Welcome!

THE SCHOOL OF
Applied Functional Medicine™

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Applying Functional Medicine to Maximize Your Clinical Impact:

The Science and The Art That Many Practitioners Miss

Through the Lens of Hypertension

Meet Janelle and Molly

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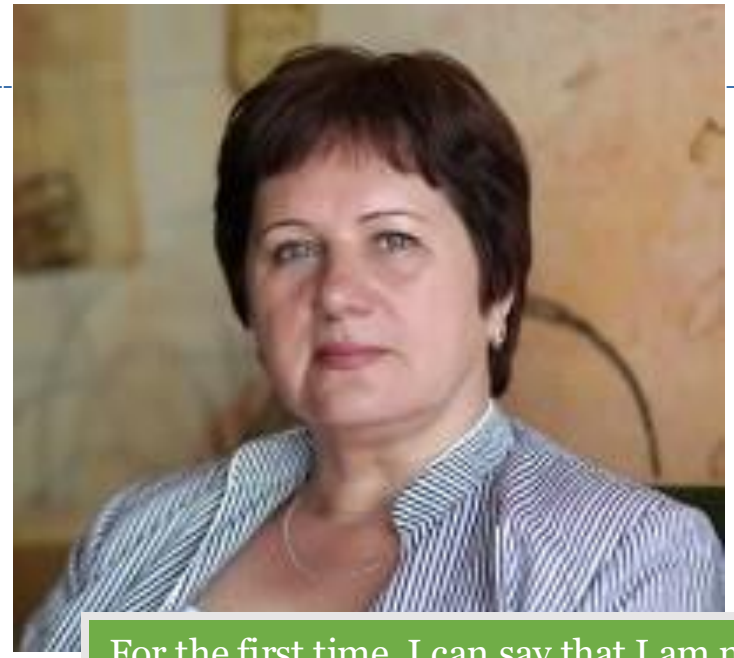
"I have tears in my eyes as I write this! Today for the first time, I took away all hypertensives – the 3rd of 3. Today, I finally feel like I am Being the practitioner I always wanted to be. A healer. Helping people actually return to health. Not just treating disease and giving pills. It feels amazing. Thank you!"



For the first time, I can say that I am no longer afraid.

Afraid to live. To be active. To say yes when my grandkids want me to join in their play.

From the bottom of my heart, I am so grateful. You've given this grandmama back her spark.

All Things are Interconnected, Uniquely!

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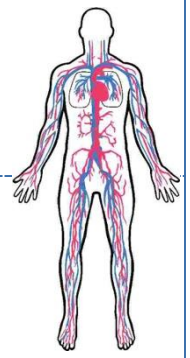
- Oxygen Intake and Spiritual Mindset
- Stress and Stress Management
- Toxins and Detoxification Ability
- Sensitivities and Allergies and Immune Health
- Energy Generation and Circulation
- Nourishment and Absorption Ability
- Genetic Predispositions and Infections
- Expectation, Association, History, Belief

Ask what kind of *Person* has this dis-ease vs. what kind of *Dis-ease* does this person have?

Cardiovascular Functional Fundamentals



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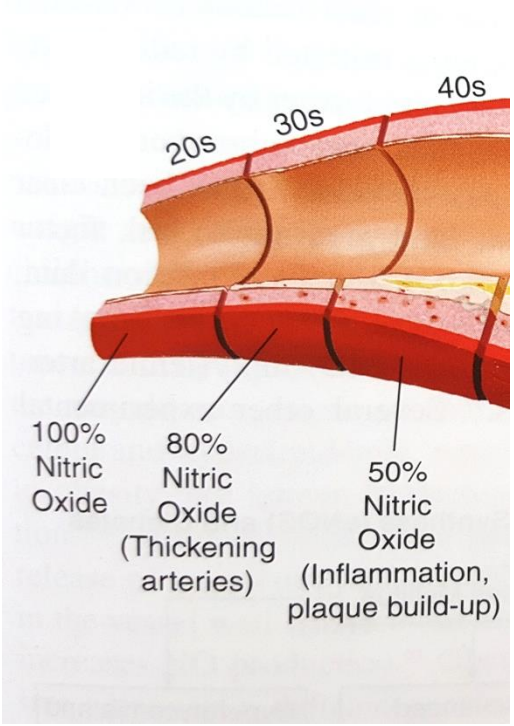
- Blood vessels transport **nutrients, gas, and wastes to/from cells throughout** the body.
- The heart pumps. **Arteries are alive, responsive, and channel/resist that flow**.
  - Muscles in the arterial walls contract (higher BP) or relax (lower BP) in response to what our life demands.
  - Just as with a garden hose, an overly pressurized line is **vulnerable to damage over time.** Arms and branches are particularly vulnerable. Progressive vessel wall damage impairs an artery's ability to dilate (vasodilation).
  - Hypertension perpetuates itself with frequency and severity. Wear'n'tear attracts the atherosclerotic repair process.
  - Notably high or low blood pressure increases the risk of CVD, as does increased BP variability.
- Vascular wellness is about the **persistent functional balance** of dilation (NO, nitric oxide) and constriction (Ang-II, angiotension-II).
  - NO is made in the endothelial lining and smooth muscle cells of blood vessels and also by platelets and white blood cells. Reduces WBC adhesion, inflammation, and platelet aggregation.
  - **NO production fades with age and with increasing damage to the endothelial lining**.* An excellent example of the forward-feeding cycle of disease, especially as it relates to regulation of barrier function.



* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4310385/ and image, from Houston, 2020, *Integrative Cardiovascular Medicine*, p. 9

Cardiovascular Functional Fundamentals

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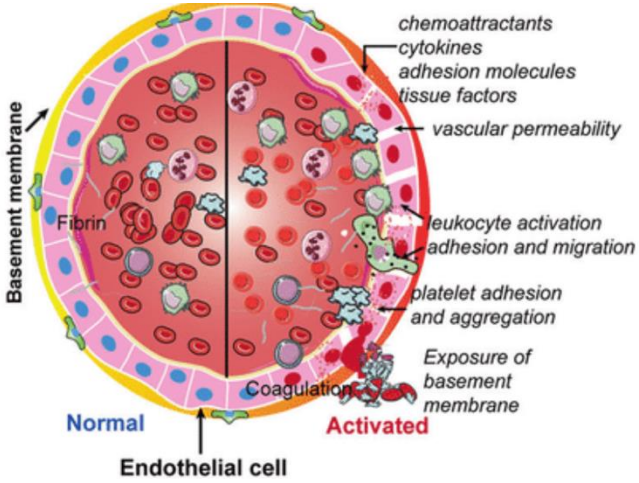
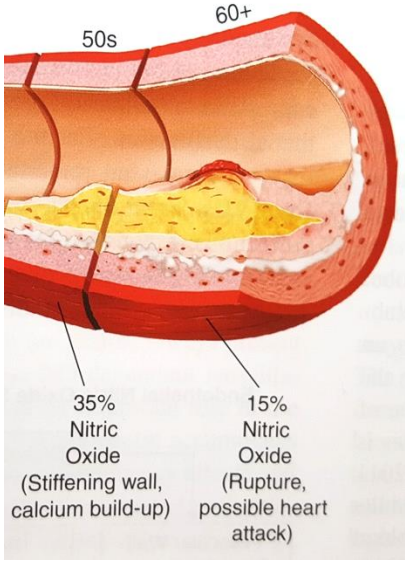
- **Atherosclerosis** is triggered by some combination of endothelial insults or irritants which increases arterial wall permeability and inflammatory "stickiness".
  - As tissue is damaged, a **localized, healing inflammatory response** ensues which becomes chronic and inherently dysregulated.
  - The arterial wall thickens, **primarily with oxidized, small, dense LDL particles**, recruiting macrophages to control the process, with insufficient HDL support to remove the resulting lipid pool.



- **Increased vascular permeability** (leaky vessels!) promotes uptake of immune cells, cholesterol, but also toxins, pro-oxidants, and pro-inflammatory cytokines and immune complexes.

- Chronic, progressive build-up of vessel-blocking plaque in the intima of arteries eventually results in **significant stenosis that restricts blood flow and causes tissue hypoxia**.
  - An autoimmune dynamic may also worsen chronic escalation.
  - Cardiovascular "events" may ensue.



* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4310385/ and nitric oxide image, from Houston, 2020, *Integrative Cardiovascular Medicine*, p. 9
Vascular permeability image: https://www.researchgate.net/figure/Pathophysiology-of-endothelial-cells-Endothelial-cells-exist-in-the-inner-layer-of-blood_fig1_347878707

Hypertension – a Symptom, not a Disease

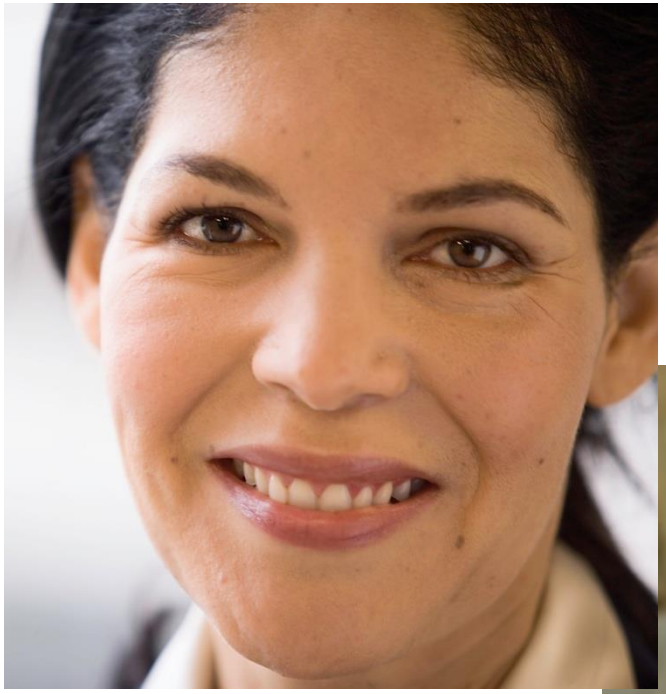
- Chronically elevated systolic and/or diastolic blood pressure.
- Caused by **dysregulation of one or more of three normal responses of the blood vessel** to a huge array of possible insults:
  - Inflammation
  - Oxidative stress/damage
  - Vascular immune dysfunction
- When chronic and synergistic, these dynamics contribute to **endothelial dysfunction**, a strong predictor of future cardiovascular events (as measured by FMD).

"Hypertension is not a disease. It is a correct but dysregulated vascular response. The blood vessel is an innocent bystander."

- Dr. Mark Houston

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5347643/

Hypertension: Who is this Person?



