



Toxic Substances

Exotoxins

- Environmental toxicants
- Mycotoxins
- Heavy metals
- Drugs (prescription, OTC, recreational)

Endotoxins

- End products of metabolism
- Bacterial endotoxins

LIVER DETOXIFICATION PHASES

NONPOLAR (LIPID-SOLUBLE)

MORE POLAR (LESS LIPID-SOLUBLE)

POLAR (WATER-SOLUBLE)

Lipid-soluble (non-polar) toxic substances can be stored in adipose tissue and contribute to an increased/mobilized toxin load.

PHASE 1

Bio-Transformation

Reactions

- Oxidation
- Reductions
- Hydrolysis
- Hydration
- Dehalogenation

Supportive Nutrients

- B Vitamins
- Vitamins C+E
- Zinc, Selenium, Magnesium
- Glutathione, NAC, ALA
- Bioflavonoids+ Polyphenols

Intermediate Metabolites

PHASE 2

Conjugation

Reactions

- Sulfation
- Glucuronidation
- Glutathione conjugation
- Amino Acid conjugation
- Acetylation
- Methylation

Supportive Nutrients

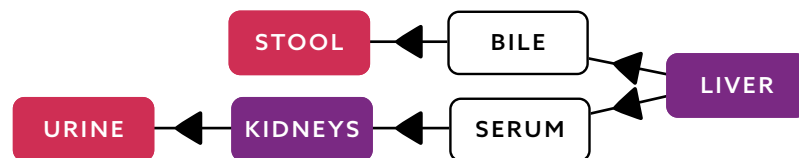
- B Vitamins
- Vitamins C+E
- Zinc, Selenium, Magnesium
- Glutathione, NAC, ALA, CDG
- Bioflavonoids, Polyphenols, Amino Acids

Superoxide

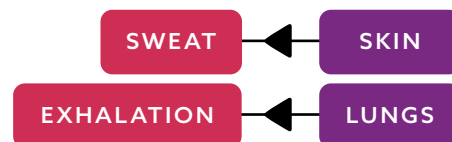
Free Radicals

Reactive Oxygen Intermediates

PRIMARY METHODS OF ELIMINATION



OTHER METHODS OF ELIMINATION



PHASE 3

Elimination

No specific reactions take place in Phase 3 detoxification but refers to the transport of conjugated metabolites out of the liver via efflux transporters activated by Nrf2 into bile or blood for excretion.

Supportive Nutrients

- Vitamins C+E
- Zinc, Selenium, Magnesium
- Glutathione, ALA, CDG
- Bioflavonoids
- Polyphenols
- Gutamine