Filming Session 3

Topics
Functional Biochemistry

Toxicity Chemicals
Toxic metals
Radiation

Basic nutrition
Most popular nutrients
Brief explanation of the Starter kit

Principles of
Functional Biochemistry

Enzymes are protein catalysts that regulate the rates at which physiological processes take place. They are encoded by specific genes which in turn are stimulated by hormones.

There are 3870 enzymes catalogued in the ENZYME DATABASE.

There are two types

1) those that require a coenzyme such as the oxido-reductases. 22% of known enzymes require coenzymes to function.

2) those that do not require a coenzyme such as the digestive enzymes.

Four parts

1.The apoenzyme is the protein part of an enzyme.

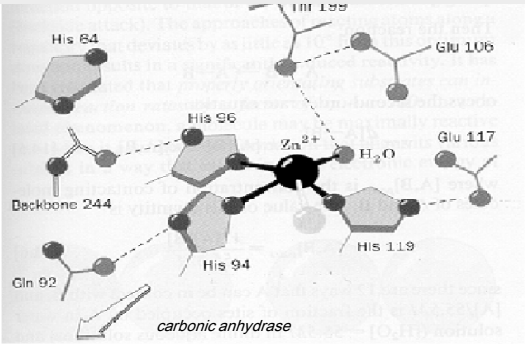
2.The coenzyme is required for the activation of an enzyme.

3.Metal ion catalysts

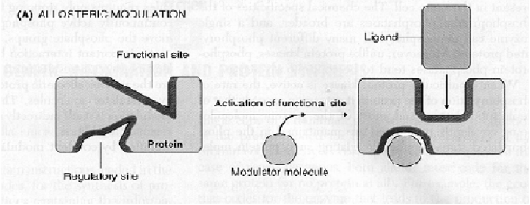
a) Metalloenzymes contain tightly bound metal ions most commonly transition metal ions such as Fe2+, Fe3+, Cu2+, Zn2+,Mn2+ or Co3+.

b) Metal activated enzymes loosely bind metal ions from solution, usually alkaline earth metal ions Na+, K+, Mg2+ or Ca2+

$CO_2 + H_2O = H_2CO_3 = H^+ + HCO_3$

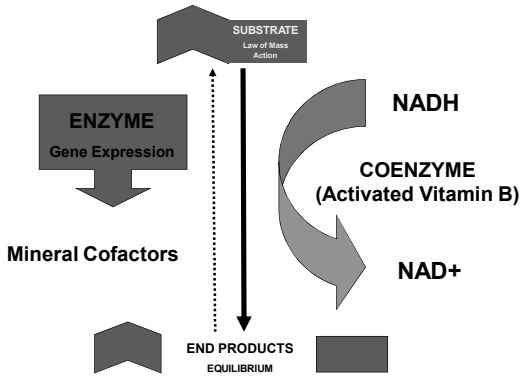


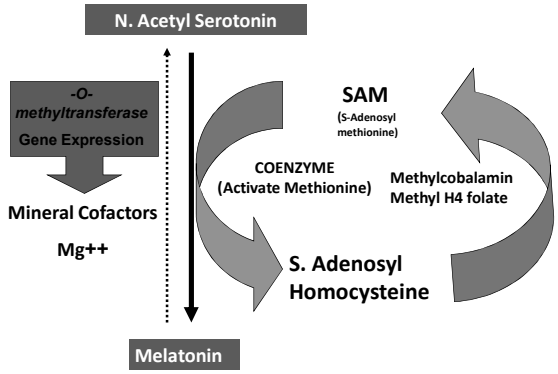
4. Low molecular weight allosteric effectors modulate the catalytic activity of certain regulatory enzymes.



