Nutrition and Immunity

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Autoimmune Diseases

- ~80 different autoimmune diseases identified so far: Crohn's, Rheumatoid Arthritis, lupus, MS, Hashimoto's, Sjogren's, Celiac, etc.
- Over-reactive immune system
- Genetic link
- Environmental triggers include:

  gut issues including intestinal permeability

  Toxins: heavy metals, synthetic chemicals

  Gluten and other food allergies/insensitivities

  Infections- lyme, Epstein-barr, cytomegalovirus

  Mitochondrial and cell membrane dysfunction

  Too little sleep/too much stress

Common denominator: Inflammation

Journal of Biochemica et Biophysica Acta
December 2019 Vol. 1863 Issue 12

Mercury Induced Inflammation and Autoimmunity

- **Abstract**
- **Background**
- **Human exposure to mercury leads to a variety of pathologies involving numerous organ systems including the immune system.** A paucity of epidemiological studies and suitable diagnostic criteria, however, has hampered collection of sufficient data to support a causative role for mercury in autoimmune diseases. **Nevertheless, there is evidence that mercury exposure in humans is linked to markers of inflammation and autoimmunity.** This is supported by experimental animal model studies, which convincingly demonstrate the biological plausibility of mercury as a factor in the pathogenesis of autoimmune disease.

Nutrition Review
2017 Dec 1;75(12): pp.1046-1058

Adverse effects of gluten ingestion and advantages of gluten withdrawal in nonceliac autoimmune disease

- **Abstract**
- In light of the coincident surge in overall gluten intake and the incidence of autoimmune diseases, the possible biological adverse effects of gluten were explored. Multiple detrimental aspects of gluten affect human health, including gluten-dependent digestive and extradigestive manifestations mediated by potentially immunological or toxic reactions that induce gastrointestinal inadequacy. **Gluten affects the microbiome and increases intestinal permeability. It boosts oxidative stress and affects epigenetic behavior. It is also immunogenic, cytotoxic, and proinflammatory.** Gluten intake increases apoptosis and decreases cell viability and differentiation. In certain nonceliac autoimmune diseases, gluten-free diets may help curtail the adverse effects of gluten. Additional in vivo studies are needed to unravel the puzzle of gluten effects in humans and to explore the potential beneficial effects of gluten-free diets in autoimmune diseases.

International Journal of Celiac Disease
Volume 5, 2017 - Issue 4

Are Non-Celiac Autoimmune Diseases Responsive to Gluten-Free Diet?

ABSTRACT

Genetic risk factors for autoimmune diseases are constantly discovered, however, environmental factors are lagging behind and the precipitating events leading to development of autoimmune diseases remain enigmatic. Gluten is a well-established inducing nutrient in celiac disease and gluten withdrawal is the only current effective therapy. **More and more studies have shown that non-celiac autoimmune diseases can partially respond to gluten free diet.** The present editorial reviews those conditions and suggest multiple potential mechanisms that might operate in clinical amelioration of non-celiac autoimmune diseases.

Essential Metabolic Nutrients

Amino Acids(Proteins)

- Leucine
- Isoleucine
- Valine
- Methionine
- Threonine
- Tryptophan
- Phenylalanine
- Lysine

Fatty Acids

- Omega 3 fat- alpha linolenic acid
- Omega 6 fat- linoleic acid

Essential Metabolic Nutrients That Run Your Metabolism

Vitamins

- Biotin
- Vitamin B1-Thiamin
- Vitamin B2- Riboflavin
- Vitamin B3- Niacin
- Vitamin B4- Choline
- Vitamin B5- Pantothenate
- Vitamin B6- Pyrodoxine
- Vitamin B9- Folate
- Vitamin B12- Cobalamin
- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K
- Vitamin C

Minerals

- Calcium
- Chloride
- Chromium
- Cobalt
- Copper
- Iodine
- Iron
- Magnesium
- Manganese
- Molybdenum
- Phosphorus
- Potassium
- Selenium
- Sodium
- Zinc

Nutrient Deficiency in America:

