

# Let's Talk Detox

*How RDNs Can Reclaim the Cleanse*

**PRESENTED BY**  
**Mary Purdy, MS, RDN**

**Today's Dietitian**  
SPRING SYMPOSIUM  
**2020**  
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## Contact and Disclosures

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- Podcast:** "Mary's Nutrition Show"  
<http://marypurdy.co/podcast-posts/>
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**Financial Disclosures:**

- Wellebate Account with Emerson Ecologics:  
<https://wellebate.me/>

**Other Affiliations:**

- Faculty with IFNA Academy:  
<https://www.ifnacademy.com/>
- Board Member & Past Chair: Dietitians in Integrative and Functional Medicine  
<http://www.integrativerd.org/>
- Board Member: Hunger and Environmental Nutrition <https://hendpg.org/>

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## Learning Objectives

- 1** Define and discuss the process of detoxification/ bio-transformation and its role in human health.
- 2** Identify potential areas of exposure to toxicants in the environment and diet and their associated health risks.
- 3** Implement dietary and lifestyle strategies for minimizing exposure and supporting optimal detoxification and elimination.
- 4** Discuss risks of poorly implemented detoxification protocols as well as contraindications and important considerations around supporting patients in this area.

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## What is Detoxification?

- Also known as "bio-transformation"
- **Biochemical process** by which non water-soluble compounds are transformed into water soluble compounds that are then excreted by the body through urine, sweat, or stool
- **Benefit:** Protects body from adverse effects of external and internal toxins
- Basis of drug metabolism



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## RDNs: Support the Heart

### We recommend minimizing:

- Saturated fats
- Trans fats
- Processed foods
- Excess salt
- Sedentary lifestyle
- Excess alcohol

### We encourage increasing:

- Fiber-rich foods
- Phytosterols
- Mineral-rich foods
- Foods that support nitric oxide: beets, chard, rhubarb
- Healthy fats: omega 3s
- Exercise



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## Supporting Organs of Detoxification

### Key Organs:

- **Liver**
- **Kidneys**
- **GI Tract** (microbiome)
- Lungs
- Skin
- Lymphatic system

### Currently an increased exposure to toxicants:

- Environmental
- Consumed foods
- Cooking methods
- Dietitian advice matters



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## The Importance of Supporting Organs of Detoxification

- **Undernourished body**<sup>1</sup>
  - Most Americans not meeting nutrient needs
- **Higher nutrient needs**
  - Medical issues/chronic disease
  - Drug nutrient depletions<sup>3,4</sup>
- **Commonly compromised digestive tracts**
  - Constipation
  - IBS
  - Malabsorption issues
- **Unhealthy lifestyle habits** can impede optimal detoxification/biotransformation and increase endogenous toxin production<sup>2</sup>
  - High Stress
  - Low Activity
  - Poor sleep



1. Steele et al., *Americans Do Not Meet Federal Dietary Recommendations*  
 2. Bost et al., 2015, *Chemical Alterations: Role of Endogenous and Exogenous Factors*  
 3. Murray et al., *Drug Interactions and Changes in Nutrient Requirements*  
 4. Jones, MD (2015) *Textbook of Functional Medicine*

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## Fact: Environmental Toxicants Are An Issue for Human Health<sup>1, 2, 3</sup>

1. Endocrine **disrupting** chemicals and persistent organic pollutants ("Forever Chemicals") and pesticides
2. **Contribute** to and/or **exacerbate** chronic health issues/diseases
3. **Direct** exposure
4. **Indirect** exposure
5. **Accumulation** over time
6. Potential **synergistic effects** of combined chemical exposure



1. Gies, A. et al., *The Endocrine Society's Second Scientific Statement on Endocrine-Disrupting Chemicals*  
 2. US Department of Health and Human Services, National Institutes of Health, *Tox News*  
 3. US Department of Health and Human Services, National Institute of Environmental Health Sciences, *website*

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## "Precautionary Principle"

"When an activity **raises threats** of harm to human health or the environment, **precautionary measures** should be taken, **even if** some cause-and-effect relationships are not fully established scientifically."



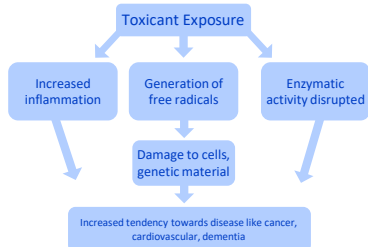
1. Balleisen et al., *Protecting Public Health and the Environment*

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## Impaired Detoxification<sup>1</sup>



1. Chung, RPH. Detoxification effects of phytochemicals

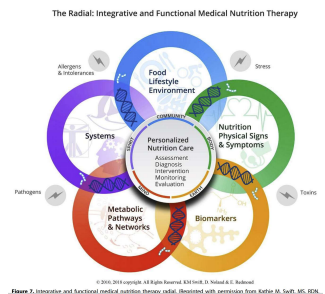
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## 2019 Standards of Practice and Standards of Professional Performance (SOP/SOPP)

Registered Dietitian Nutritionists in Integrative and Functional Medicine<sup>1</sup>



© 2019, 2018 copyright. All Rights Reserved. EAT 100K. D. Noland & S. Redmond

Figure 3. Integrative and functional medical nutrition therapy radial. Distilled with permission from Kathy W. Smith, PhD, RD, CNSC.

