- Vitamin D promotes good bacteria levels, especially when combined with B vitamins.



The image is a simple, bright yellow sun with rays, representing the source of Vitamin D.

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Vitamin A

- Immune tolerance is given to substances like food and body tissue to prevent the immune system from attacking.
- Vitamin A helps maintained tolerance, which is regulated by gut bacteria.
- This means it helps with allergies and autoimmune conditions.
- It also has an ability to help the gut lining function.



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B Vitamins

- Relationship with the gut is complicated because the good gut bacteria makes B vitamins.
- In return, the B-vitamins help regulate several aspects of gastrointestinal function
- B vitamins involved for the intestinal role of immune function response
- Gut microbes make B12 but it appears that they make it for themselves and not for use by the body and use it for regulatory purposes such as transcription (gene expression)



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B Vitamins

- Folic acid helps maintain T-Regulatory cells
- B 2 is involved with MAIT Cells (innate-like lymphocytes with anti-bacterial function) to help fight infection
- Gut bacteria are important regulators of immune response and their production of B vitamins is just one way to help immune response
- Fermented milk and sourdough are just two fermented foods that produce B-vitamins.



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Vitamin C

- Helps promote many good bacteria strains
- Antioxidant repair or prevent damage by free radicals caused by toxins that are ingested into the gastrointestinal system
- Preventing or helping to repair damage to the intestinal wall lining and damage good gut bacteria
- Helps reduce intestinal inflammation
- Some early research has found that bacteria (specific strains) can produce Vitamin C



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Vitamin E

- Like vitamin C, vitamin E helps protect against free-radical damage. It can also help balance histamine in the intestines and the body
- There are some animals studies that suggest that bacteria can synthesize vitamin E and aid absorption
- In animal models, when gut bacteria levels were lowered, symptoms of vitamin E deficiency appeared



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Vitamin K

- Bacteria produces vitamin K which is then absorbed into the body via the intestinal wall lining
- Antibiotics deplete vitamin K
- Warfarin inhibits the activation of the Vitamin K (in order to thin the blood)
- There is some speculation that taking probiotics could interfere with Warfarin (but no proof)



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Minerals

- Many minerals have specific relationships with specific bacteria
- Some bad bacteria strains actually deplete minerals while good bacteria has a synergistic relationship
- Lactobacillus and bifidus strain produce lactic acid which lowers the intestinal pH and increase mineral absorption (they become more soluble)
- Prebiotics such as inulin and FOS have been shown to increase mineral absorption



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Calcium/Magnesium

- Calcium may play a role in helping our good gut bacteria survive.
- Contributes to how lactobacillus strains of good bacteria do their job
- Studies show that a deficiency in magnesium lowers bifidobacteria in the colon and is also connected to symptoms of depression and anxiety, which may be due to the gut-brain connection.
- A lack of magnesium is also connected to higher levels of intestinal inflammation.



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Calcium/Magnesium

- Calcium and magnesium work together for intestinal health.
- Aid muscle contraction in the gastrointestinal system, and help create a smooth transition of foods from one end to the other. They are usually found in foods together
- SCFA increase calcium solubility and absorption
- They also aid the absorption potassium, sodium and magnesium
- L. acidophilus and L. rhamnosus aid electrolyte absorption



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Manganese

- Toxic in high levels, low amounts of manganese are important for several functions in the body.
- Researchers believe that manganese is needed to help several strains of good bacteria grow.
- Also involved in the production of manganese catalase – gut bacteria either manufacture or produce enzymes that do so



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Zinc

- A zinc deficiency may result in several gastrointestinal issues.
- Too little zinc can alter the quality and quantity of good bacteria.
- Zinc is needed for the survival of several species of bacteria (including pathogens but good bacteria have an ability to inhibit their access and take it for themselves)
- Regulates the gap junctions in the gut lining and helps prevent them from opening up.
- Zinc is also essential for producing stomach acid, which aids the digestion of protein
- Production of SOD (along with copper)



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Selenium

- This is essential for gut health as it regulates inflammation, prevents free radical damage and helps prevent damage to the gut lining.
- Selenium increases the diversity of bacteria strains and in turn, the good gut bacteria, help to improve the availability of selenium in the body.
- As an antioxidant protects microbes and intestines from oxidative stress



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Sulfur

- Some strains of good bacteria produce sulfur, which helps other strains grow.
- Makes for another complicated relationship between our good gut bacteria and our nutrients.
- Studies have shown that the sulfur compounds produced by gut bacteria can influence the flavour of food.
- Sulfur is an important mineral that helps maintain hair, skin cartilage and tissue.



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Sulfur

- It also helps keep enzymes active and makes vitamin D from the sun more available to the body.
- Sulfur benefits glucose metabolism and a deficiency of the mineral has been noted in those with Alzheimer's.
- Dysbiosis has been linked with sulfur deficiency as strains of bad bacteria can reduce sulfur levels, making it unavailable to the body.



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Iron

- One rate study found that iron aided the production of butyrate by bifidus bacteria
- It also increases the overall number of Bacteroides and Clostridium Cluster IV (a type of beneficial bacteria that helps regulate and maintain gut function)
- Researchers are looking at this group of bacteria for possible supplements to prevent or correct dysbiosis
- Involved in the production of catalases – which are involved in Phase I and II activities of intestinal bacteria



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Nutrients

- It's complicated
- Unless a known deficiency is present – help clients with a cross sections nutrients
- Whole food multi as a supplement and whole foods in the diet while supporting gut health
- Omega 3 as a supplement can be considered
- Algae (chlorella or spirulina) have many of the key nutrients
- Bee pollen is also high in nutrients for gut
- Make sure all nutrients are covered