Detoxification

- The liver is a vital organ responsible for: detoxification, amino acid and protein synthesis, production of biochemicals needed for digestion, cholesterol synthesis, production of triglycerides, hormone production, bile production, and the decomposition of red blood cells. Plays a role in carbohydrate metabolism (gluconeogenesis, glycolysis, etc) and glycogen storage
- Detoxification is the process where the body eliminates or neutralizes toxic substances.
    - Most detoxification takes place in the liver, but the skin, lungs, kidneys, and intestines also have a role
    - Liver filters the blood to remove large toxins, synthesizes and secretes bile full of cholesterol and other toxins, and enzymatically disassembles unwanted chemicals
- Toxic substances are chemicals that can cause harm in the body. The most common toxins are: pesticides, industrial chemicals and combustion pollutants (like PCBs), toxic metals, food additives, preservatives and drugs, and endocrine disrupters (many estrogenically-active compounds)
    - Toxins come from various sources, such as the air, food, drugs, smoking, metabolic by-products
    - Lifestyle factors play a role in accumulation of toxins
    - Toxins can act in an additive manner
    - Many of these substances are fat soluble, so they can remain in the body tissues for years
        - Water-soluble compounds are excreted through the urine. Fat soluble ones are stored in the fat cells
        - To remove toxins, the body must convert them into water soluble molecules through the detoxification system (biotransformation system)
- If there are problems with detoxification, more free radicals are produced and there is oxidative stress on the body
    - This causes health problems, which may be treated with pharmaceutical drugs, which further overloads the liver
- Detoxification has two phases: Phase I Bioactivation and Phase II Conjugation
    - Phase I prepares the toxins to undergo phase II reactions
        - It provides an active site for the attachment of the water-soluble group
        - Side effect of phase I is the production of free radicals
        - Glutathione is the most important antioxidant for neutralizing free radicals

        - Magnesium is necessary for glutathione
    - Phase II conjugates a water soluble group to the toxin so it is non-toxic and can be excreted
        - Neutralizes the toxin
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- Required nutrients, enzymes, and cofactors for Phase I
    - B vitamins
    - Glutathione
    - BCAAs
    - Flavonoids
    - Phospholipids
    - Antioxidants like NAC, SAMe, milk thistle, vitamin C, Vitamin E
    - Carotenoids
- Required nutrients for Phase II
    - Amino Acids (glutamine, glycine, taurine, cysteine)
    - Sulphur/Sulphurated phytochemicals (found in cruciferous vegetables and garlic)
    - Selenium
    - N-acetylcysteine (NAC), cysteine, methionine needed for glutathione conjugation

- Antioxidant/Protective Nutrients that impact detoxification
    - Carotene (vitamin A)
    - Vitamin C
    - Vitamin E
    - Selenium
    - Copper
    - Zinc
    - Manganese
    - Coenzyme Q10
    - Thiols
    - Bioflavonoids
    - Pycnogenol
    - Milk thistle (silymarin)
    - Artichoke extract
    - Ellagic acid in pomegranate and many berries
    - Catechins from green tea and grapes
    - Glucosinolates found in crucifers, such as watercress and broccoli
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- GI tract and gut permeability also plays a role in detoxification

- Impacts drug absorption by altering gastric emptying intestinal transit time
- Increased gut permeability permits better absorption of toxins to be processed and removed by the liver
- Fiber supports detoxification
  - Binds to carcinogens and other toxic agents
  - Increases transit time so less reabsorption of toxins

- Detox Diets
  - Elimination diet leading to strict diet of vegetables and fruit and water to rest the gut and intestines
  - Make sure to choose one that allows for adequate protein and nutrients
  - Ensure essential nutrients are being given through supplementation
  - Helps give mental jump to eating better and losing weight
  - Helps improve liver function

80/20 Rule: No one is perfect. Set your goal to eat properly 80% of the time.