Making the Connection: The Impact of Leaky Gut on Pain, Autoimmunity & Cancer

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7 SIGNS OF A SOUND GUT



THE INCREASING PREVALENCE OF PAIN, AUTOIMMUNITY & CANCER

- In the United States, approximately 20.9% of adults (51.6 million people) reported experiencing chronic pain in 2021.
- Autoimmune diseases are dramatically increasing with more exposures to environmental toxins.
- Cancer incidence continues to rise for many common cancers—especially for women.
- 2024—First Year the US Expects More than 2M New Cases of Cancer









WHAT ARE YOU DOING IN YOUR PRACTICE?





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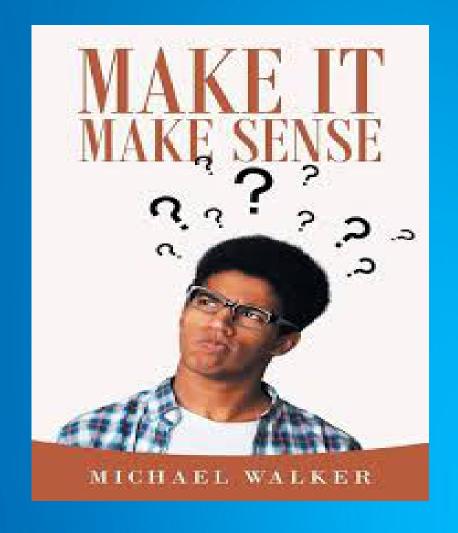
GOLD STANDARD STRATEGIES FOR PAIN, AUTOIMMUNITY, CANCER

- Pain medicines, pain blocking injections in tendons or joints
- Anti-inflammatory medication like NSAIDs or corticosteroids.
- Immunosuppressants
- Surgery: Removal of cancerous tissue is a common primary treatment for many types of cancer.
- Chemotherapy: Using drugs to kill cancer cells is a common treatment approach, often used in combination with other treatments.
- Radiation therapy: Using radiation to kill cancer cells is another common treatment approach, particularly for some types of cancer.
- Other Treatments: Immunotherapy, targeted therapies, and hormone therapy are some of the other treatment modalities that have been developed to treat cancer
- IVIG infusions









Last time I checked I didn't have a Platinol or Adriamycin deficiency

Last time I checked, I didn't have an NSAID deficiency

Last time I checked, I didn't have a prednisone or methotrexate deficiency.

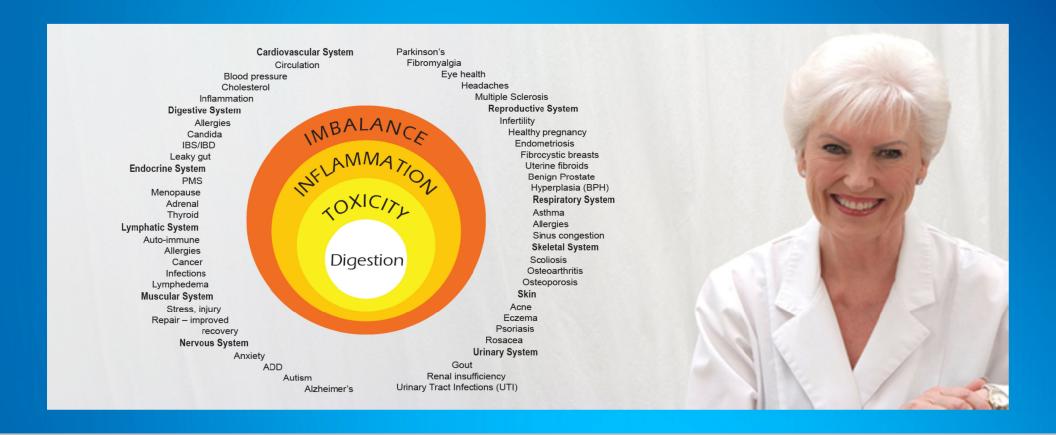
Last time I checked, I didn't have an opioid deficiency.



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"We are not born diseased—we create it, and we can uncreate it"





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Making The Connection to How WE Create Disease

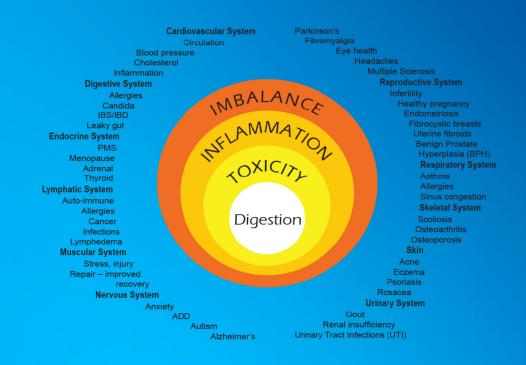
Ignoring importance of prenatal nutrition and digestive health for mom, embryo, fetus

Ignoring rate at which a human's digestive system develops

Unnecessary C-sections & declining rates of breast feeding

Ignoring nutrition deficiency& increasing rates of toxicity

Failure to recognize importance of enzyme therapy for disease management and prevention





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The First 1,000 Days Will Impact the Last 1,000 Days

- Prenatal nutrition drives a child's early development and sets the footprint for the future health of that individual.
- The impact of a mother's nutritional status on her baby's health starts before embryonic development and is essential to providing building blocks for brain development, healthy growth, and a strong immune system.
- Mother's digestive health is of equal importance to ensure nutrients are making it to baby vs contributing to the ripple effect of disease.