1. Noland, D., Academy of Nutrition and Dietetics. Revised 2019 Standards of Practice

2. Graphic used with permission from Kathy W. Smith, PhD, RD, CNSC

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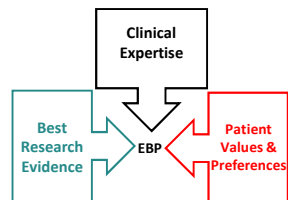
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## Evidence-Based Dietetics Practice

The Academy 2019 definition of Evidence-Based Dietetics Practice is<sup>1</sup>:

- **Evidence-based practice** is an approach to health care wherein credentialed nutrition and dietetics practitioners use the **best available evidence** to make decisions for patients/clients, customers, individuals, groups, or populations.



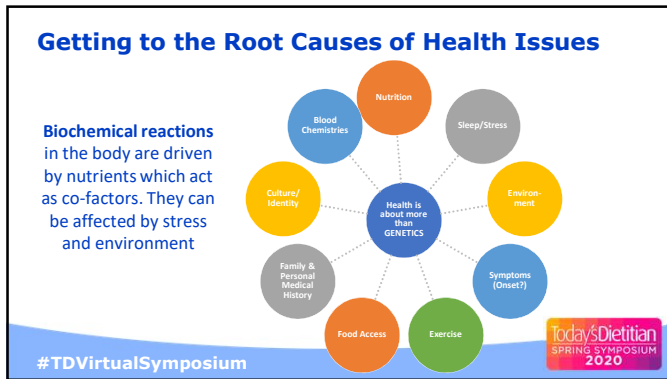
"Practice-based Evidence"

1. Academy of Nutrition and Dietetics Definition of Terms List

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### Toxicant Exposure: *Basics*

- **Inhaled, ingested, or dermal administration** → Systemic circulation where they find their way to tissues or organs, bind to receptors, and exert effects
- **Toxins are removed** from our bodies by four major processes:
  - Absorption
  - Distribution
  - Metabolism or biotransformation
  - Elimination

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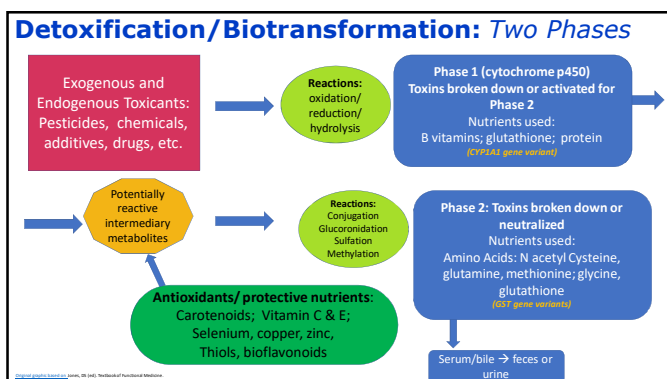
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## Glutathione: Master Antioxidant in the Body

- Made up of 3 amino acids (protein is key)
  - Cysteine
  - Glutamate
  - Glycine
- Protection against/elimination of<sup>1</sup>
  - Reactive Oxygen and Nitrogen Species
  - Endogenously Produced Toxicants
- Deficiency -> higher oxidative stress<sup>2</sup>

Relies on Glutathione Transferases ("GST") FAMILY of enzymes (3)

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1. Luchbach, et al. Glutathione Homeostasis and Functions  
2. Secher, et al. Glutathione synthesis of glutathione  
3. Graph: Based on Townsend, R, and Tew, K. The role of glutathione in liver disease

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## Nutrition and Glutathione

A whole pattern of biochemical reactions that are contingent upon nutrients to function:

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1. Graph: Hensch, 2019 Permission granted by Dr. Deanne Hensch  
2. Graph: https://pubs.rsc.org/en/content/articlepdf/2019/fo/fo90000a with permission by Linus Pauling Institute

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## Superoxide Dismutase (SOD)<sup>1</sup> :

- Antioxidant enzyme in cytosol, lungs, lymph, and arterial wall that **relies on zinc and copper**
- Antioxidant in mitochondria that **relies on manganese**
- Neutralizes superoxide radical and **increase cellular defenses**
- Interacts with **glutathione**

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Granger SS, et al. Advances in nutrition and human glutathione. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5555555/pdf/advances-nutrition-2016-0014.pdf

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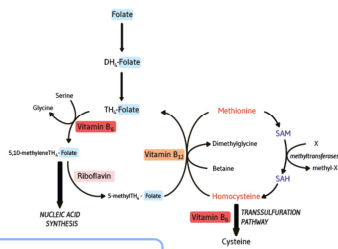
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## Methylation as Part of Detoxification

Figure 2. Overview of One-carbon Metabolism



- Folate/B12/B6 all act as methyl donors here.
- MTHFR gene variants can play a role as well<sup>1</sup>

1. Weisberg, I. et al. A second genetic polymorphism in methylenetetrahydrofolate reductase (MTHFR) with association from 1000 Genomes Consortium. *PLoS ONE* 2010;15(12):e0155105.