Factors affecting enzyme function

1. **Temperature**
2. **Enzyme concentrations**
3. **Substrate concentration**
4. **pH**
5. **Inhibitors can poison enzymes e.g. certain chemicals e.g. toiletries, cosmetics, toxic metals and mycotoxins.**



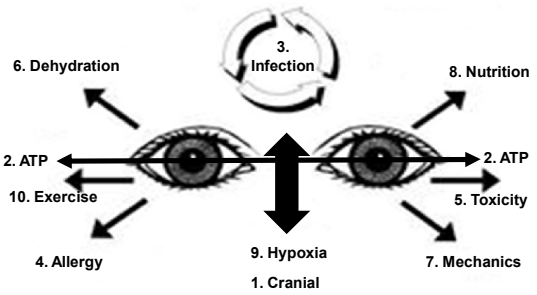


CHALLENGES FOR ENZYME PATHWAY INHIBITION

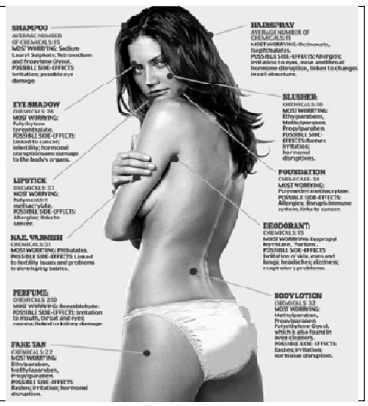
1. A WEAK ASSOCIATED MUSCLE WILL STRENGTHEN TO THE REQUIRED END PRODUCT.
2. A STRONG INDICATOR MUSCLE WILL WEAKEN WHEN CHALLENGED TO THE SUBSTRATE.
3. THIS WEAKNESS WILL BE NEGATED BY THE MINERAL COFACTORS AND / OR THE COENZYME (USUALLY AN ACTIVATED VITAMIN B)

Toxicity

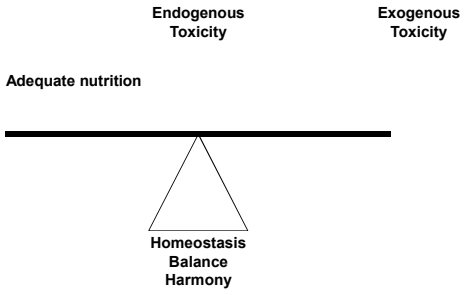
Eyes into Distortion (EID)

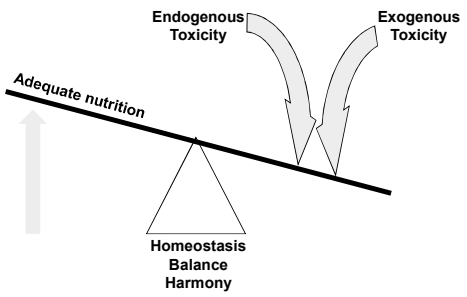


Toxicity



Toxicity at the root of many disorders





Toxicity
1. Internal Chemicals e.g. neurotransmitters, hormones generated by the mind
External Chemicals - xenobiotics

2. Toxic metals

3. Radiation e.g. radioactive
. isotopes, electromagnetic stress

Endogenogous toxins are generated from the mind are mediated by the hypothalamus hormones –
Thyrotrophic releasing hormone
Corticotrophic releasing hormone
Gonadotrophic releasing hormones
Growth hormone releasing hormone
Somatostatin
Prolactin inhibiting hormone
300 Neuropeptides

External toxins (Xenobiotics) come from

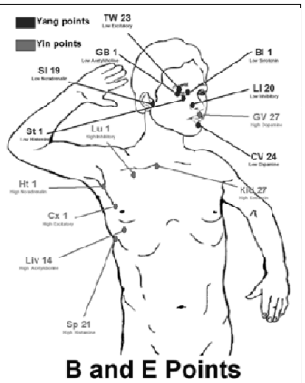
What we eat
What we drink
What we breath
What we put on our skin
Electromagnetic pollution
Harmful solar wavelengths

Identifying the priority meridian imbalance

Identifying the Definitive Meridian
1. Therapy localise the SCN point (should remain strong)
2. Cross Therapy localise to each meridian B&E point
3. Only one will weaken. This is the *definitive* meridian
4. You can confirm with the respective neurotransmitter vial)
5. Identify weak associated muscle

Yang points begin or end on the face.