Cardiovascular Disease Chain of Causality (Interconnectedness)

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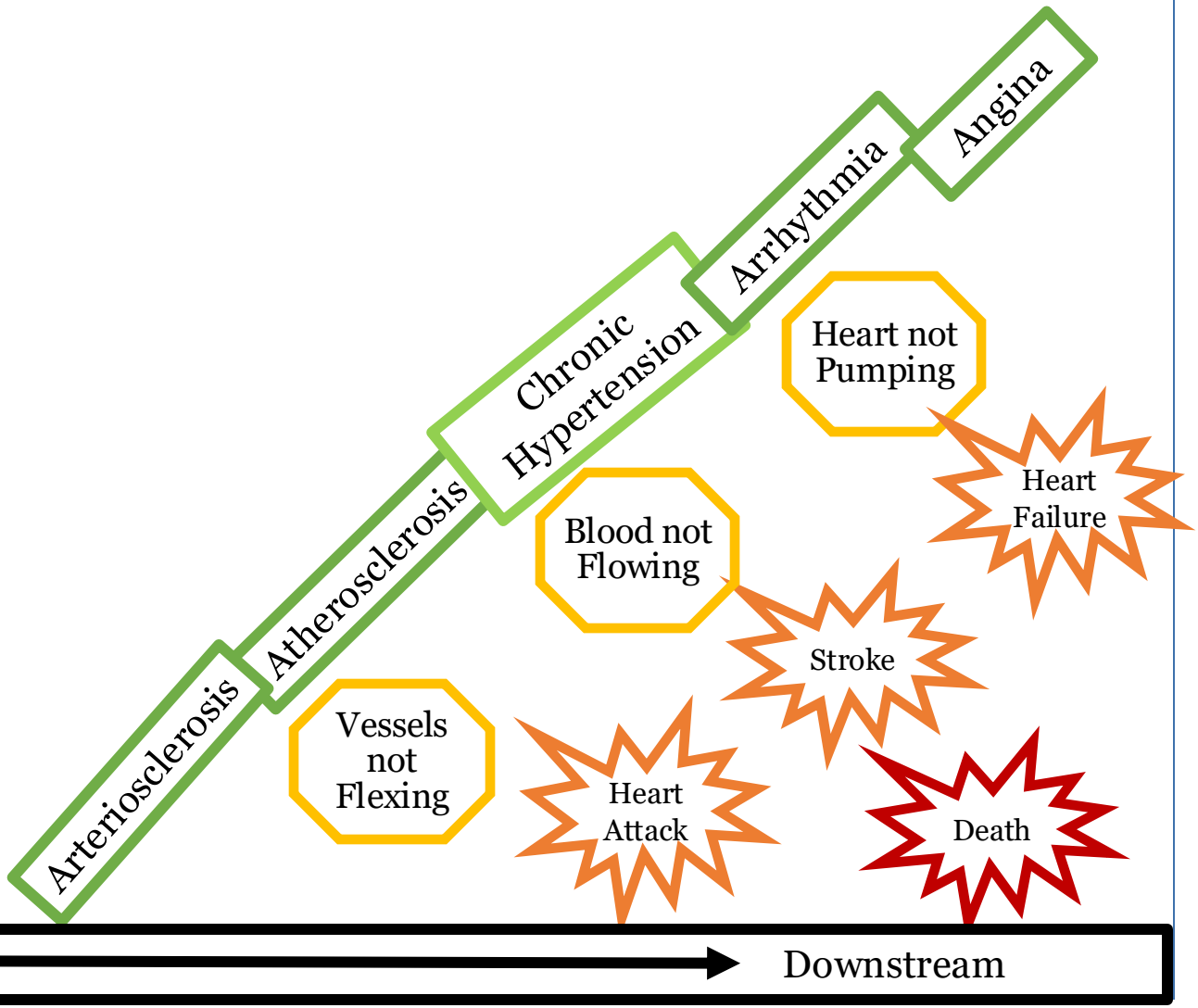
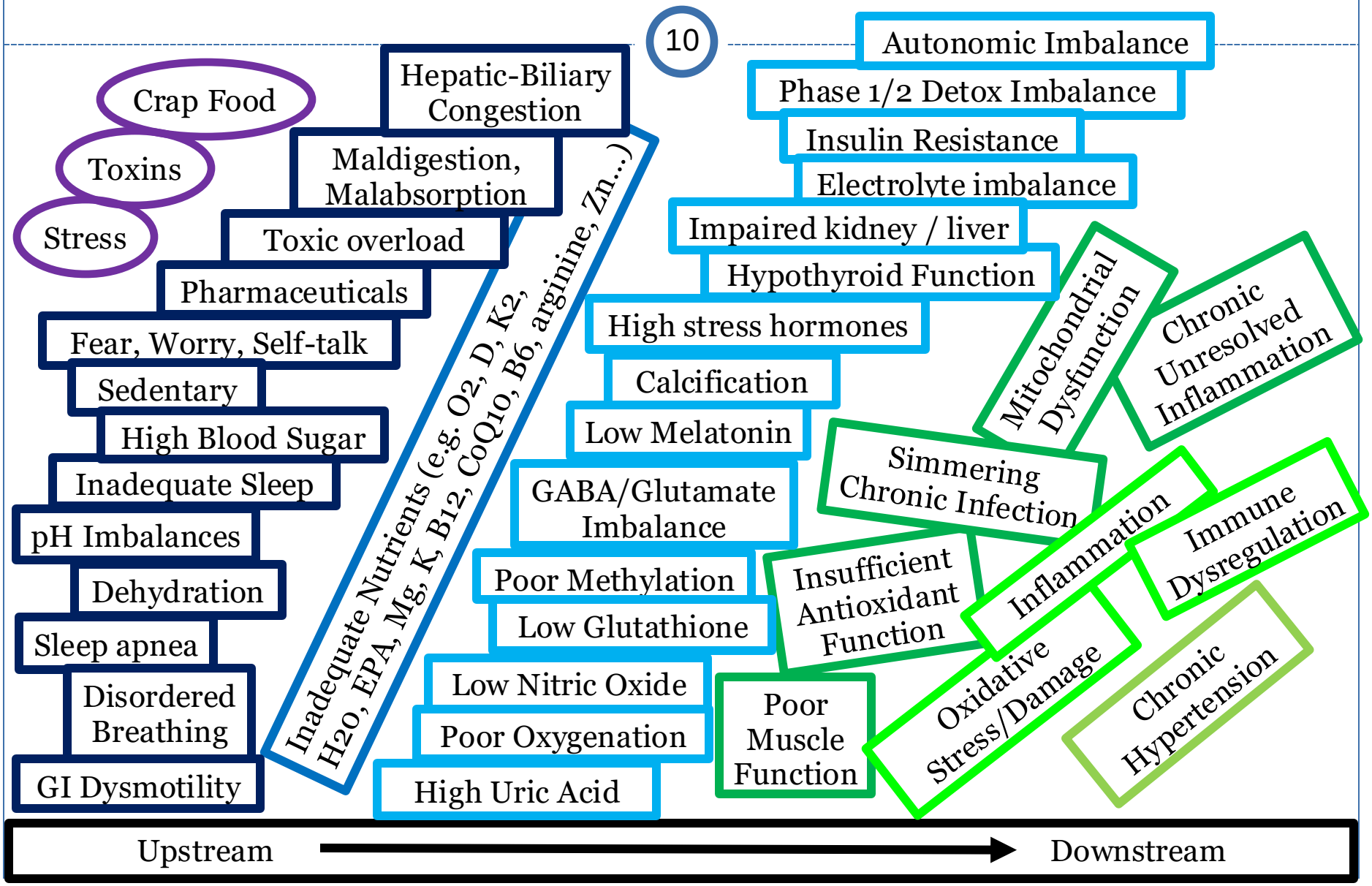