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## Oxidative Stress<sup>1</sup>

- An **imbalance** between the generation of Reactive Oxygen Species (ROS) and the detoxification of the reactive intermediates (our antioxidant defense system)
- ROS are generated as **by-products** of our metabolism and outside toxicants (smoking, chemicals, pollution)
- Disruption of the ROS production/detoxification cycle, **contributes to** the development of human pathologies, including age-related diseases:
  - Cancer
  - Cardiovascular disease
  - Neurodegenerative diseases
  - Genetic disorders

1. Cadenas, S. et al. ROS in oxidative stress: Implications in cancer progression.

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## What is Nrf2?<sup>1</sup>

- **Nuclear Factor Erythroid-2-Related Factor 2**, or Nrf2: A transcription factor
- **Regulates the expression of genes that encode for antioxidant proteins and enzymes:**
  - Glutathione
  - Superoxide Dismutase (SOD)
  - Glutathione-S-transferase 1 = detoxifying enzymes
  - Protect against oxidative stress
- **Oxidative stress conditions/many exogenous chemicals** can negatively affect and destabilize the process.
- **WHY is this important? Diet can help support Nrf2... More later!**



1. Cadenas, S. et al. ROS in oxidative stress: Implications in cancer progression.

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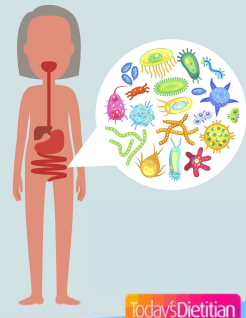
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## The Role of the Gut Microbiome<sup>1,2</sup>

**GI TRACT:** where we digest, absorb, and process our nutrients from the food we eat:

- Produce nutrients
- Communicate with our brain
- Inform our immune system
- Detoxify
- Eliminate waste



1. Singh, R.K. et al. Influence of diet on the gut microbiome  
2. Holtman et al. Gut Microbiome: Potential Implications

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## Assessment & Evaluation

*Put on Your Detective Cap*

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## Possible Symptoms of Poor Detoxification/Toxicant Exposure

- Indicators are not always clear
- Toxicant exposure, poor detoxification/elimination **potentially playing a role**
- Eye, skin, respiratory issues (asthma)<sup>2,3</sup>
- Fatigue<sup>2,3</sup>
- Headaches<sup>2,3</sup>
- Congestion<sup>2,3</sup>
- GI issues<sup>2,3</sup>
- Neurological issues<sup>2,3</sup>
- Joint aches/muscle weakness<sup>2,3</sup>
- "Pins and needles" and many of the above: mercury<sup>1,4</sup>



Symptom Checker

1. Rice, JH et al. Environmental mercury and its toxic effects  
2. U.S. Department of Health and Human Services, National Institutes of Health, Tox Team  
3. Lee, S. Acute symptoms associated with chemical exposures  
4. Lee, S. et al. Acute symptoms associated with chemical exposures

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### Possible Symptoms of Poor Detoxification/Toxicant Exposure

- Potentially playing a role in MANY chronic issues/diseases
- Combination of diet, lifestyle and genetics
- Cardiovascular issues<sup>1</sup>
- Obesity ("Obesogens")<sup>2</sup>
- Blood sugar Issues: "Diabetogens"<sup>3,4,5</sup>
- Autoimmunity Issues<sup>6,7</sup>
  - Thyroid Dysfunction
  - Rheumatoid Arthritis



1. Aronow, Z et al. Analysis of the effects of exposure to polychlorinated biphenyls
2. National Institute of Environmental Health Sciences website: Obesogens
3. Egan, M. Persistent Organic Pollutants Mediated Insulin Resistance
4. Pizzorno, J. Is the Diabetes Epidemic Primarily Due to Toxins
5. Favalon, P et al C. R. Biotoxins
6. Favalon, M et al Toxicology of autoimmune diseases
7. Vojdani, A et al. Environmental triggers and autoimmunity

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### Possible Symptoms of Poor Detoxification/Toxicant Exposure

- Potentially playing a role in MANY chronic issues/diseases
- Combination of diet, lifestyle and genetics
- Parkinson's<sup>1</sup>
  - Low levels of glutathione
- Infertility or other reproductive issues<sup>2,3</sup>
- Fibromyalgia?<sup>4</sup>
- Inflammation<sup>5</sup>
- NAFLD/NASH<sup>6</sup>



1. Aronow, Z et al. Analysis of the effects of exposure to polychlorinated biphenyls
2. National Institute of Environmental Health Sciences website: Obesogens
3. Egan, M. Persistent Organic Pollutants Mediated Insulin Resistance
4. Pizzorno, J. Is the Diabetes Epidemic Primarily Due to Toxins
5. Favalon, P et al C. R. Biotoxins
6. Favalon, M et al Toxicology of autoimmune diseases
7. Vojdani, A et al. Environmental triggers and autoimmunity

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### Chemical Sensitivities or Intolerances

- Headaches, sensitivities to strong smells, respiratory issues
- Occurs in 1 of 5 primary care patients<sup>1</sup>
- Early Indicator of potential disease<sup>2</sup>
- Assessment of diet and lifestyle
- Assessment tools



1. Greenstein, M et al. (2013). Green, M. (2013). Chemical Intolerance is primary care patients' environmental health concern. *Ann Fam Med*. 2013 Jul-Aug;15(7):507-62.
2. Green, M. (2013). A Multiple Chemical Sensitivity: Review of the State of the Art in Epidemiology, Diagnosis, and Future Perspectives. *J Occup Environ Med*. 2013;55(2):138-146.

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## QEESI: *The Quick Environmental Exposure and Sensitivity Inventory*

- A validated **questionnaire for chemical intolerance** and the most widely used screening instrument available for personal use
- Researchers and clinicians around the world use the QEESI to **document symptoms and intolerances**
- **Self-reported** symptoms and exposures:
  - Head
  - Cognitive issues
  - Musculoskeletal



<https://tstresearch.org/qeesi-2/>

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[illegible]

### — Impact of Sensitivities —

If you are sensitive to certain chemicals or foods, on a scale of 0-10 rate the degree to which your sensitivities have affected various aspects of your life. If you are not sensitive or if your sensitivities do not affect these aspects of your life, answer "0." Do not leave any items blank.