Nutrient based reference ranges for set populations established by government panels

- EAR- Estimated Average Requirement
- DRI- Dietary Reference Intake
- RDA- Recommended Daily Allowance
- AI- Adequate Intake
- TU- Tolerable Upper Limit

RDA's on Food Labels

Amount per serving

Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg DV =20ug = 800 IU	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Foods, Fortificants, & Supplements
Where Do Americans Get Their Nutrients
Journal of Nutrition 2011 Oct.; 141(10)

Nutrient	%< EAR
Calcium	35%
Magnesium	45%
Zinc	8%
Vitamin A	34%
Vitamin C	25%
Vitamin D	70%
Vitamin E	60%
Vitamin K	35%
Omega 3 fats	High

7 Important Nutrients for Immune Health

Vitamin D (Hormone D)

- Sunlight (UVB rays)
- Foods- liver, egg yolks, butter, fatty fish
- Involved in over 1000 gene proteins
- Bone health (calcium placement)
- Neurotransmitters: serotonin
- Influence immune antimicrobial peptides
- Studies show viral and cancer incidence higher in northern climates
- Check lab- 50ng/mL
- If supplementing use D3 not D2
- Balance with A and K2

Vitamin A

- Retinol (retina)
- Beta carotene is not vitamin A
- “Anti-infective” vitamin
- Critical to the formation and function of the epithelium
- Regulates T cell mediated and antibody immune response
- Liver, cod liver oil, butter, cheese

J Clin Med. 2018 Sep; 7(9): 258

Role of Vitamin A in the Immune System

- Vitamin A (VitA) is a micronutrient that is crucial for maintaining vision, promoting growth and development, and protecting epithelium and mucus integrity in the body. VitA is known as an anti-inflammation vitamin because of its critical role in enhancing immune function. VitA is involved in the development of the immune system and plays regulatory roles in cellular immune responses and humoral immune processes. VitA has demonstrated a therapeutic effect in the treatment of various infectious diseases.
- Research has shown that crucial immune organs need constant dietary intake to maintain VitA concentrations
- VitA has both promoting and regulatory roles in both the innate immune system and adaptive immunity; therefore, it can enhance the organism's immune function and provide an enhanced defense against multiple infectious diseases.

7 Important Nutrients for Immune Health

Magnesium

- Relaxing mineral
- In the chlorophyll molecule of green plants
- Involved in 400-1000 enzymes
- Works closely with calcium
- Magnesium is very important to the production and function of insulin
- Very common deficiency due to industrial farming

Zinc

- Involved in ~2,000 enzymes
- Involved in Inhibiting replication of viruses
- Involved in production of Superoxide dismutase (antioxidant)
- Regulates T cells (immune cells)
- Works closely with copper
- Testosterone production
- Oysters, red meat, dairy
- Absorption inhibited by phytates in grains, seeds, beans, and nuts

7 Important Nutrients for Immune Health

Iodine

- Thyroid hormones
- Enhances white blood cell activity
- Potent antimicrobial agent
- High concentrations in breast and prostate
- Seafood

Selenium

- Antioxidant and immune stimulator
- Protects thyroid from toxins like goitrogens
- Deiodinase enzymes- convert T4-T3
- Strengthens white blood cells
- Selenoproteins protects against mercury toxicity
- Most fish has more selenium than mercury (excluding shark, swordfish, mackerel)
- Seafood and Brazil nuts are best source

Biological Trace Element Research Journal
2007 Dec; 119 (3): pp.242-253
Selenium and Mercury in Pelagic Fish in the Central North Pacific near Hawaii

- **Protective effects of selenium against mercury toxicity have been demonstrated in all animal models evaluated**. As interactions between selenium and mercury and their molar ratios in seafood are essential factors in evaluating risks associated with dietary mercury exposure, considering mercury content alone is inadequate. In this study, the absolute and molar concentrations of mercury and selenium were determined in edible portions from 420 individual fish representing 15 species of pelagic fish collected from the central North Pacific Ocean near Hawaii. With a Se/Hg molar ratio of less than 1, mako shark was the only fish containing a net molar excess of mercury. A selenium health benefit value based on the absolute amounts and relative proportions of selenium and mercury in seafood is proposed as a more comprehensive seafood safety criterion.