Hypertension Chains of Interconnectedness



BP Measurement: Devil in the Detail

- **Often poorly measured in the clinic.** Affected by many external factors (e.g. whitecoat).
  - Needs to be fully at rest, seated for 5+ minutes without speaking or eating/drinking with arm extended straight at shoulder height and fully supported at elbow and wrist. Ideally in both arms and legs, sitting and standing. **
- **24-hour ambulatory monitoring (with brachial and central BP) is key!**
  - Averages matter. Home monitoring at a variety of times can be helpful but requires careful instruction. And won't enable you to gain accurate overnight data!
- **5-10% increase in blood pressure early in the morning is normal** and a healthy response of our circadian rhythm. It maps with the AM cortisol surge (adrenal stress hormone) to prepare us for the day.
  - But chronically elevated cortisol promotes arteriosclerosis - hardening of the arteries due to sustained high blood pressure (via thickening of the vessel's muscle layer).
  - Thus it makes sense that sustained, elevated cortisol (hyper-adrenal states) is a major driver in hypertension!
- **Elevated pulse pressure** (systolic-diastolic) often indicates stiff (hardened) arteries with low elasticity.
  - Calcium supplements can be dangerous! Yet the body must have sufficient calcium intake, or the body will rob bones to keep blood levels sufficient.
  - "Unmanaged" calcium can deposit in arterial walls and contribute to stiffness and rigidity. This is seen also in patients using blood-thinning medications that block action of Vitamin K (e.g. Warfarin).*
  - Vitamin D, Vitamin K2, and magnesium are an ideal trio to ensure that excessive calcium is kept out of arteries.**
- **Blood pressure should dip substantially (10-15%) in the middle of the night** in response to large melatonin secretion (or supplementation!). "Big dippers" have a lower risk of heart disease and stroke. ***
  - For patients who have trouble falling asleep, put a major focus on Sleep Hygiene. Consider calming herb teas (use glycine powder to sweeten) and/or 100-400mg l-theanine and/or 500mg taurine to promote better GABA/glutamate balance. If trouble staying asleep (or known high overnight cortisol), consider 0.3 to 1mg of melatonin at bedtime to promote endothelial healing overnight. Much more may be needed with significant endothelial dysfunction (e.g. covid).

** https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4926726/

Optimizing Parasympathetic Response on Purpose

- Meditation, Hypnosis
- Maintain a diverse, healthy microbiome (e.g. diet, sleep, Abx avoidance)
- Traditional and Electro-Acupuncture
- Diet: Higher fat diet, sufficient choline, polyphenol-rich
- Targeted synbiotics
- Fasting (appropriate)
- Exercise (appropriate)
- Yoga, Tai chi chuan, feeling connected in shared experience
- Mindful Breathing. Slow, less frequent and via the nose.
  Exhalation equal to or longer in duration than inhalation. Pauses between inhalation/exhalation.
  All of these not typical when you're in a sympathetic N/S mode! Address mouth breathing.
- Choices that reduce cortisol or increase oxytocin. Smiling, laughing, time with pets, hugging, snuggling, good sex, singing, falling in love, hobbies that are relaxing (vs. stressful re: achievement bias).
- Gratitude journaling (5-10 minutes)
  Not just a quick "family, healthy, friends" kind of superficial reflection. Choose 3 very specific things that engage your emotions and your memory. Relive it.
- Become Mindful and Selective about habitual thought patterns.
  Signal to the body feeling safe, secure, and supported.
- Meet the required, daily minimal intake of the "other vitamins" (J=joy, P=play, N=nature)

Ann N Y Acad Sci. Author manuscript; available in PMC 2015 Aug 12.
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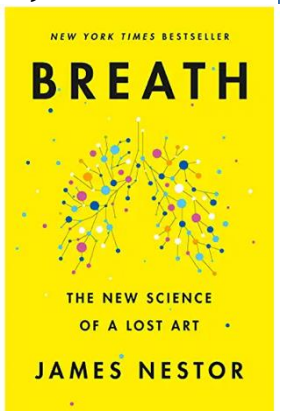
Ann N Y Acad Sci. 2009 Aug; 1172: 172–180.
PMID: 19743552
doi: 10.1196/annals.1393.013

The Inflammatory Reflex and the Role of Complementary and Alternative Medical Therapies

Stacey L. Oke and Kevin J. Tracey



https://www.ncbi.nlm.nih.gov/labs/pmc/articles/PMC4533858/

All Things are Interconnected, Uniquely!