How much have your sensitivities affected:  
 [0 = not at all]    [5 = moderately]    [10 = severely]

1. Your diet?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>
2. Your ability to work or go to school?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>
3. How you furnish your home?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>
4. Your choice of clothing?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>
5. Your ability to travel to other cities or drive a car?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>
6. Your choice of personal care products, such as deodorants or makeup?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>
7. Your ability to be around others and enjoy social activities, for example, going to meetings, church, restaurants, etc.?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>
8. Your choice of hobbies or recreation?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>
9. Your relationship with your spouse or family?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>
10. Your ability to clean your home, iron, mow the lawn, or perform other routine chores?	<input type="text" value="0"/>	<input type="text" value="1"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="5"/>	<input type="text" value="6"/>	<input type="text" value="7"/>	<input type="text" value="8"/>	<input type="text" value="9"/>	<input type="text" value="10"/>

Total Life Impact Score (0-100):

[illegible]

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— Other Exposures —	
<p>Do believe that you have been exposed to a variety of other agents. As before, point out the agent that you suspect is a source of your illness. Rate the severity of your symptoms on a 0-10 scale. Do not rate any agent with a score of 0.</p> <p>For each item, circle one number only          [0 = not at all probable] [9 = extremely probable]          [10 = disabling symptoms]</p>	
<p>1. Childhood pet(s) _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>2. Pet(s) birds, such as canary, parrot, wren, fly, song birds, etc. _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>3. Pet(s) cats _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>4. Childhood exposure to cat(s) or dog(s) through pet(s) owner _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>5. Childhood contact with other cats, dogs, birds, etc. _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>6. Feeding fish to others, such as, dog(s), cat(s), pig(s), bird(s) _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>7. Feeding fish to others, such as, dog(s), cat(s), pig(s), bird(s) _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>8. Feeding fish to others, such as, dog(s), cat(s), pig(s), bird(s) _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>9. Feeding fish to others, such as, dog(s), cat(s), pig(s), bird(s) _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>10. Feeding fish to others, such as, dog(s), cat(s), pig(s), bird(s) _____ 0 1 2 3 4 5 6 7 8 9 10</p>	<p>1. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>2. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>3. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>4. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>5. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>6. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>7. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>8. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>9. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p> <p>10. Problems with your pet(s) or birds, such as, pet(s) owners _____ 0 1 2 3 4 5 6 7 8 9 10</p>
Total Other Interference Score (0-100) _____	

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## Medical Symptoms Questionnaire for Before/After

- From standard medical textbooks associated with proper history taking
  - The Michigan Manual of Clinical Diagnosis
  - Ferri's Clinical Advisor
  - Signs & Symptoms; Observation, Emergency Identification, Causes, Associated Findings (Nurses Reference Library)

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

The Toxicity and Impairment Screening Questionnaire identifies symptoms that help to identify the underlying causes of illness, and helps you track your progress over time. Rate each of the following symptoms based upon your health profile for the past 30 days. If you are taking after the first time, record your responses for the last 4 hours (ONLY).

**POINT SCALE**  
 0 = None or almost none have the symptoms  
 1 = Occasionally have it, effect is not severe  
 2 = Occasionally have effect is severe  
 3 = Frequently have it, effect is not severe  
 4 = Frequently have it, effect is severe

DIGESTIVE TRACT	HEAD	MOUTH/THROAT
1. Nausea or vomiting	1. Headaches	1. Chronic coughing
2. Diarrhea	2. Dizziness	2. Coughing (urgent need to clear throat)
3. Abdominal pain	3. Tinnitus	3. Coughing (chronic, less of voice)
4. Bloating or passing gas	4. Toothaches	4. Coughing (dry)
5. Heartburn		
6. Stomach/Intestinal pain		
Total 18 _____		Total 2 _____
EARS	HEART	NOSE
1. Itchy ears	1. Irregular or skipped heartbeats	1. Itchy nose
2. Ear pain	2. Rapid or pounding heartbeats	2. Nose problems
3. Ringing in ears	3. Chest pain	3. Runny nose
4. Hearing loss	4. Shortness of breath	4. Sneezing
5. Swelling of ears, hearing loss	5. Fainting or lightheadedness	5. Excessive mucus formation
Total 5 _____	Total 5 _____	Total 5 _____
EMOTIONS	JOINTS/MUSCLES	SKIN
1. Nervousness	1. Pain or aches in joints	1. Itchy skin
2. Anxiety, fear or nervousness	2. Stiffness or limitation of movement	2. Skin rashes, sores or dry skin
3. Depression	3. Pain or aches in muscles	3. Hives
4. Irritability or aggression	4. Swelling or redness of joints	4. Flushing or hot flashes
5. Depression	5. Pain or aches in muscles	5. Excessive sweating
Total 5 _____	Total 5 _____	Total 5 _____
ENERGY/ACTIVITY	LUNGS	WEIGHT
1. Fatigue, sluggishness	1. Chest congestion	1. Rapid weight loss/gain
2. Difficulty in making decisions	2. Coughing, wheezing	2. Rapid weight loss/gain
3. Difficulty in making decisions	3. Shortness of breath	3. Rapid weight loss/gain
4. Difficulty in making decisions	4. Coughing, wheezing	4. Rapid weight loss/gain
5. Difficulty in making decisions	5. Shortness of breath	5. Rapid weight loss/gain
Total 5 _____	Total 5 _____	Total 5 _____
OTHER	MIND	OTHER
1. Difficulty in making decisions	1. Poor memory	1. Increased thirst
2. Difficulty in making decisions	2. Confusion, poor comprehension	2. Increased or rapid urination
3. Difficulty in making decisions	3. Poor concentration	3. Constipation or diarrhea
4. Difficulty in making decisions	4. Difficulty in making decisions	4. Constipation or diarrhea
5. Difficulty in making decisions	5. Difficulty in making decisions	5. Constipation or diarrhea
Total 5 _____	Total 5 _____	Total 5 _____
<b>GRAND TOTAL</b> 91		