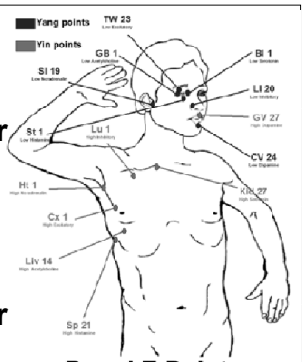
Yin points begin or end on the trunk.



B and E Points

Yang points indicate neurotransmitter deficiencies.

Yin points indicate neurotransmitter excesses



B and E Points

Detoxification

Detoxification is a generic term for the metabolism (catabolism) of both endogenous and exogenous chemicals.

The main endogenous chemicals to be metabolised are

- **Neurotransmitters**
- **Hormones**
- **Eicosonoids**
- **Certain Fatty acids**
- **Retinoids**

The main exogenous chemicals (xenobiotics) to be metabolised are either

- **Water soluble**
- **Lipid soluble**

Lipid soluble chemicals are generally metabolised by

1. **Hydroxylation to make them more water soluble**

OH

Lipid soluble chemicals are generally metabolised by

1. **Hydroxylation to make them more water soluble**
2. **Conjugation to aid their elimination through the kidneys or biliary system.**

Many hormones are methylated after hydroxylation before they are conjugated.

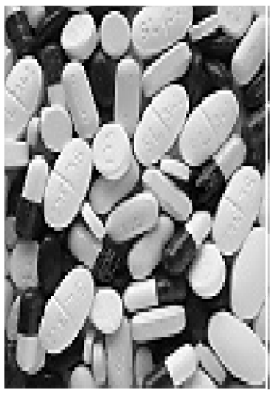
CH_3

Probably 90% of detoxification involves the metabolism of the endogenously produced chemicals.

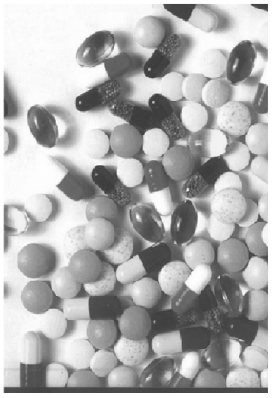
Like
Neurotransmitters
and Hormones

However to fully understand endogenous detoxification its easier to start by learning about exogenous detoxification.

Those of medical relevance are



1. Drugs
2. Chemical carcinogens
3. Pesticides and other various compounds.



More than 75,000 synthetic chemicals now exist.

Most will require detoxification, with the liver being the main organ involved.

Occasionally a xenobiotic maybe excreted unchanged.

It is convenient to consider the metabolism of xenobiotics in two phases.

1. Phase 1 hydroxylation catalyzed by the mono-oxygenases cytochrome P450's.

2. Phase 2 Methylation or Conjugation.

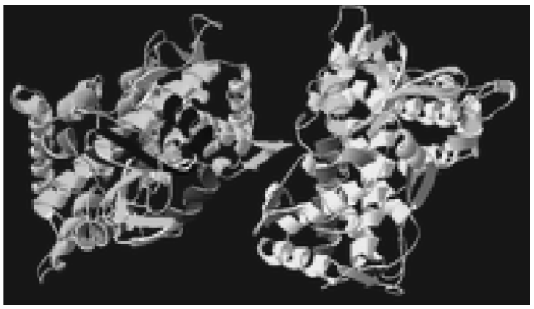
The overall purpose of the two phases is to increase their water solubility (polarity) and thus facilitate their excretion from the body.

Very hydrophobic xenobiotics would persist in adipose tissue indefinitely if they were not converted to more polar forms.

In certain cases, Phase 1 metabolic reactions convert xenobiotics from inactive to biologically active compounds.

In some instances the original xenobiotics are pro-carcinogens which then become converted to carcinogens by the phase 1 hydroxylation.

Phase 1 Hydroxylation



There are 14 families of the Cytochrome P450 enzyme encoding for between 35-60 distinct P450 enzymes.

They all use the abbreviated root symbol CYP.

This is followed by a number designating the family having similar sequence identity.

This is followed by a capital letter indicating the subfamily.

Lastly this is followed by another number indicating the individual P450's in the family.