7 Important Nutrients for Immune Health

Vitamin C

- Humans, other primates, guinea pigs, and a few other species do not make internally
- Linus Pauling mad popular in the 1970's
- Collagen formation
- Carnitine formation (fat metabolism)
- Antioxidant
- Adrenal hormones
- Glutathione (antioxidant)
- Cell uptake inhibited by sugar
- Red and yellow peppers, kiwi, strawberries, broccoli, lemons, limes

Linus Pauling

Toxicity:
The dose makes the poison.

Natural

- Arsenic, mercury, lead
- Talc (talcum powder)
- Asbestos
- Castor beans (ricin)
- Peanuts (aflatoxins)
- Red kidney beans (phytohaemagglutinin)
- Gluten
- Wheat germ agglutinin
- Lectins

Grains and Beans (legumes) have the highest levels of naturally occurring toxins in the food supply. They are also the most common allergens. This is why our ancestors utilized preparation methods like sprouting, fermenting, culturing, and soaking to minimize exposure.

Synthetic

- Carbon tetrachloride (refrigerant)
- Pesticides
- Medications
- Hexane (solvent used to extract oils out of plants)
- NSAID's
  - acetaminophen
  - ibuprofen
- Perfluorooctanoic acid:
  - Non stick cookware
- Plastic residues:
  - Bisphenol a
  - Phthalate

Journal of Immunotoxicology Volume 13, 2016 - Issue 2

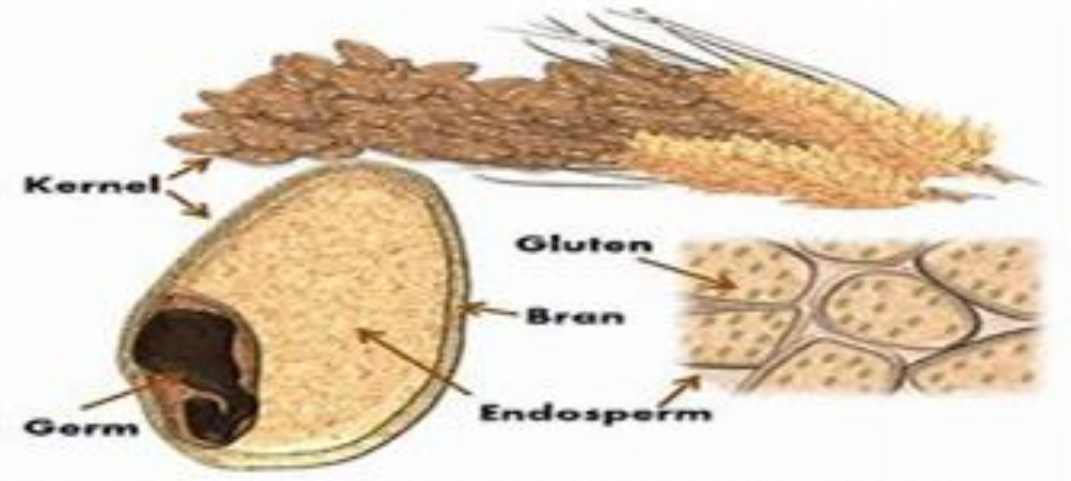
Cord blood gene expression supports that prenatal exposure to perfluoroalkyl substances causes depressed immune functionality in early childhood