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## Medications and Drug Nutrient Interactions

- 50% of Americans take medication
- Meds can deplete/interact with certain nutrients
- Gradual depletions → health issues
- Factor this into assessment
- Birth Control:** Folate, B12, B6, zinc, Vitamin C
- Proton Pump Inhibitors:** B12, Vitamin C, Folate, Zinc & other minerals,
- Tylenol:** Glutathione


[www.mytavin.com](http://www.mytavin.com)

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## Blood Tests May Provide Insights

- Elevated ALT** - Alanine aminotransferase<sup>1</sup>
- Elevated AST** - Aspartate aminotransferase<sup>1</sup>
- Elevated GGT** - Gamma-glutamyl transferase<sup>2,3</sup>
- Vitamin D**<sup>4</sup>
- Mercury levels**
- Elevated CRP**
- May indicate inflammation and oxidative stress



1. Gordon, B. et al. Potential effects of polychlorinated biphenyls (PCBs).  
 2. Lee, H. et al. Serum gamma-glutamyltransferase: new insights about its role in liver disease.  
 3. Boring, C. et al. Gamma-glutamyltransferase: A Predictor.  
 4. Lerner, E. et al. Relationship Between Urinary Phthalate Metabolites and Endocrine & Cardiovascular

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## Blood Tests May Provide Insights

- **Elevated Homocysteine**
  - May indicate issues with methylation
- **Elevated Methylmalonic Acid**
  - Potential B12 deficiency
- **HbA1C, blood glucose, insulin,**
- **Cholesterol**
- **Thyroid labs**

More extensive tests should be ordered by the patient's physician



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## If Possible: Genetic Testing May Also Shed Light<sup>1,2,3,4</sup>

Single Genetic Polymorphisms, or SNPS:

- MTHFR Gene Variants
- GST Gene Variants
- CYP1A1 Gene Variants
- Not deterministic
- Look at symptoms, medical Hx, nutrition status, blood work etc.
- 23 & Me: <https://www.23andme.com/>
- Nutrigenomix: <https://www.nutrigenomix.com/>
- Genetic Genie: <https://geneticgenie.org/>

1. Al-Ashkar et al. Influence of CYP1A1, GST polymorphisms  
2. Chatterjee S, et al. Prevalence of CYP1A1 and GST  
polymorphisms  
3. Peterson S et al. CYP1A1, GSTM1, and GSTT1  
polymorphisms and diet effects  
4. Weinberg S, et al. A second genetic polymorphism in  
methylenetetrahydrofolate

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## GOAL #1: Reduce Overall Body Burden

- Occupational and home environment chemicals
- Lifestyle
- Diet
- It may be a combination

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Toxicant	Found in...	Potential health effects include...
Bisphenols	Plastic containers Linings of cans	Endocrine disruption Obesogenic issues Neurodevelopmental disruption
Phthalates	Clear plastic food wrap  Food Manufacturing equipment	Endocrine disruption Obesogenic issues  Oxidative Stress Cardiotoxicity
PFC's : Perfluoralkyl	Grease Proof Paper/Paperboard (Fast food Wrappers)	Immunosuppression Endocrine disruption Obesogenic issues
Perchlorate	Food packaging	Thyroid function Disruption
Food additives	Nitrites	Thyroid function Disruption Carcinogenicity

1. Tresselt, L. et al. Food Additives and Child Health.

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## Recommendations/Solutions

- Encourage stainless steel and glass bottles and containers
- Reduce canned foods, if able, or seek out those that are BPA-free
- Discourage microwaving plastic containers
  - Look at recycle codes on the bottom of containers
  - If 3 or 7, it may be made with BPA
- Encourage more home cooking and less fast food



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## Assess & Reduce Pesticide Exposure

**In Produce, Dairy, and Coffee:**

- Glyphosate<sup>1,2</sup>, Atrazine<sup>3</sup>
- Chlorpyrifos<sup>4,5</sup>
- Neurological/respiratory issues
- Potential negative effects on microbiome
- Conventional dairy<sup>6</sup>
- Conventional Coffee beans
- Environmental NOTE:** Sulfoxaflo (pesticide hurting bees)

**Recommendations and Solutions:**

- Encourage buying organic if possible<sup>6</sup> or pesticide free
- Wash/peel produce
- Purchase produce with thicker skins
- Choose low fat dairy

1. Gennari, A. et al. - Glyphosate's Suppression of Cytochrome P450  
2. IARC Monographs on the Evaluation of the Hazard of Atrazine  
3. U.S. Environmental Protection Agency for Research on Cancer  
4. Kim, H., Yoon, S., Kim, S., Kim, Y., et al. Residue-induced neurotoxicity  
5. National Pesticide Information Center: Chlorpyrifos Fact Sheet  
6. Galloway, N. The Pesticide in Your Coffee Beans  
7. Walsh, J. et al. Production-related contaminants (pesticides, antibiotics and hormones)