Examples:-

CYP1A1 metabolises PAH's
2-estrogens
CYPIA2 metabolises 16-estrogens
CYPIB1 metabolises 4-estrogens
and synthetic estrogens
CYP2A6 metabolises nicotine
CYP2B4 metabolises phenobarbital

CYP2C9 metabolises warfarin

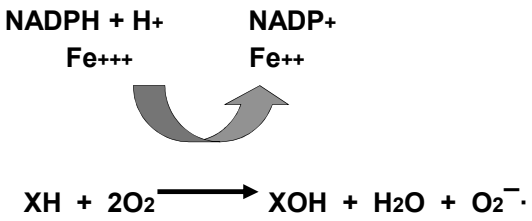
CYP2C19 and CYP2D6 most antidepressants and antipsychotics

CYP2E1 metabolises ethanol, solvents and components in tobacco smoke.

CYP3A4 50% pharmaceutical drugs. Induced by St John's Wort. Inhibited by grapefruit.

PHASE 1 (HYDROXYLATION)

(Cytochrome P450)



Cytochrome P450 enzymes are

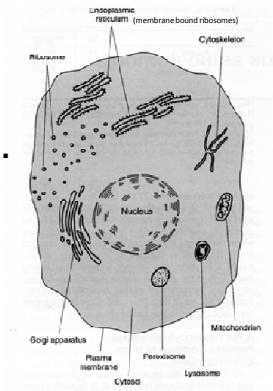
1. **Hemoproteins (like hemoglobin).**
2. **Widely distributed across species especially in bacteria.**
3. **Present in the endoplasmic reticulum of all cells but greatest in the liver, small intestine, lung and glial cells.**

Endoplasmic reticulum.

Major site of protein synthesis.

Synthesis of various lipids.

Oxidation of many xenobiotics.

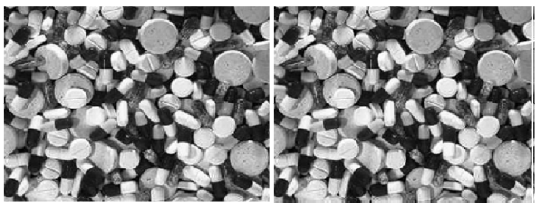


Cytochrome P450 enzymes

4. **Require NADPH not NADH in their activation.**
5. **Require adequate levels of phosphatidyl choline rich in the membranes of the endoplasmic reticulum for optimal function.**

Cytochrome P450 enzymes

6. **Are inducible and is therefore the mechanism of drug interaction.**



Cytochrome P450 enzymes

6. Are inducible and is therefore the mechanism of drug interaction.
7. Can have polymorphisms (individual genetic isoforms) which can exhibit low catalytic activity.

50% of all drugs prescribed to humans are metabolised by the various P450 enzymes.

However many P450 enzymes are inhibited by various drugs or their metabolic products, producing another cause of drug interaction.

Inability to Phase 1 detoxify

1. Leads to either the absorption and displacement in phospholipid cell membranes,
2. Inactivation of specific enzymes
3. The toxin binding with serum albumin, which is antigenic leading to the production of antibodies against it.

P450 INDUCTION NUTRIENTS

Phosphatidylcholine, NADPH, (thus Mg), Fe, FMN, FAD, Thiolate (α-lipoic for Sulfur),

Broccoli (IA2), Brussel sprouts (1A2), St John's Wort (3A4,5,7), Licorice, Black Walnut

High protein, Low carbohydrate, Ethanol (2E1),

Zn, Cu, Cr, Ca, Mol, Se, Vit E, Vit C, Bioflavonoids, Beta Carotene, NAC,

(NUTRIENT PHASE 1 & 2 contains all the above nutrients)