CURRENT PRENATAL NUTRITION COUNSELING

- Recommended that pregnant women receive Nutrition Counseling with a Registered Dietitian but RDs seldom provide.
- PNC becomes the responsibility of the healthcare team which varies by provider, with 19% obstetricians & 26% general practitioner with limited and outdated nutrition training.
- A recent study identified a disconnect between the recognized impact of nutrition on pregnancy outcomes and doctor's ability to confidently and effectively counsel patients on nutrition in pregnancy.
- Results demonstrate a need to develop curriculum and interventions to educate Ob/Gyn residents about pregnancy-related nutrition.







HOW DIGESTION CHANGES DURING PREGNANCY

- Many of the digestive discomforts of pregnancy such as morning sickness, constipation, and heartburn are all related to the relaxed tone and slowed action of the digestive system.
- Progesterone causes smooth muscle relaxation which slows digestion and impacts nutrient absorption.
- The gallbladder is also affected with delayed emptying which increases the chances of gallstone formation.
- Stress on the body also shunts digestive capacity/output.







TOXICITY BEGINS IN UTERO

- The gut microbiome can influence nutrient absorption during pregnancy and cause more global effects on gestation and fetal growth.
- The maternal microbiome IS directly seeded into infant guts to influence their health internally.











Making The Connection to How WE Create Disease

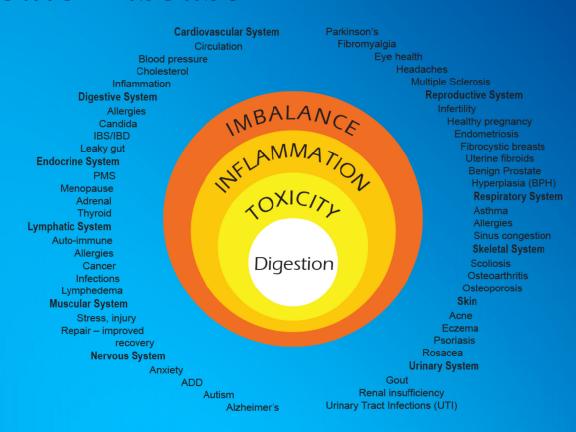
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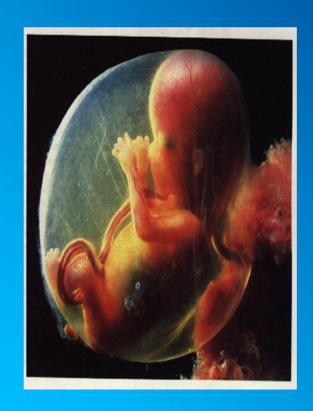


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HOW WE CREATE DISEASE: IGNORING DEVELOPMENTAL BIOLOGY

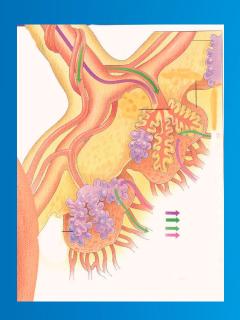
- The gastrointestinal (GI) system is one of the first systems to develop during the process of ontogenesis.
- Any disorder of GI tract during this period can result to serious consequences on the organism.
- Therefore, it is important to address the processes of normal development of the GI tract for disease prevention in adulthood.







Gut Developmental Biology and Characteristics IN-UTERO GI TRACT DEVELOPMENT



- Pancreas buds (v/d) are seen at 30 days
- Dilation of stomach at 6th week
- Duodenum and jejunum crypts at 10th to 11th week
- Ileum and colon crypts at 11th to 12th week

- Brush borders, and enzymes developed at 10th-12th week
 - Lactase, sucrase, maltase, glucoamylase start at 10th week
- °α-amylase at 6th month after term birth
- Villi: fully developed in teenage years



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Biochemicals (Nutrients, Enzymes & DNA)
are obtained through our mother's breast milk
NO BABY FORMULA CONTAINS THEM

DO NOT MAKE DIGESTIVE ENZYMES FOR FORMULAS,
ONLY FOR MOTHER'S BREAST MILK



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Limitations of the Infant Digestive Tract

- Newborn stomach secretions contain pepsin and HCL which, along with the pancreatic enzymes, effectively break down the specific proteins, minerals, and fats presents in breast milk
- The walls of the infant's small intestine are extremely permeable during the first 9 months ensuring maximum absorption but with less discretion than that of a mature gut
- Breakdown of more complex starches occurs in the small intestines and involves pancreatic amylase around 15 months
- Gut lining closes at closer to 24 months
- Foods that come in too early are going to bring on more toxicity and inflammation in that child if there is not proper digestive support provided.