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## Assess and Reduce Exposure to Food Aggravators

Possible aggravating foods or food sensitivities:

- Dairy, corn, wheat, soy, eggs, tree nuts, shellfish
- Especially if excessive
- Intake of these foods can cause inflammation of the digestive tract



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## Assess and Reduce Intake of:

### High Fat Meat & Dairy<sup>1</sup>

- Higher levels of persistent organic pollutants

### High Mercury fish<sup>2</sup>

- LIMIT: Chilean sea bass, chinook salmon, halibut, mahi mahi, tuna, albacore
- AVOID: swordfish, mackerel, bluefin tuna steak
- CONSUME: ♥ anchovies, black sea bass, catfish, oysters, trout, sardines, scallops

### PCBS, Dioxins in Seafood<sup>3</sup>

- Processed or Cured Meats:
  - Carcinogenic
  - Increases oxidative stress

### Meats Cooked at High Heat<sup>4</sup>

- Advanced Glycation End Products, or AGEs
- Polycyclic Aromatic Hydrocarbons, or PAHs
- Heterocyclic Amines, or HAs
  - Carcinogens
  - Charbroiled beef

Remember the cumulative effect here; it's **not about** creating a culture of fear



1. Gao et al. Persistent Organic Pollutants in Food
2. Washington State Dept. of Health. Healthy Fish Guide Website
3. The Toxic, Persistent Organic Pollutants
4. Gribble, S. et al. Advanced glycation end products in food

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## Decrease or Eliminate Over the Short Term

- Excess refined sugar/HFCS and poor-quality fats which can tax liver<sup>1,2</sup>
- Processed/chemicalized/packaged foods<sup>3,4</sup>
- Polysorbate, BHT, BHA
- Artificial sweeteners (in excess)<sup>5</sup>
  - Potential negative impact on microbiome
- Recreational drugs and alcohol
- Excessive caffeine
- Use of Non-stick Cookware<sup>6</sup>
- **It's likely not just one thing!**

1. Jensen T, et al. Fructose and sugar
2. Gribble S, et al. Role of Dietary Protein
3. Bessler TG, et al. Effects of food processing on the health of chemicals
4. Jain A, et al. Evaluating hazards posed by additives in food
5. Bhanu-Gupta, C. Effects of Sweeteners on the Gut Microbiome
6. Saito, H. et al. PTFE-coated non-stick cookware and toxicity concerns


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## GOAL #2: Improve the Body's Ability to Fight Oxidative Stress

### Supportive Dietary Interventions



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## Increase Supportive Nutrients: Whole, Unprocessed, Plant-based Foods

**Focus on Fiber (30-40grams/day) for elimination support**

- Most Americans get 17g/day<sup>1</sup>
- Feed gut microbes – role in detoxification<sup>2</sup>
- Beans and whole grains

**Bright colored fruits, vegetables, herbs for phytonutrients to help support effects of oxidative stress<sup>3,4</sup>**

- **Anthocyanidins:** berries and grapes<sup>5</sup>, beets,
- **Glutathione-containing:** avocado, asparagus, cucumber, artichoke<sup>4</sup>
- **Apiaceous Veggies:** celery, carrots, parsley, parsnips<sup>6</sup>
- **Carotenoids:** carrots, sweet potatoes

1. Position of the Academy of Nutrition and Dietetics: Health Implications of Dietary Fiber  
2. Springer, R. et al. Advanced nutrition and human metabolism  
3. Holgate, K. Regulation of metabolic detoxification pathways  
4. Holgate, K. et al. A Review of Dietary Phytochemicals  
5. Cho, K. et al. Dietary intake and supplementation  
6. Holgate, K. et al. CYP1A2, GSTA1, and GSTP1 polymorphisms and diet effects

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## Supportive Dietary Interventions

- **Plant-based protein for amino acids like cysteine:**
  - Beans, lentils
  - Fiber, minerals
  - Phytochemicals
- **Omega 3-rich foods to reduce inflammation:**<sup>1</sup>
  - Flax/hemp chia seeds, walnuts, fish
  - Minimize farm raised salmon
- **B vitamin-rich foods to support phase 1 & 2 and methylation processes**
  - Whole grains
  - Beans
  - Leafy/green veg for folate
  - Eggs for B12
- **Increase fluid:**<sup>2</sup>
  - Filtered if possible
  - Green Tea
  - **Hibiscus Tea:** Vitamin C and potential diuretic<sup>3</sup>



1. Holgate, K. et al. A Review of Dietary Phytochemicals for Oxidative Stress  
2. U.S. Department of Health and Human Services, National Institutes of Health, The Toxicology Branch  
3. Holgate, K. et al. A phytochemical and nutraceutical review

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## Increase Supportive Nutrients: Whole, Unprocessed, Plant-based Foods

**Experiment with foods with diuretic properties:**

- Celery
- Burdock
- Dandelion
- Cucumber
- Parsley

**Vitamin C and selenium-rich foods supports glutathione:**

- Citrus, broccoli, peppers, strawberries
- Brazil nuts, seafood
- Mediterranean diet is associated with higher levels of glutathione in humans<sup>1</sup>