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Ask what kind of *Person* has this dis-ease vs. what kind of *Dis-ease* does this person have?

Functional Medicine Tenets

- Each person is **unique.**
- Everything in the body/system is **interconnected.**
- The body's **natural, default state** is one of wellness.
- **Dis-ease precedes disease** and is evidence of imbalance, blockage, or impairment in natural functioning.
- **Resilient health** repels dis-ease.
- The root cause and the complaint may be **distant** from one another (in the body, in time, in the biochemistry).
- The **collection of root causes** of dis-ease is unique for each person. Effective medicine is **customized** for each person.
- Wellness includes the **entire patient experience** (physical, mental, emotional, spiritual).
- The patient's **active participation and belief** in their healing are central to their ability to get (and remain) well.
- **All modalities** that bring greater balance, ease, and flow to the patient are a key part of their unique healing journey and ongoing "health care".

Putting the Puzzle Pieces Together

We are not designed to be
Stressed, Toxic, Inflamed, Infected, Malnourished, & Unrested
and yet still easily
Thrive, Grow, Reproduce, be Lean, feel Well,
Eat Anything we want, enjoy perfect BMs, and have Great Sex.

This combination would be Not Natural.

Why are we struggling?
Crap Food, Toxins, Stress

Even when aware, we lack Education, Inspiration, Empowerment, and Community support!

Food: **Teach** What's In There!

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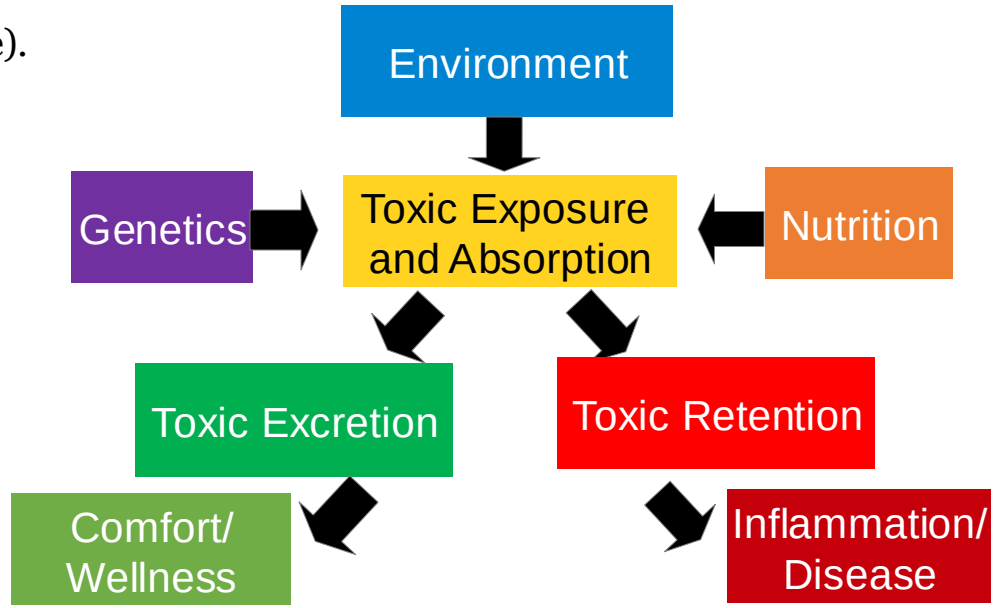
- **Categories**: vegetables, fruits, nuts, seeds, whole grain, legumes, eggs, dairy, meats, poultry, seafood, oils/fats, seaweed/algae, insects, sugar/sweeteners, spices/herbs/seasonings, ferments.
- **Core components**: carbohydrates, proteins, fats, fiber, water.
- **Nutrition**: calories, minerals, amino acids, vitamins, essential fats, phytonutrients.
- **Impact**: ATP, enzymes, hormone metabolism, tissue growth and healing, detoxification.
- **Experience**: satisfaction, deprivation, pleasure, discomfort/pain, habit, inconvenience, connection, memories and rituals, loneliness, eating quickly or slowly.
- **Broken/Refined food ingredients**: vegetable oils, stripped and bleached grain flours, high fructose corn syrup (HFCS), transfats, GMO foods, fillers (e.g. meat glue, wood pulp as "cellulose"), MSG (e.g. hydrolyzed vegetable protein), emulsifiers and thickeners (e.g. carrageenan*), flavor enhancers (e.g. glutamate), and texturizers (e.g. gelatin).
- **Artificial additives****: sweeteners# (e.g. aspartame, sucralose), chemical flavors, preservatives (e.g. sodium benzoate, TBHQ, "pink slime" with ammonia hydroxide), colors (e.g. Blue Lake, Red #40), olestra (fake fat), leavening agents (e.g. potassium bromate***).
- **Residues**: antibiotics, advanced glycation end products (AGEs e.g. French fries, potato chips), heterocyclic amines, BPA, glyphosate, toxic elements (e.g. arsenic in rice, mercury in fatty fish), mycotoxins (e.g. cashews, peanuts, grains, coffee), fluoride (e.g. tea, wine), cookware or food storage debris (e.g. iron, aluminum, BPA, microwaved-plastic-bag, Styrofoam).
- **Unwelcome guests**: bacteria (incl. antibiotic-resistant strains), mold, parasites.
- **Potential dis-ease culprits**: histamine, salicylates, oxalates, phytate, lectins, tannins, allergen, sensitivity, intolerance,
  high-fat, high-fiber, high-protein, high-carb, high-sugar, high-calorie,
  low-fat, low-fiber, low-protein, low-carb, low-calorie.
  Bio-individuality!

* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8539934/ # Artificial sweeteners and gut permeability? https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7353258/
** A list of additives and their use/status re: the US FDA: https://www.fda.gov/food/food-additives-petitions/food-additive-status-list
*** An aggressive, carcinogenic, oxidative agent, banned in many countries, found in high residue in breads e.g. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8269585/

The Experience of **Toxicity** is Individual

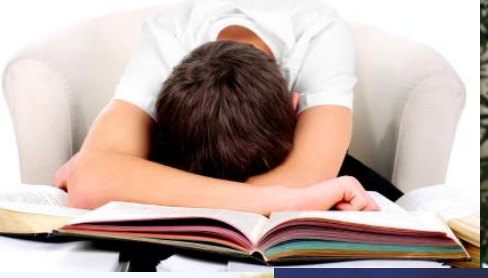
- We Are designed to **manage and excrete toxins readily.**
  Urine, stool, sweat, hair, fingernails, saliva, tears, breath. What we cannot or do not excrete then circulates and/or is stored in the body.
- "Detoxification" is about the biotransformation of substances that **allows for their transport and excretion.** This includes **mobilization** of stored toxins (e.g. heavy metals) from within tissues.
- **Our toxin *tolerance* is particularly individual.**
  Exposure that is toxic to one person may be fine for another person.
- Our **toxin *clearance*** capacity varies dramatically (and also depends on toxin type).
- Our **toxin *resilience*** capacity varies dramatically (and depends on the overall state of our health).
- **Toxic *retention*** varies by toxin and tissue affinity (e.g. lead in bone; mercury in brain, adipose tissue).
- A vicious cycle can be at play.
  Toxicity promotes dis-ease via multiple mechanisms; on the other hand, **dis-ease exacerbates toxicity.**



Mechanisms of Dis-ease from Toxins*

- **Cellular damage**
  (e.g. DNA, cell membrane, mitochondria, endoplasmic reticulum) which can do anything from promoting carcinogenesis to dysregulating apoptosis to impairing cell signaling to reducing ATP formation. Ultimately affecting any cell's function e.g. neurons, pancreatic b cells.
- **Increased oxidative stress** (increased reactive oxygen species) which can drive cycle of inflammation and more oxidative damage over time, including plaque formation.
- **Enzyme dysfunction** (e.g. mineral substitution, protein misfolding) that can impair anything from detoxification itself (e.g. Phase 1 CYP450, Phase 2 NRF-2 or GPX, Phase 3 p-glycoprotein) to thyroid function.
- **Displacement** e.g. lead for calcium or zinc or BPA displacing testosterone in SHBG.
- **Immune system disruption** (e.g. NF-kB) which promotes cycle of inflammation and oxidative damage and more inflammation (e.g. a common dynamic in neurotoxicity) or immunosuppression or primed hypervigilance (e.g. asthma, allergy, autoimmune disease, multiple chemical sensitivity).*
- **Microbiome imbalance** e.g. overt antimicrobial effect, future antimicrobial resistance.
- **Hormone receptor dysfunction**
- **Increased adiposity** to serve as toxin depot for protecting vital glands/organs.#
- **Epigenetics** (e.g. DNA methylation, histone behavior) which may have immediate, later-in-life, and also later succeeding generational effects.
- A rich mix of overt **damage to Cells** and downstream **damage to Function** including the body's own ability to rid itself of the toxin.

* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6858758/ , https://www.jacionline.org/article/S0091-6749(17)30846-1/fulltext
# https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2664469/
An extensive set of curated references for many of these mechanisms of disease may be found in the Toxicity/Detoxification clinical course.