THREE YEAR OLDS

•CAN PROPERLY UTILIZE SUGARS BECAUSE THEY NOW HAVE BETTER GUT BACTERIA BALANCE
•BUT THEY ARE STILL NOT DONE, THEIR DIGESTIVE SYSTEM IS STILL DEVELOPING



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CHILDREN'S DIGESTIVE SYSTEMS ARE NOT FINISHED UNTIL THEY ARE OUT OF PUBERTY

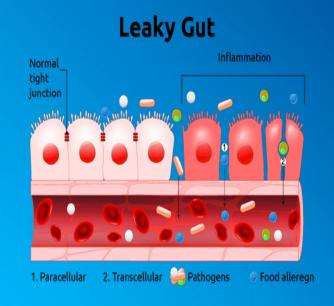


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What is the Cost of Poor Digestion in Infancy Through Adolescents?

- Prolonged toxicity and inflammation from not digesting damages the intestinal lining as well as hormone and neurotransmitter balance.
- When gut flora is abnormal it can penetrate the gut lining and allow poisonous and pathogenic microroganisms to enter the blood stream.
- Many of these microbes have their own metabolisms and produce/regulate hormones and neurotransmitters.
- What is occurring in epidemic proportions amongst our youth?











Making The Connection to How WE Create Disease

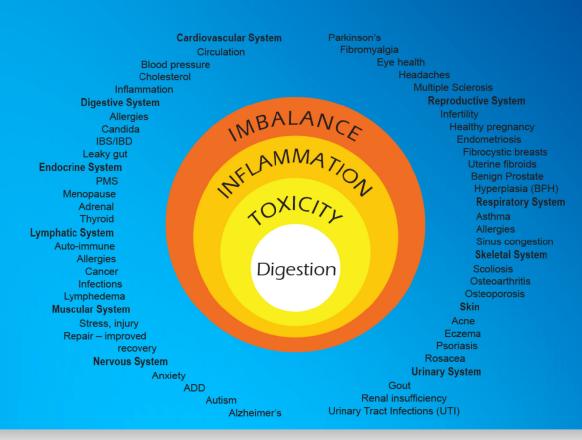
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LOSS OF NATURAL BIRTH, FEEDING, & IMMUNITY

- Human microbial colonization begins at birth and continues to develop until the microbiota becomes adult-like.
- The infant's important developmental stages are entirely dependent upon the colonization of microorganisms, beginning at birth.
- Modern changes in lifestyle, sanitization, csections, antibiotics, and immunizations are factors that shift the microbiota driving increases in immune-mediated diseases.









Rising Rates of Caesarean Sections

- According to new research from the World Health Organization caesarean section use continues to rise globally, now accounting for more than 1 in 5 (21%) of all childbirths.
- This number is set to continue increasing over the coming decade, with nearly a third (29%) of all births likely to take place by caesarean section by 2030.
- While a caesarean section can be an essential and lifesaving surgery, it can put women and babies at unnecessary risk of shortand long-term health problems if performed when there is not medical need.





Declining Rates of Breastfeeding

- While about 80% of babies are breastfed at birth, by three months, less than 20% are exclusively breastfed.
- The official recommendation is that babies are exclusively breastfed for six months but only 1% of babies are exclusively breastfed by this point.

Table 1.1Composition of milk from different types of animals.

Animal	Protein total	Casein %	Whey protein %	Fat %	Carbo- hydrate %	Ash %
	%					
Human	1.2	0.5	0.7	3.8	7.0	0.2
Horse	2.2	1.3	0.9	1.7	6.2	0.5
Cow	3.5	2.8	0.7	3.7	4.8	0.7
Buffalo	4.0	3.5	0.5	7.5	4.8	0.7
Goat	3.6	2.7	0.9	4.1	4.7	0.8
Sheep	5.8	4.9	0.9	7.9	4.5	0.8

Component	Human	Bovine
Protein (g/dL) ¹	0.9 to 1.2	3.3
Fat (g/dL) ¹	3.2 to 3.6	3.7
Lactose (g/dL) ¹	6.7 to 7.8	4.5
Oligosaccharides (g/dL) ¹	0.7 to 1.2	0.1
No. of identified oligosaccharides ²	<200	approximately 40
% fucosylated ²	35% to 50%	approximately 1%
% sialylated ²	12% to 14%	Less than 25%
Sowces: (Ballard & Morrow, 2013), ² (Totten et a	iL, 2012).	