1. Hecht, G. et al. A Review of Dietary (Phyto)nutrients for Glutathione Support.

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## Increase Cruciferous Vegetables: Support Liver Function

**\*Especially for individuals with GST SNPs<sup>1,2,3</sup>**

**"Glucosinolates:"**

- Compounds found in brassicas that may upregulate GST enzymes
- → Isothiocyanate: "Sulfurophane"

- Arugula
- Brussel sprouts
- Bok choy
- **Broccoli sprouts<sup>4,5,6</sup>**
- Broccoli rabe
- Cabbage
- Cauliflower
- Collard greens
- Daikon radish
- Kale
- Mustard greens
- Radish
- Turnips
- Watercress
- Horseradish, wasabi

1. Hodges, RE, et al. Modulation of metabolic detoxification pathways using foods.  
2. Imai, N, et al. Modulation of xenobiotic-metabolizing cytochromes (P450).  
3. Imai, N, et al. Modulation of xenobiotic-metabolizing cytochromes (P450).  
4. Gao, H, et al. Effect of different cooking methods on health-promoting compounds of broccoli.  
5. Imai, N, et al. Effect of different cooking methods on health-promoting compounds of broccoli.  
6. Hodges, RE, et al. Modulation of metabolic detoxification pathways using foods.

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## Remember Nrf2?

**The Isothiocyanate: Sulfurophane**

- Induce and upregulate Nrf2: activates cell's endogenous defenses<sup>1</sup>

**Myrosinase needed**

- Produced when chopped or chewed
- Provided by intestinal flora
- Destroyed by high heat cooking
- Eat raw or Steamed (2)

**Zinc plays a role in upregulating Nrf2 activity and reducing oxidative stress:**

- Nuts and seeds
- Soybeans
- Chicken
- Ensure sufficient stomach acid

1. Hristova, P. Transcription Factor Nrf2.  
2. Hristova, P. et al. Modulation of xenobiotic-metabolizing cytochromes (P450).

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### Organosulfur Compounds: "Thiols" in Alliums Can Support Liver Function<sup>1-5</sup>

#### Dose:

- 2 to 5 g of fresh garlic (approximately one clove)
- 0.4 to 1.2 g of dried garlic powder
- 2 to 5 mg of garlic oil
- 300 to 1,000 mg of garlic extract

Add to stir fries, salads, eggs, soups, vegetables

- Onions
- Scallions
- Chives
- Leeks
- Shallots
- Garlic



1. Bianchini, F et al. Allium vegetables and organosulfur compounds.  
2. Ponzio, A et al. Garlic and cancer.  
3. Chatterjee, D et al. The health and vegetable intake.  
4. Chatterjee, D et al. Garlic, cancer and liver disease.  
5. Garlic, National Center for Complementary and Integrative Health.

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### Detoxification and Antioxidant Defenses: Other Possible Support

#### Sea Vegetables<sup>1</sup>

- Mineral content

#### Spirulina<sup>2,3</sup> - small studies:

- 6g/day (1 tbsp) improved NAFLD
- Reduced arsenic levels
- Supports superoxide dismutase

#### Turmeric<sup>4</sup> Green Tea<sup>5</sup> Cilantro<sup>5,6</sup>



1. Kim, H et al. Hepatoprotective effects of sulfated polysaccharides from sea vegetables.  
2. Hasegawa, H et al. The hepatoprotective and hepatocarcinogenic effects of Spirulina.  
3. Kawanishi, S et al. Effects of Spirulina on liver function.  
4. Hasegawa, H et al. A review of dietary phytochemicals for liver disease.  
5. Hasegawa, H et al. Green tea and liver disease.  
6. Hasegawa, H et al. Cilantro (Coriandrum sativum): A promising functional food.

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## Digestive and Microbiome Support

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## Optimize and Support Digestive Function

- Slow down and chew
- Digestive-supportive foods – i.e. herbs and spices – like carminatives and bitters<sup>1,2,3</sup>:
  - Ginger
  - Mint
  - Fennel
  - Anise
- Pepper
- Dandelion
- Artichoke
- Ensure sufficient stomach acid



1. Fu, H. et al. Effect of ginger on gastric motility.  
2. May, A. et al. Phytochemistry and gastrointestinal benefits of the medicinal spice.  
3. Nelson, V. et al. Functional study with digestion-enhancing properties.

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## Microbiome Support

- **Fiber nourishes good bacteria**
  - Role in toxicity of environmental toxicants and drugs<sup>1,3</sup>
  - Microflora prevents pathogenic bacteria from invading the GI tract<sup>2</sup>
  - **Short Chain Fatty Acids:** improve blood flow and delivery of nutrients to colon<sup>4</sup>
- **Prebiotic fibers<sup>2</sup>**
  - **Speed** transit time
  - Leeks, asparagus, Jerusalem artichokes, garlic, onions, oats, soybean
- **Probiotics**
  - Support immune function
  - *L. acidophilus* may **inhibit production** of carcinogenic compounds<sup>4</sup>
  - Miso, yogurts, **fermented foods**



1. Chen, D. et al. The gut microbiota: a major player in the health.  
2. Davis, J. et al. Fiber and prebiotics: mechanisms and health benefits.  
3. Nelson, V. et al. - Interplay Between the Host, the Human  
4. Gopfer, S. - Advanced nutrition and human metabolism

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## Supplementation

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## Supportive Supplementation