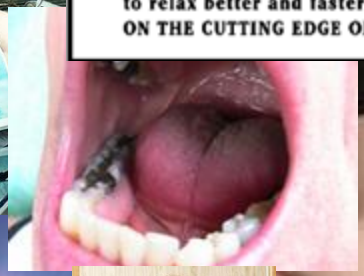




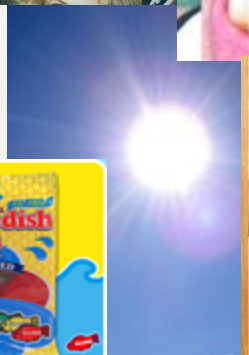








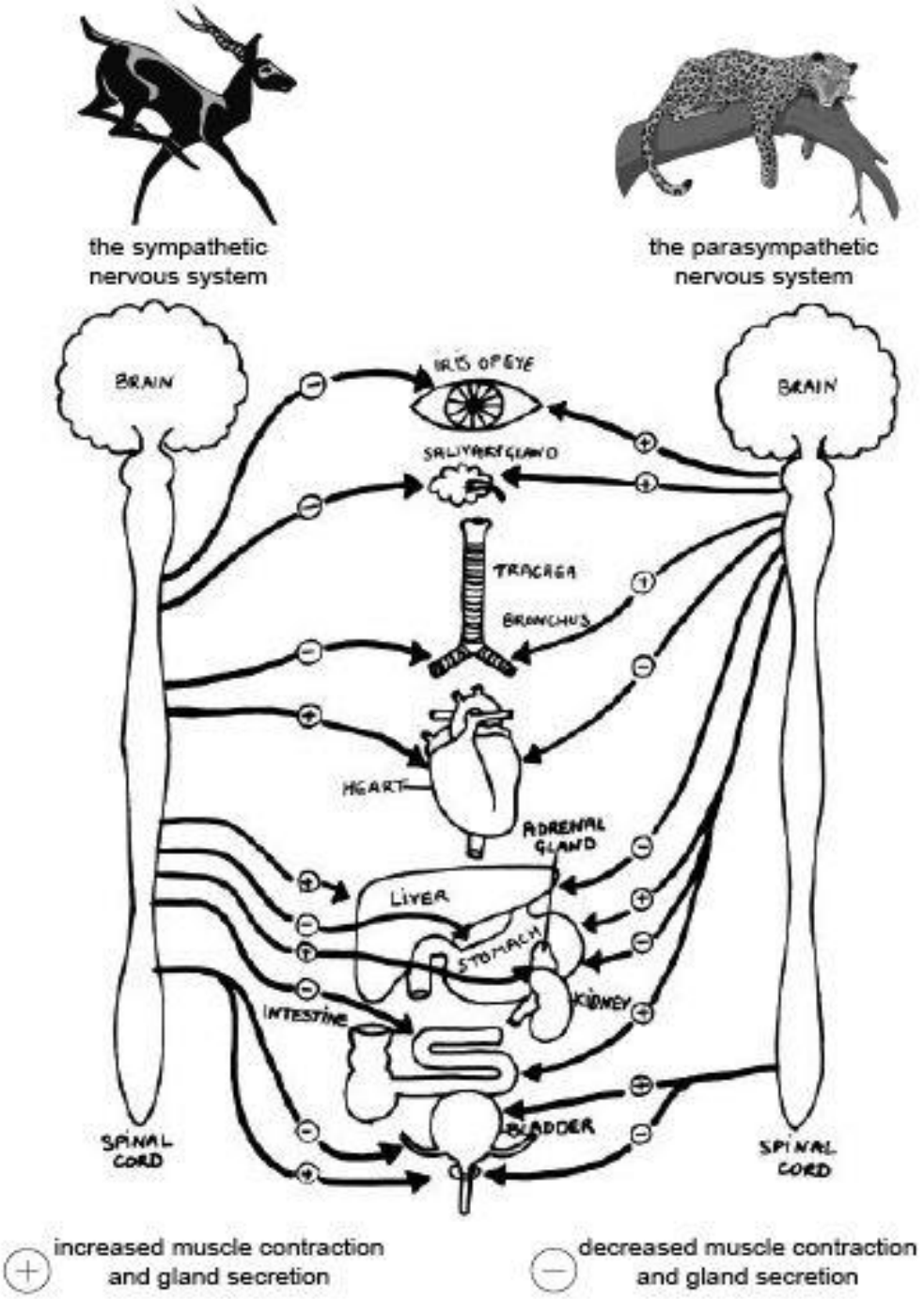







Dis-ease in the Nervous System?

- **Sympathetic**
  - Fight-or-Flight-or-Hide
  - Increased focus and alertness
  - Increased metabolic activities to prepare body for emergency activity
  - Designed to be short-term exceptions for survival
- **Parasympathetic**
  - Rest-and-Digest-and-Heal
  - Relaxed external muscles. Increased digestive activities to store energy for future use. **Immune function.**
  - Designed to be our primary state
- Most organs and glands in the body have receptors to **receive impulses from both modes** (either inhibitory to "stop work" or stimulatory to "work harder")



Chronic Stress and Endothelial Dysfunction

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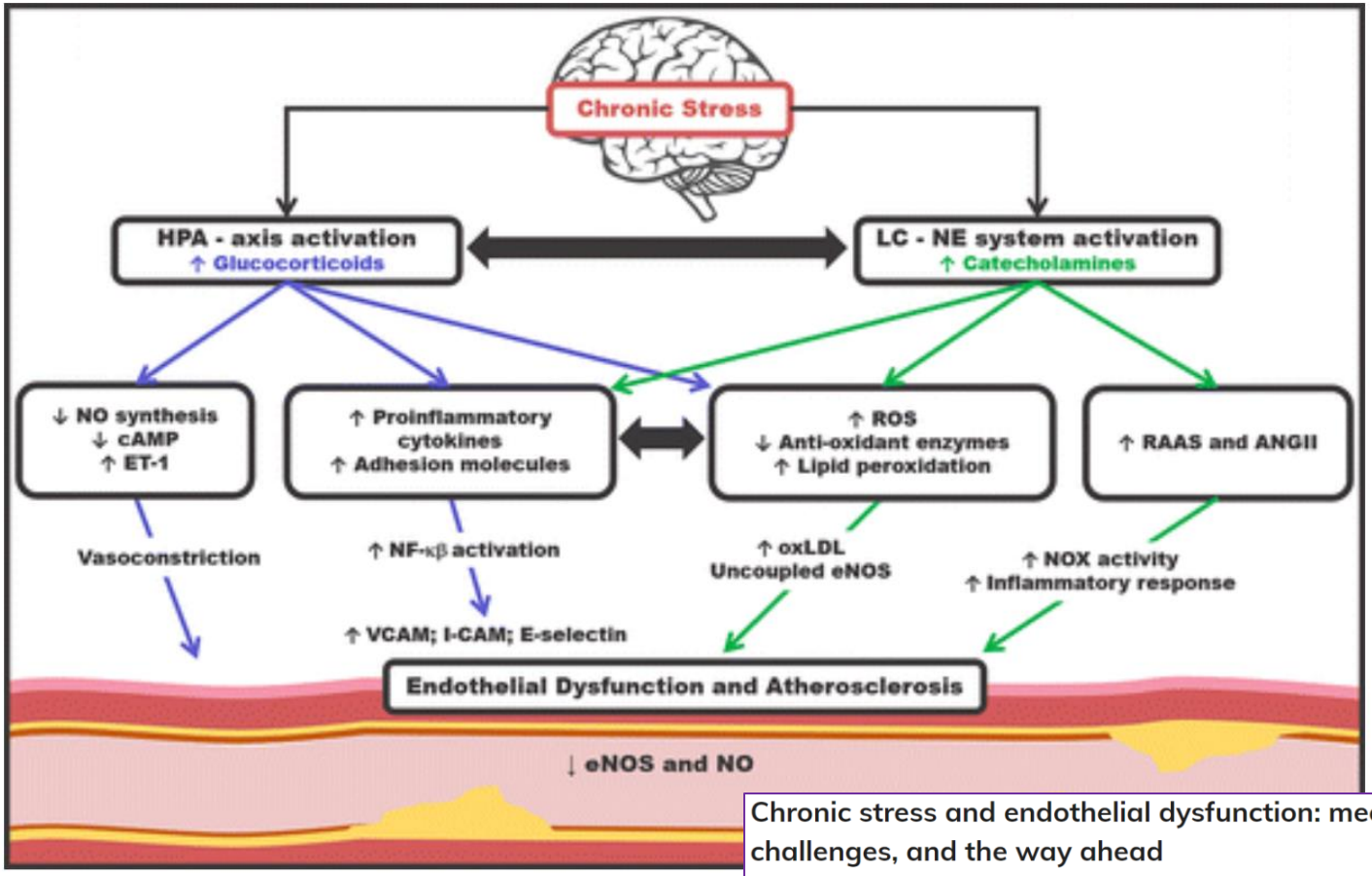