TRANSFORMATION
THE GENESIS OF GOOD HEALTH®



Bifidobacterium Infantis Extinction

- As a result of declining natural births and breastfeeding, humans in the U.S. have lost a third of their microbial diversity, mostly on their skin and in their stomachs and digestive tracts.
- Vaginal bacteria changes and diversifies as we prepares for birth and children born via C-section miss out on an important inoculation.
- Microbe extinction may be at the root of modern plagues like asthma, allergies, diabetes, obesity and even some forms of cancer.
- Low levels of bifidobacteria in the intestines have also been associated with many other diseases, including celiac disease, diabetes, obesity, allergic asthma, and dermatitis.





WHY DOES THIS MATTER?

























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Making The Connection to How WE Create Disease

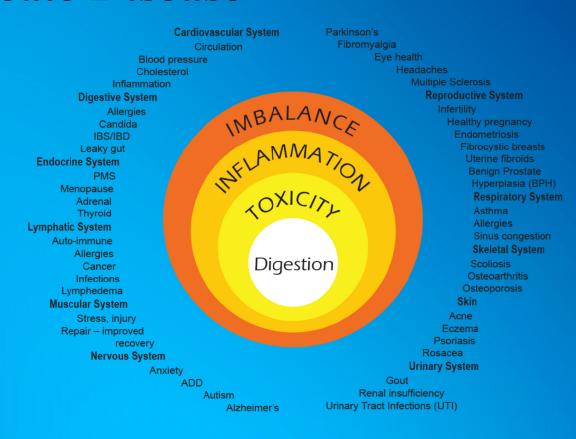
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MICRONUTRIENT DEFICIENCY & DISEASE DEVELOPMENT

- Micronutrient inadequacies have important implications for long-term health and increase one's risk for chronic diseases like cancer, cardiovascular disease, type 2 diabetes mellitus, osteoporosis, and agerelated eye disease.
- BUT THAT'S ONLY A
 PROBLEM IN
 UNDERDEVELOPED
 COUNTRIES...RIGHT?





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OVERFED & UNDERNOURISHED

WRONG!!!

- USDA's recommended daily fiber amount for adults is 25 -38 gm/day for adults
 - American adults eat 10-15 gm/day total fiber
- USDA recommends children should eat 14-38-gm/day depending on age
 - Actual consumption on average is less than 10 gm/day
- In the US and the UK, at least ½ of women of reproductive age are deficient in one or more micronutrients from diets high in processed nutrient void foods
 - Inadequacy for Vit A, 46% for Vit C, 95% for Vit D, 84% for Vit E, and 15% for Zinc
 - Most are also deficient in choline, which is critical during fetal development for stem cell proliferation and apoptosis.









HOW IMPORTANT IS NUTRITION IN YOUR PRACTICE FOR MANAGEMENT OF DISEASE?





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Making The Connection

Cysteine

Reduces pain caused by systemic inflammation due to its potent antioxidant properties. ¹²

B Vitamins

In animal studies, treatment with inositol induces antinociception (pain reduction).^{3,17}

Oleic Acid

This fatty acid is a precursor of oleamide, an analgesic that affects neurotransmitters such as dopamine, serotonin, acetylcholine, and GABA (Gamma-aminobutyric acid), all of which play a role in pain signaling.⁴⁵

Antioxidants

Clinical trials show antioxidant therapy is an effective treatment for chronic pain; Vitamin E reduces neuropathic pair; Vitamin C can lower morphine consumption after surgery; Coenzyme Q10 relieves statin- induced myopathy;^{28,23,03,1,2}

Lipoic Acid

Very effective treatment for neuropathic pain.^{26,27}

Vitamin D

Deficiency often presents clinically as muscle or bone pain. 23,24,25

PAIN

Magnesium

Carnitine

Deficiency of this amino acid may manifest as muscle weakness, pain (myalgia) or neuropathy. Supplementation reduces several types of chronic pain.^{6,7,8}

Lowers pain by blocking NMDA receptors in spinal cord; Effective in reducing post-operative pain.9.10.11

Vitamin BI, B2, B6, BI2

These produce a dose-dependent decrease in various kinds of pain (heat, pressure, chemical); Increases sensitivity to pain meds; Their effect is likely mediated through serotonergic neurotransmitters. 192021.22

Choline

Activates specific receptors in brain and spine that lower acute pain.^{17,18}

Minerals

Manganese is a cofactor for the potent antioxidant superoxide dismutase, which fights free radicals, a known source of pain. Copper supplementation can relieve arthritic pain. Treatment with Selenium improves muscle pain in deficient patients. Research suggests both Zinc and Calcium play a role in the transmission of pain signals through nerves. [21,31,41,516]



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Making The Connection

Lipoic Acid

Supresses damaging chemicals (cytokines) in GI tract that cause an inflammatory immune response; Preserves glutathione levels and recycles vitamin C.^{35,36}

Magnesium

Deficiency affects the amount of good bacteria found in the gut; May help prevent stomach ulcers; Insufficient « levels are very common in people with irritable bowel; Antacids induce magnesium deficiency; 23,334

Choline

Maintains the barrier function of gastric epithelium (helps prevent stomach ulcers) via its role in building cell membranes and acting as a surfactant in the GI tract. 30,311