- **Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a class of synthetic compounds that have widespread use in consumer and industrial applications. PFAS are considered environmental pollutants that have various toxic properties, including effects on the immune system**. Recent human studies indicate that prenatal exposure to PFAS leads to suppressed immune responses in early childhood. In this study, data from the Norwegian BraMat cohort was used to investigate transcriptomics profiles in neonatal cord blood and their association with maternal PFAS exposure, anti-rubella antibody levels at 3 years of age and the number of common cold episodes until 3 years. Genes associated with PFAS exposure showed enrichment for immunological and developmental functions. The analyses identified a toxicogenomics profile of 52 PFAS exposure-associated genes that were in common with genes associated with rubella titers and/or common cold episodes. This gene set contains several immunomodulatory genes (*CYTL1, IL27*) as well as other immune-associated genes (e.g. *EMR4P, SHC4, ADORA2A*). In addition, this study identified *PPARD* as a PFAS toxicogenomics marker. These markers can serve as the basis for further mechanistic or epidemiological studies. This study provides a transcriptomics connection between prenatal PFAS exposure and impaired immune function in early childhood and supports current views on PPAR- and NF-κB-mediated modes of action. **The findings add to the available evidence that PFAS exposure is immunotoxic in humans and support regulatory policies to phase out these substances.**

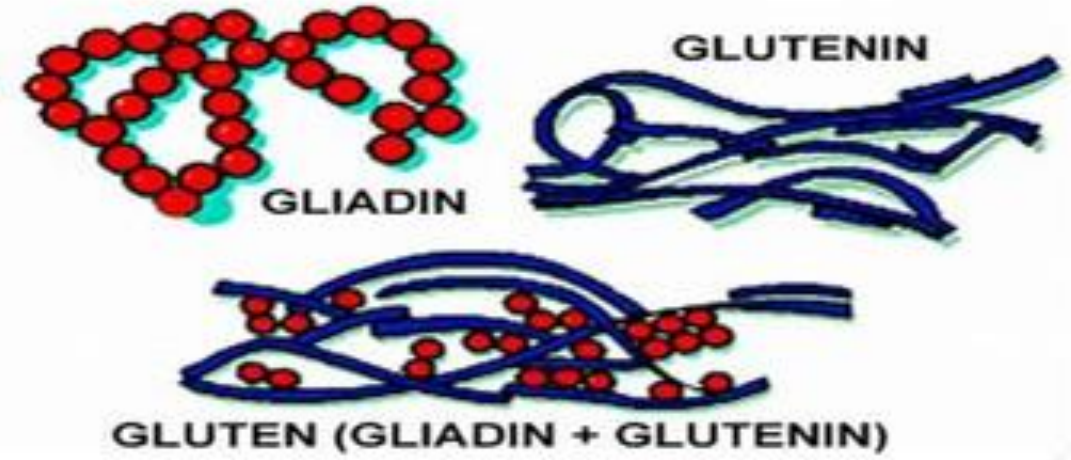
Medications Deplete Nutrients

- Statins- Vitamins D, K2, CoQ10
- Steroids- calcium
- H-2 blockers(acid)- K2, D, calcium, iron, zinc, folate, B12
- Metformin- folate, calcium, magnesium, B12, chromium
- NSAID’s- folate, iron
- Diuretics- calcium, magnesium, potassium

What is Gluten?



The Gluten protein is mainly found in the endosperm of grain Kernel (seed)



Where is Gluten?

- **B**arley
- **R**ye
- **O**at
- **W**heat

Is Wheat (Gluten) Bad?

- Depends on the person (health, genetics)
- What kind of wheat (emmer, einkorn, dwarf, etc.)
- How was the wheat grown and harvested (monoculture)
- How was the wheat prepared

Zonulin, regulation of tight junctions, and autoimmune diseases

Ann. NY Acad. Science 2012 July; 1258(1): pp25-33

- Our discovery of zonulin, the only known physiologic modulator of intercellular TJ (tight junction) described so far, increased understanding of the intricate mechanisms that regulate the intestinal epithelial paracellular pathway and led us appreciate that its up-regulation in genetically susceptible individuals leads to autoimmune diseases.
- Collectively, autoimmune diseases are highly prevalent in the U.S., affecting between 14.7 and 23.5 million people — up to 8 percent of the population
- **Stimuli that cause zonulin release in the gut -** Among the several potential intestinal luminal stimuli that can trigger zonulin release, we identified small intestinal exposure to bacteria and gluten as the two more powerful triggers

Anti-nutrients in Grains

- Phytates
- Enzyme inhibitors
- Gluten or other hard to digest proteins
- Lectins:

  Wheat germ agglutinin (WGA)

1. Why Is Wheat (Gluten) a Problem Now?

Hybridization: Scientist Norman Borlaug creates semi-dwarf wheat in 1960's. Semi-dwarf wheat has a shorter thicker stalk to support a larger seed head needed for higher yields. This increased the gluten content over older varieties of wheat.