Chronic stress and endothelial dysfunction: mechanisms, experimental challenges, and the way ahead

Lucien Derek Sher, Hannah Geddie, Lukas Olivier, Megan Cairns , Nina Truter, ... See all authors

10 AUG 2020 // https://doi.org/10.1152/ajpheart.00244.2020

https://journals.physiology.org/doi/full/10.1152/ajpheart.00244.2020

Chronic Bio-individual **Stress** Sources

- **Emotional stress** (especially the combination of possible/actual harm and loss of control)
  - Work performance, family dynamics, finance issues, peer approval, etc..
  - Grudges, resentment, unalleviated anger, living in the past, unexpressed emotions…
  - Preoccupation with what is missing, never having "enough" of something/anything
  - Loneliness, social isolation, lack of social support**

- But also **Physical Stress** in various forms…
  - Infections (viral, bacterial, fungal, parasitic…)
  - Inflammation (e.g. arthritis), Obesity
  - Insufficient sleep, sleep apnea, shift work, jet lag
  - Overuse of stimulants (e.g. caffeine***, sugar, chocolate)
  - Toxins (including overuse of medications)
  - Too much exercise (or physical trauma)
  - Allergen exposure, including food sensitivities.
  - Poor detoxification (toxin tissue storage e.g. mercury, lead)
  - Insulin Resistance (and Hyperglycemia) and Hypoglycemia
    - Teach patients that cortisol raises blood sugar, perhaps much more than their dietary carbs/sugars.
  - Insufficient caloric intake (think of over-exercisers) or dietary carbohydrates (for unique person)****
    - Your clients who have adopted a low, very low, or no-carb diet must have adequate fatty acid metabolism in order to thrive, which requires B vitamins, carnitine, and healthy mitochondria. Some may thrive best with 30-40% carbohydrates vs. 15-20% (e.g. more winter squash, tubers, whole fruit). Paleo ≠ Low Carb. L

A vicious cycle?

A strong stress response promotes survival, but at a cost! Chronic immune suppression can create more stress triggers.

http://www.lifestylematrix.com/assets/1/7/The_Role_of_Stress_and_the_HPA_Axis_in_Chronic_Disease_Managment_Excerpts.pdf
** https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2841363/ *** https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2257922/
**** https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3641164/ and https://www.ncbi.nlm.nih.gov/pubmed/20860883

Interconnectedness can be a Vicious Cycle

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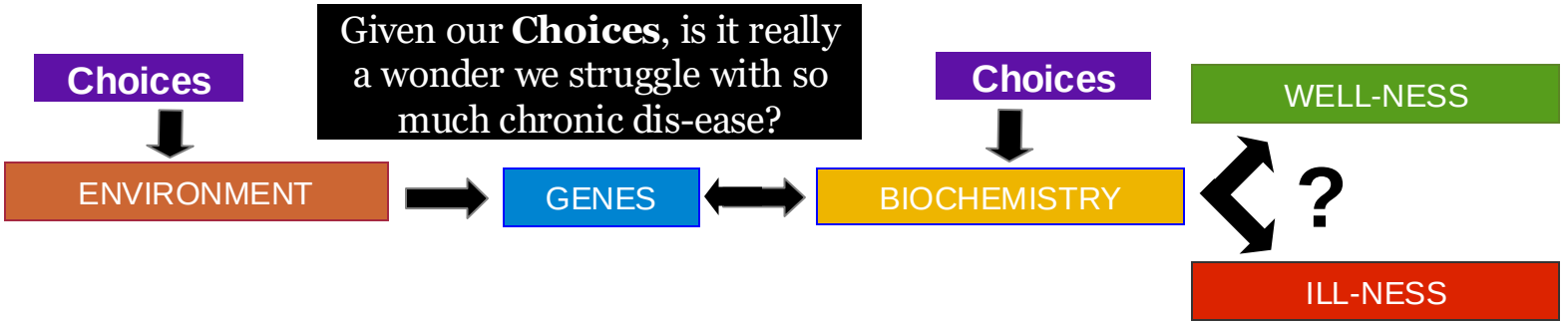
- **Crap Food**
  - Doesn't give Nutrients, Looks like a Toxin, Increases stress.
  - Loaded with refined carbohydrates, fructose, inflammatory fats
- **Toxins**
  - Deplete nutrients, Increase stress, Impair metabolism/detoxification.
  - Promotes oxidative damage to cell membranes, interferes with enzymes that drive cellular metabolism
- **Stress**
  - Depletes nutrients, Impairs digestion, Impairs detoxification.
  - Increases blood sugar and insulin demand separate from food



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- **We appreciate you being here!**
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- Be sure to check out **additional, exciting SAFM events and content**