Folate

Deficiency alters genes in a way that makes colon cells more likely to become cancerous.^{28,29}

Vitamin B6

Deficiency is strongly linked with a higher risk of developing colon cancer.^{26,27}

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Glutathione
Counteracts oxidative stress
in the intestinal mucosa (gut
wall); Recycles antioxidants
such as vitamins C & E.123

Selenium

Cofactor to glutathione peroxidase (GPx), which protects intestinal wall from inflammatory damage; Lower GPx activity due to selenium deficiency is very common in people with gut inflammation.²⁴⁵

Glutamine

Preferred fuel for enterocytes (small intestine cells), which use the most glutamine in the entire body; Keeps the junctions between intestinal epithelial cells tight so foreign proteins cannot enter bloodstream.⁶⁷⁸

Vitamin A

Zinc

Decreases intestinal permeability;

Maintains integrity of intestinal

wall, especially when inflammatory

chemicals (TNFa) compromise

epithelial lining:Works with vitamin

A in regenerating cells that line the

gut.9.10.11

Regulates growth of epithelial cells, including those that line the gastrointestinal (GI) tract; Reduces inflammatory proteins in the gut.^{12,13}

Vitamin C

An inflamed gut uses up the antioxidant vitamin C faster than a healthy gut; Promotes tissue healing in GI tract; Reduces gastrointestinal inflammation. ^{14,15}

Vitamin D

Keeps gut flora healthy by protecting good bacteria; Activates adaptive immunity that originates in Gl tract; Promotes gut barrier integrity; Deficiency linked to inflammatory bowel disease flare-ups. [477:18]

GASTROINTESTINAL HEALTH

Carnitine May be therapeutically Vitamin B12

beneficial in people with

colitis (inflammation of

colon) due to its role in

fatty acid metabolism,

which is often impaired in

GI disorders,^{23,24,25}

Improves gastrointestinal complaints in some patients with dyspepsia (indigestion); Antacids deplete B12.^{21,22}

Vitamin K

Synthesized by intestinal bacteria; Deficiency common in chronic GI disorders; Bone demineralization that occurs with inflammatory bowel diseases (Crohn's, etc) is caused by vitamin K deficiency since it is a required co



7 SIGNS OF A SOUND GUT



Making The Connection

Selenium

Subclinical deficiency negatively alters genes that regulate the inflammatory response; Deficiency promotes vascular inflammation.^{37,38}

Copper

Deficiency lowers enzyme activity (such as superoxide dismutase) that fights inflammation; Lowers damaging isoprostanes, a byproduct of inflammation.^{34,35,36}

Zinc

Inflammation raises demand for zinc; Pro-inflammatory chemicals (cytokines) dose dependently decrease in response to zinc repletion.^{31,32,33}

Vitamin A

Regulates the cellular immune response to inflammatory signals; Deficiency increases the severity of chronic inflammation; Zinc depletion lowers vitamin A status.^{28,29,30}

Vitamin B2

Riboflavin (B2) helps minimize pain associated with inflammation; Detoxifies homocysteine, an amino acid that indirectly causes inflammation in various tissues, ^{36,27}

Manganese

Cofactor to the powerful antioxidant superoxide dismutase that fights inflammation within cells.^{1,2}

Magnesium

Deficiency activates proinflammatory chemicals called cytokines; Deficiency will also kick start a damaging immune response by activating cells called leukocytes and macrophages .^{34,5}

Glutathione

Repairs damage to cells caused by inflammation; Regulates the production of pro-inflammatory cytokines; Recycles vitamins C and E⁶⁷

Cysteine

Protects organs such as blood vessels, brain, and liver from inflammatory damage; Precursor to glutathione production; Supplementation with N-acetyl cysteine raises glutathione.⁸⁹

Vitamin C

Low vitamin C linked to inflammation; Inversely related to C-reactive protein (CRP), a marker for systemic inflammation; Increases glutathione. [0.1.12]

Vitamin D

Potent modulator of inflammation; Helps turn off chronic inflammatory responses; Inhibits pro-inflammatory cytokine production.² 12.13.20

Vitamin E

Limits destructive cell behavior caused by inflammatory enzymes gone wild; Reduces damage from tumor necrosis factor-alpha (TNF-a); Deficiency predisposes a person to inflammation-related diseases, ¹⁵²⁶

Lipoic Acid

Neutralizes free radicals caused by uncontrolled inflammation in both water and lipoic phases of the cell; Protects endothelial cells from inflammation; Regenerates other antioxidants such as vitamin E, C, and glutathione. ^{17,18}

INFLAMMATION

Vitamin B6

Low B6 status is linked to high levels of CRP and systemic inflammation. 1,33,34

Coenzyme Q10

Decreases several inflammatory markers (CRP and IL-6) in supplementation trials, Affects genes that control response to inflammatory stress. ^{21,2223}

