The Collaborative on Health and the Environment:
Environmental Influences on the Thyroid Gland

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Functional Medicine: Root Imbalances & Systems Biology
HPT Axis

Hypothalamus

TRH

Anterior pituitary

TSH

Thyroid

T₄, T₃

Increases metabolism
Thyroid symptoms occur when excess cortisol blocks production of TSH or prevents conversion of T4 to T3. These symptoms may include: fatigue, cold intolerance, weight gain, memory problems, poor concentration, depression, hair loss, dry skin, infertility.

When cells get the T3 hormone they need, the body is healthy and works as it should.
Genetic Factors
   HLA-DR
   HLA-DQ2, DQ8
   Immune regulatory genes
   Thyroid specific genes

Environmental Factors
   Iodine
   Selenium
   Drugs
   Infections
   Stress
   Toxins
   Gluten (Dairy)

Endogenous Factors
   Vitamin Deficiencies
   Hormonal Shifts (Pregnancy, Menopause)
   Blood Sugar Fluctuations/Leptin Levels
   Female Gender
   Aging
   Emotional Stress (Esp. Chronic)
   Gut Flora/Dysbiosis
   Intestinal Hyperpermeability
Thyroid Support
Reduction of Autoimmune Triggers

• **Environmental Toxins**
  – Reduction of exposures when feasible
  – Detoxification measures

• **Food Triggers: Gluten**

• **Heal the Gut Lining (Intestinal Hyperpermeability)**

• **Hormonal Fluctuations**
  – Balance hormones
  – Support nutritionally

• **Microbial Infections --> Antimicrobials**
  – Viruses: EBV, Coxsakie, Influenza B, Rubeola, Rubella
  – Bacteria: Yersinia
Liver Detoxification Pathways & Supportive Nutrients

Endotoxins
* End products of metabolism
* Bacterial endotoxins

Exotoxins
* Drugs, (prescription, OTCs, recreational, etc)
* Chemicals
- Agricultural
- Food additives
- Household
- Pollutants/contaminants
* Microbial

**PHASE I**
[cytochrome P450 enzymes]

Toxins
(non-polar: lipid-soluble)

Reactions
- Oxidation
- Reduction
- Hydrolysis
- Hydration
- Dehalogenation

Enzymes, Cofactors & Other Nutrients Used
- Riboflavin (vit. B2)
- Niacin (vit. B3)
- Pyridoxine (vit. B6)
- Folic acid
- Vitamin B12
- Glutathione
- Branched-chain amino acids
- Flavonoids
- Phospholipids

**PHASE II**
[conjugation pathways]

Intermediary metabolites

Enzymes
- Sulphation
- Glucuronidation
- Glutathione conjugation
- Acetylation
- Amino acid conjugation
- Glycine
- Taurine
- Glutamine
- Ornithine
- Arginine
- Methylation

Antioxidant/Protective Nutrients/Plant Derivatives
- Carotenes (vit. A)
- Ascorbic acid (vit. C)
- Tocopherol (vit. E)
- Selenium
- Copper
- Zinc
- Manganese
- Coenzyme Q10
- Thiols (found in garlic, onions & cruciferous vegetables)
- Bioflavonoids
- Silymarin
- Pycnogenol

**more polar: more water-soluble**

Reactive Oxygen Intermediates

Superoxide

Free Radicals

Secondary Tissue Damage

Excretory derivatives

Serum → Kidneys → Bile → Urine → Faeces/stool

l lipid-soluble (nonpolar) toxins stored in adipose (fat) tissue contribute to increased/mobilised toxin load with weight loss

* N-acetyl-cysteine, cysteine, methionine are precursors
Immune System Support

- Vitamin D3
- Gut Flora Support
  - Probiotics
  - Fermented Foods
  - Fiber
- Acupuncture
- Mind-Body Practices
Reduction of Inflammation