2. Why is Wheat (Gluten) a Problem Now?

Modern Processing: Used to be stone grinding the grain, soaking, and fermenting has been replaced by high temperature drying, chemical extraction, added preservatives, added synthetic vitamins and minerals, and added refined ingredients.

3. Why is Wheat (Gluten) a Problem Now?

Preparation: Our ancestors would use a sour culture to ferment the grains when making bread. This process would require up to 5 days to make a loaf. It allowed the natural microbes in the culture to pre-digest the grains reducing the anti-nutrients and increasing the nutrients.

4. Why is Wheat (Gluten) a Problem Now?

Quantity in production and consumption. What used to make up a small part of the diet in the from of bread has become a staple in our diet and our skin care products.

5. Why is Wheat (Gluten) a Problem Now?

Humans are suffering from a wide array of gut problems: acid reflux, IBS, gall bladder disease, SIBO, Celiac, Crohn's. A weakened gut has less tolerance for durable food proteins.

Differences in the End Product

Ezekiel 4:9® Sesame Sprouted Grain Bread

100% Flourless, Complete Protein ***Item #123***

Serving Size:	**1 Slice (34g)**	**Potassium:**	**75mg**
Carlories:	**80**	**Carbohydrates:**	**14g**
Total Fat:	**0.5g**	**Dietary Fiber:**	**3g**
Cholesterol:	**0mg**	**Protein:**	**4g**
Sodium:	**80mg**	**Net Wt:**	**24 oz (680g)**

INGREDIENTS: Organic Sprouted Wheat, Filtered Water, Organic Sprouted Barley, Organic Sprouted Millet, Malted Barley, Organic Sprouted Lentils, Organic Sprouted Soybeans, Organic Sprouted Spelt, Fresh Yeast, Organic Wheat Gluten, Sea Salt. Rolled in Organic Unhulled Sesame Seeds.

Sara Lee 100% Whole Wheat	Whole Wheat Flour, Water, High Fructose Corn Syrup, Wheat Gluten, Sugar, Yeast. Contains 2% or less of each of the following: Soybean Oil, Calcium Sulfate, Salt, Dough Conditioners (May Contain One or More of the Following: Mono- and Diglycerides, Ethoxylated Mono-and Diglycerides, Sodium Stearoyl Lactylate, Calcium Peroxide, Datem, Ascorbic Acid, Azodicarbonamide, Enzymes), Wheat Bran, Guar Gum, Distilled Vinegar, Calcium Propionate (Preservative), Yeast Nutrients (Monocalcium Phosphate, Calcium Phosphate, Ammonium Phosphate), Corn Starch, Vitamin D3, Soy Lecithin, Milk, Soy Flour.	

Who Should Be Careful With Gluten?

- Celiac Disease
- Autoimmune Diseases (Lupus, MS, RA, Crohn's, etc)
- Thyroid Issues (Grave's, Hashiomoto's, hypo/hyper)
- Gut issues
- Allergies, especially known food allergies

** Testing for non-celiac gluten sensitivity is incomplete at this time. The best way to determine sensitivity is elimination for 6-8 weeks and check results.*

Where is Gluten?

- Breads, cereals, crackers, pretzels, pastas
- Most processed foods as a thickener, stabilizer, etc.
- Skin/ hair care products: lotions, shampoo, etc
- Medications: Ambien, Fosamax
- Supplements

Caution with Gluten Free Products

- Higher in carbohydrates
- Replaced with gums: guar gum, gellen gum, etc
- Added oils

**Look at the ingredients*