Glutamine

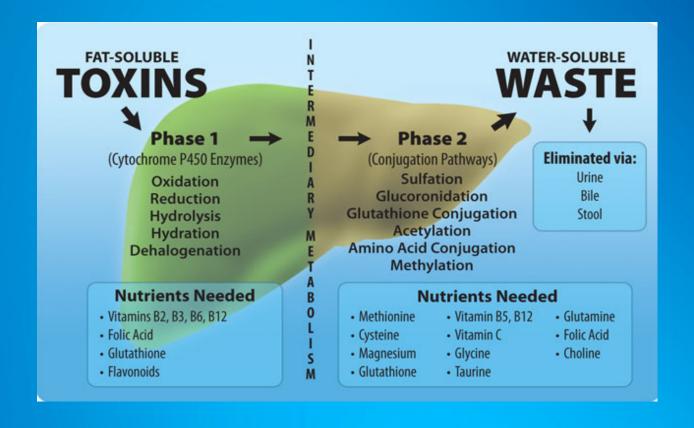
Decreases cytokine production; Invokes an anti-inflammatory response; Precursor to glutathione.^{19,20}



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NUTRITION'S ROLE IN DETOX





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Our Toxic (external) World

Environment

- Air & Water
- Noise
- Technology

Stress

- **Emotional**
- **Physical**
- Energetic

Food Supply

- GMO's
- Chemicals
- Antibiotics
- **Growth hormones** Furniture

In Your Home

- **Cleaning supplies**
- Cosmetics
- Cookware



7 SIGNS OF A SOUND GUT



Support Your **Digestive System**

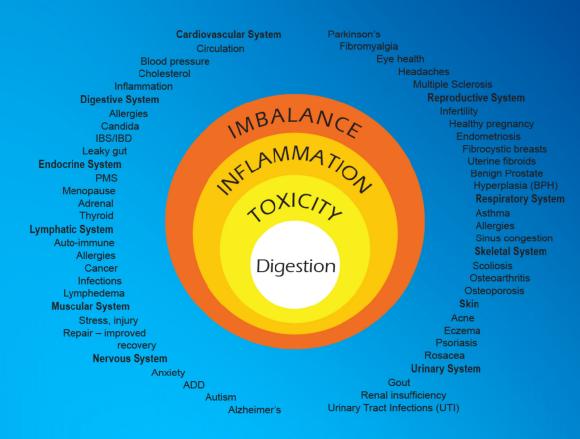
- In addition to nutrition, A well-functioning digestive system is crucial for detoxifying the body.
- Gut health directly impacts how efficiently you eliminate waste and absorb nutrients.
- Although food can function as medicine, it is difficult to replete a deficiency with food alone.
- Nutrition is only as good as your ability to digest what you are eating.





HOW WE ARE CREATING DISEASE

Failure to recognize importance of enzyme therapy for disease management and prevention





7 SIGNS OF A SOUND GUT



Our Toxic (Internal) World

- Poorly digested carbohydrates ferment
 - Nutrients cannot be properly absorbed or utilized and become toxins
- Poorly digested lipids turn rancid
 - Toxins in the colon are absorbed into the bloodstream, oxidized to become free radicals
- Poorly digested proteins putrefy
 - Results in toxic amines and the kidneys become overloaded
 - The lymphatic system, which also works to remove toxins, will also suffer







Making The Connection

TOXICITY

- Headaches
- Fatigue
- Dry skin
- Bad breath
- Disturbed sleep
- Cholesterol imbalances
- Compromised immunity







Making The Connection

INFLAMMATION

- Inflamed bowels
- Achy joints
- Sinus congestion
- Acid reflux
- Frequent infections



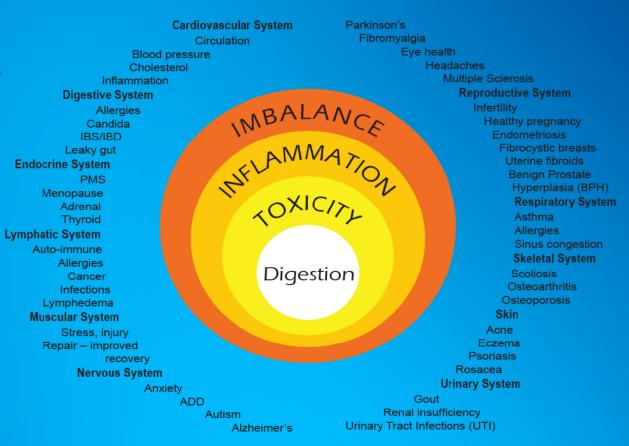




Making The Connection

IMBALANCE

- Food allergies
- Arthritis
- Autoimmunity
- Asthma
- Eczema
- Gout
- MS
- Cancer





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LEAKY GUT & PAIN

- When the gut lining becomes permeable, undigested food particles and bacteria can enter the bloodstream, triggering an inflammatory response throughout the body, including joints and muscles, leading to pain.
- The composition and function of the gut microbiota influence cytokine production which will influence pain sensitivity and perception.
- Changes to gut bacteria in people with painful GI issues such as inflammatory bowel disease and irritable bowel disease has long been recognized.