- **Co-enzyme Q 10** 100mgs<sup>1</sup>
- **Vitamin D** :1000-4000 IU's (check levels)
- **B complex** with methylated forms
- **Alpha-Lipoic Acid**: 100-300mgs/day<sup>2</sup>
- **N-Acetyl Cysteine** (600mgs/day)<sup>3</sup>
- **Milk Thistle** (200-600mgs/day)<sup>4</sup>
- **Sulforaphane supplements**<sup>5,6</sup>
- **Quality** is a consideration
- **Combined formulations:** synergistic effect may be the key
  - Green tea extract
  - Calcium D glucarate<sup>7</sup>
  - B Vitamins<sup>10</sup>
  - Milk Thistle
  - Amino acids
    - Glycine
    - Glutamine
- Preliminary research and small cohorts showing effectiveness<sup>2, 8, 9</sup>
- More research needed
- Take away from Meds

1. Spauld CB, Burrows of Coenzyme Q10
2. Hargreaves M, et al. A Review of Evidence (Phytochemicals) for Gastrointestinal Support
3. Spauld CB, et al. Effects of N-Acetylcysteine, and
4. Achuthan, Milk Thistle
5. Hargreaves M, et al. Effects of N-Acetylcysteine, and
6. Hargreaves M, et al. Effects of N-Acetylcysteine, and
7. "Calcium D-Glucarate - A Monograph". Alternative Medicine Review
8. Hargreaves M, et al. Effects of N-Acetylcysteine, and
9. Hargreaves M, et al. Effects of N-Acetylcysteine, and
10. Hargreaves M, et al. Effects of N-Acetylcysteine, and

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## Support Bio-Transformation: Personalization is Key

- **BREAKFAST**
  - **Scrambled eggs** or omelets with broccoli, garlic/onions, peppers over rice/grain with sesame oil, herbs and spices
  - **Smoothie:** greens, berries, flax, tofu, spirulina
- **SNACKS**
  - Hummus and cruciferous veggies
  - Nut butter and apple
  - Avocado on WG crackers
- **BEVERAGES**
  - Green or herbal or dandelion tea
- **LUNCH AND DINNER**
  - **Arugula salad** with edamame, variety of vegetables, scallions, tomatoes, seeds/nuts, olives
  - **Curried Lentil Soup** with carrots, celery, sweet potatoes, cauliflower
  - **Sprouted Corn Tortillas** with beans, cilantro, salsa, cabbage
  - Add herbs and spices to taste
- **DESSERTS**
  - Berries, dried fruit and nuts, coconut

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## Lifestyle Approaches and Support

**Encourage** exercise or physical activity that clients enjoy:

- Yoga, running, dance
- Supports digestion, relieves stress, stimulates lymphatic system

**SWEATING:** may support removal of heavy metals.<sup>1</sup>

- Ensure Adequate Sleep
- Minimize Stress

- Dry brushing body<sup>2</sup>
- Body work: massage, etc.



1. Sears MR, et al. "Acids, calcium, lead, and mercury in food"
2. Stanley J. "The Truth About Dry Brushing"

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## Cautions and Considerations

- **Discuss** Medications and DNIs and **avoid** highly medically complex or ill patients
- **Screen** for eating disorders
- **Mindfulness** around pregnancy with additional supplemental support
- Be mindful of **definitive statements** and promises which can backfire
  - "May support"
  - "Preliminary research indicates/suggests"
  - "Has the **potential** to improve"



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## Limitations

- **Dietary changes** can often mean health improves anyway
- **Patient** finances, access, culture and motivation, and ability
- Genetic and individual variation: what works for one **may not** for another
- Dosage can **be difficult** to determine
- More research is needed! **Leverage the evidence** available as well as our clinical experience



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## Bottom Line

- **Reducing** toxicant exposure can only be beneficial
- **Supporting organs** of detoxification/biotransformation supports overall health
- **Engaging** in a "detoxification" supportive protocol may also help patients identify lifestyle and dietary patterns that are either detrimental or beneficial
- **Dietitians** have the opportunity to be leaders here:
  - For **human** health
  - For **planetary** health
  - Influence **at the root causes** of the issue of our food/agricultural system



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## Summary Recommendations

- **Identify**/reduce exposure to identified environmental toxicants
  - Occupational/personal care/household products
  - Food packaging, storage, cookware
- Minimize **excessive** alcohol, caffeine, sugar, poor quality fats, additives, processed foods
- Minimize high **mercury** fish/processed or charbroiled meats, microwaving plastic
- Look at the **whole picture**
- Ensure high **fiber** intake and sufficient **protein**
- Ensure high intake of **cruciferous** and **allium** and other colorful vegetables
- Ensure adequate **water** intake
- Consider **realistic** supportive supplementation
- **Encourage** exercise, self care
- **Personalize** recommendations to meet needs of individual



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## Additional Resources

- National Resources Defense Council: <https://www.nrdc.org/>
- NIH Tox Town: <https://toxtown.nlm.nih.gov>
- NIEHS: National Institute of Environmental Health Sciences: <https://www.niehs.nih.gov/>
- Dietitians in Integrative and Functional Medicine: [www.integratived.org](http://www.integratived.org)
- Institute for Functional Medicine: [www.ifm.org](http://www.ifm.org)
- Organic Consumers: <https://www.organicconsumers.org>
- Environmental Health, An Integrative Approach (2018-2020): [https://integrativemedicine.arizona.edu/education/online\\_courses/enviro-med.html](https://integrativemedicine.arizona.edu/education/online_courses/enviro-med.html)

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## Questions?

Mary Purdy, MS, RDN

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