Selenium

Deficiency is linked to fibromyalgia; In one trial, symptoms improved in 95% of patients supplemented with selenium for at least 4 weeks.^{25,26,27}

Magnesium

Involved in pain perception pathways and muscle contraction; Treatment with magnesium can improve tenderness and pain.^{23,24,25}

Zinc Blood levels of zinc are associated with a number of tender points in fibromyalgic patients.²²

Antioxidants

Low antioxidant status increases pain in fibromyalgia, which is often considered an oxidative stress disorder. 19,20,21

Coenzyme Q10

Clinical trials consistently show that CoQ10 reduces fibromyalgia symptoms such as pain and fatigue. 1,2,3,4

Carnitine

Deficiency causes muscle pain due to inefficient cellular energy metabolism (mitochondrial myopathy) which presents as fibromyalgia.^{4,5}

Choline & Inositol

Altered levels of both nutrients seen in fibromyalgia; Choline & inositol are involved in pain perception. 67,8,9

Serine

Blood levels of this amino acid are much lower in fibromyalgia patients. 10,11

Vitamin D

Low levels impair neuromuscular function and cause muscle pain; Deficiency is common in fibromyalgia patients. (2,13,14,15,16

Vitamin B1 Thiamin (B1) deficiency mimics fibromyalgia symptoms including serotonin depletion (decreased pain threshold), a decrease in repair enzymes (muscle soreness) and poor energy production (muscle fatigue.) ^{17,18}



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FIBROMYALGIA



LEAKY GUT & CANCER

- When "leaky" the immune system continually reacts to the array of pathogens and toxins entering the bloodstream. (Ripple Effect)
- The immune system becomes distracted away from the cancerous cells that are beginning to grow and multiply in another area.
- Dysbiosis or leaky gut promote the progression and the development of hepatocellular carcinoma (HCC) via the release of cancer-and senescence-promoting metabolites and increased hepatic exposure to gut-derived microbe-associated molecular patterns (MAMPs) such as lipopolysaccharide (LPS).
- MAMPs promote hepatic inflammation, fibrosis, proliferation, and the activation of anti-apoptotic signals.





LEAKY GUT & CANCER

- Breast cancer survivors are prone to weakened gut barriers, allowing bacteria to migrate into the blood stream (remember previous slide).
- Unaddressed gut permeability fuels inflammation, which, elevates risk for co-morbid disease development, cancer recurrence, and a poor quality of life.
- The body's inflammatory response to intestinal permeability promotes "inflamm-aging," that accelerates biological aging and age-related frailty, morbidity, and mortality.





LEAKY GUT & CANCER

- There is a causal relationship between colorectal cancer (CRC), chronic systemic inflammation, persistent infections, and the presence of dysregulated circulating inflammatory markers.
- Circulating levels of zonulin were higher in CRC patients compared to tumor-free controls supporting the hypothesis of an interplay of gut barrier dysfunction and bacterial translocation in colorectal carcinogenesis.
- How do we regulate zonulin?





SIDE EFFECTS TO STANDARD CANCER TREATMENTS

- Cancer treatment, especially chemotherapy, can damage the intestinal lining.
- Chemotherapy is implicated in increased intestinal wall permeability, mucositis, sickness behaviors, and changes in the gut microbiota.
- Chemotherapy-induced mucositis is associated with increased symptoms of pain, anxiety, and depression.
- Radiation therapy can significantly alter the gut microbiome, leading to an imbalanced and less diverse microbiota community.
- This dysbiosis has been linked to increased inflammation, oxidative stress, and tissue damage.





Carnitine

Studies show that carnitine can reduce anxiety and improve feelings of well being. ^{28,29}

Vitamins D and E

Low vitamin D status is linked to anxiety; Animal studies confirm the role of vitamins D and E in reducing anxiety-related behavior.^{24,25,26,27}

Vitamin B3

One of the symptoms of severe B3 deficiency (pellagra) is anxiety; Pharmacological doses of B3 may enhance the calming effects of GABA in the brain; Converts tryptophan to serotonin. 19,22,23

Vitamin B6

Cofactor in synthesis of calming neurotransmitters such as GABA (gamma-aminobutyric acid), serotonin and dopamine. 19,20,21

Zinc

Reduces anxiety in clinical trials, possibly due to its interaction with NMDA (N-methyl-D- aspartate) receptors in the brain which regulate mood. 16,17,18

Chromium

Its effect on serotonin transmission may explain its anxiolytic (anxiety relieving) effect in animal studies.^{30,31}

Folate

Aids in production of neurotransmitters such as dopamine and serotonin, which have a calming effect on mood.^{19,32,33}

Inositol

A neurochemical messenger in the brain, inositol (vitamin B8) affects dopamine and serotonin receptors; Trials confirm it is very effective in reducing panic attacks. ^{1,2}

Choline

Precursor to the neurotransmitter acetylcholine, which affects focus and mood; Low levels of choline linked to anxiety.^{3,4}

Serine

Exerts a calming effect by buffering the adrenal response to physical or emotional stress; Lowered anxiety scores of patients with post traumatic stress disorder.^{5,6,7}

Copper

Integral part of certain chemicals in the brain (such as endorphins) that calm anxious feelings; Anxiety-like behavior may be exacerbated with copper deficiency.^{8,9,10}

Selenium

Repletion of selenium to normal levels reduced anxiety scores in clinical trials; Some suggest the mechanism of action is due to its role in key regulatory proteins (selenoproteins). 14,15

ANXIETY

Magnesium

Regulates the HPA (hypothalamic-pituitary adrenal) axis which controls physical and psychological reactions to stress; Deficiency can induce anxiety and emotional hyper-reactivity. 11,12,13



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Magnesium

Deficiency damages NMDA (N-methyl-D-aspartate) receptors in the brain, which regulate mood; Well-documented anti-depressant effects. 1,2,3,4

Zinc

Improves efficacy of antidepressant drugs; Particularly useful for treatment resistant patients; Regulates neurotransmitters. 33,34,35,36

Serine

Regulates brain chemistry; Involved in NMDA receptor function; Acts as a neurotransmitter; Low levels correlate with severity of depression. 31,32

Antioxidants

Oxidative stress in the brain alters neurotransmitter function; Antioxidants protect our brain, which is very sensitive to oxidation; Several antioxidants – Vitamins A, C and E, Lipoic Acid, CoQ10, Glutathione and Cysteine – play a key role in prevention and treatment of depression. 28.29,30

Biotin

Part of the B-vitamin complex, biotin deficiency has induced depression in animal and human studies. 26,27

Selenium

Integral part of regulatory proteins (selenoproteins) in the brain; Supplementation trials are promising; May alleviate postpartum depression. 5,6

Chromium

Elevates serotonin (feel-good neurotransmitter) levels in the brain; May be particularly effective on eating symptoms of depression such as carbohydrate craving and increased appetite, due to its effect on blood sugar regulation. ^{37,38,39}

Folate

Building block for many "feel-good" neurotransmitters such as serotonin, dopamine and norepinephrine; Low folate causes poor response to anti-depressant meds; The lower the folate, the more severe the depression. 7.8,9,10

Vitamin B12

Depression may be a manifestation of B12 deficiency; Repletion of B12 to adequate levels can improve treatment response; B12 deficiency common in psychiatric disorders. [1,12,13]

Vitamin B6

Cofactor for serotonin and dopamine production (feel good chemicals); Studies indicate that low levels may predispose people to depression. 14,15,16

Vitamin B2

Low B2 has been implicated in depression due to its role in methylation reactions in the brain. ^{17,18}

Vitamin D

Clinical trials suggest increasing blood levels of vitamin D, which is actually a hormone precursor, may improve symptoms of depression. 19,20,21

Inositol

Influences signaling pathways in the brain; Particularly effective in SSRI (selective serotonin reuptake inhibitor) sensitive disorders.²⁴²⁵

DEPRESSION

Carnitine

Increases serotonin and noradrenaline which lift mood; In trials, carnitine alleviates depression with few, if any, side effects. ^{22,23}



7 SIGNS OF A SOUND GUT



Leaky Gut As a Danger Signal for Autoimmune Diseases

- Genetic and environmental triggers have been long known as the major contributors to the development of autoimmunity.
- GENETICS LOAD THE GUN, THEY DON'T ALWAYS PULL THE TRIGGER
- Increasing evidence in recent years suggests that microbial translocation and intestinal barrier dysfunction, which may be affected by gut microbiota, are an important causative element for autoimmune disorders.
- The leakage of pathogens into the body system results in which equals ______.





Leaky Gut & Autommunity

- Leaky gut can also contribute to inflammation throughout the body, which is a hallmark of autoimmune diseases.
- The increased permeability of the gut lining can trigger the immune system to mistakenly attack the body's own tissues and organs, leading to autoimmune conditions.
- Modulating the gut microbiome through dietary changes, probiotics, and other strategies can help to improve gut barrier function and potentially reduce the risk of autoimmune diseases.





What We Should Be Doing

- Providing realistic and up to date nutrition guidelines and education
- Supporting a SIMPLIFIED approach to digestion and cleaning the gut
- Re-establishing harmonious microbiome
- Supporting the gut wall
- Reducing toxicity and Inflammation
- Promoting autophagy and a healthy terrain







DIGESTIVE, SYSTEMIC & MICROBIOME SUPPORT SHOULD NO LONGER BE AN OPTION, IT SHOULD BE A NECESSITY IN EVERY CONDITION THAT WALKS THROUGH YOUR DOOR



7 SIGNS OF A SOUND GUT