SUPPLEMENT ACCORDINGLY

Body Types and Toxicity

Phase 1	Biomarkers	Phase 2	Biomarkers	Key nutrients
CYP 1A1	Estradiol Estrone Ethoxyresorufin, PAH, Benzpyrene	Glutathione *(Reduced* *Glutathione)*	Naphthalene Arginine MSG	Cysteine, NAC, Glycine, Glutamic acid, PEP, Vit C, Pantethine, EFAs, Bioamines
CYP 1A2 10%	Caffeine Estradiol Estrone Methoxyresorufin	Glucuronid-ation (C-DP- Glucuronic acid	Benzoic acid Bilirubin Phenobarbital	Glucuronic acid NAD Mg, Fish oil
CYP 1B1	Estradiol Estrone Ethoxyresorufin PAH	Sulfation *(PAPs* *Methionine* *SAM* *Taurine* *Glucsulphate* *MSM* *Sulfur* *α-Lipoic)*	Acetaminophen (Paracetamol) Aniline DDT /DDE Ethylene glycol Toluene TOC	PAPs Methionine, SAM Cysteine,PNP Glutathione, Taurine Mol Mg Vit B2, Mn Glucosamine sulfate, MSM, Sulfur, α-Lipoic acid
CYP 2B4	BHT Phenobarbital	Sulfoxidation *(MeDSe reductase)*	Sulfoxide metabolite	Cysteine Mol, Mg, B2, Mn
CYP 2C9 10%	Ibuprofen Warfarin	Acetylation *(Acetyl Co-A)*	Isoniazide Neo-quinol Petroleum SLS	Acetyl CoA factor Pantothen Vit B5 P-5-P Cysteine Mg Vit C
* CYP 2C19	Phenobarbitol Diazepam	Methylation (SAM)	Caffeine Phenol Nicotine	SAM factors Methionine Mg Zn
* CYP 2D6 30%	Codeine	Glycine	Aspirin Chaly1-CoA Sodium benzoate	Glycine, Co-factors (Folic Acid, PEP, Mg, Zn, B2, B5)
CYP 2E1	Acetaminophen (Paracetamol) Benzene Carbon tetrachloride Ethanol Isoniazid	Taurine	Carbon tetrachloride Chaly1-CoA	Taurine Cysteine Vit B3 Iron P-5-P Mg Zn Ca Vit C
* CYP 3A4 50%	Acetaminophen Aflatoxin B1, G1 Codeine Nicotine Testosterone Warfarin	Cysteine		Cysteine Methionine Mg Zn PEP VitC
		Glutamine		Glutamine Mg
		Threonine		Threonine
		Tryptophan	Fungal toxin	Tryptophan
		Ornithine	Ammonia	
		Arginine		

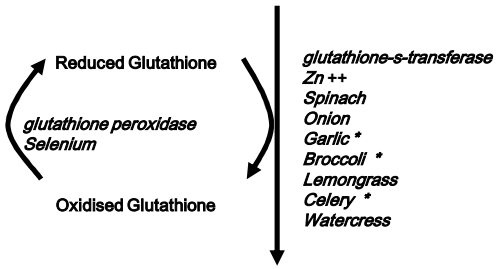
Phase 2

Conjugation

Phase 2 reactions conjugate the derivatives from Phase 1, where applicable, with molecules such as Glutathione,
Glucuronic acid,
Sulfate,
Acetyl CoA,
SAM,
Taurine, Cysteine, Glycine and Threonine.

This makes the derivatives even more water soluble for excretion through the urine or bile.

Phase 1 toxic intermediate



Glutathione (P-5-P) conjugate

A failure in the glutathione conjugation would lead to covalent combination to DNA and RNA and other cell proteins creating serious cell damage. Natural inducers of glutathione-s-transferase are *Spinach, Onion, Garlic, Broccoli, Lemon grass, Celery, Rosemary and Watercress*.

Glutathione conjugates are further metabolised before excretion.
The glutamic and glycine groups are removed and an acetyl group donated by Acetyl CoA is added to the cysteine moiety.

The resulting compound is a mercapturic acid, a conjugate of N. Acetyl Cysteine (NAC), which is then excreted in the urine.

N.Acetyl Cysteine (NAC) is thus an excellent supplement to use to activate this pathway.

N. Acetyl Cysteine may activate detoxification via -

1. Glutathione
2. Acetylation
3. Sulfation
4. Cysteine

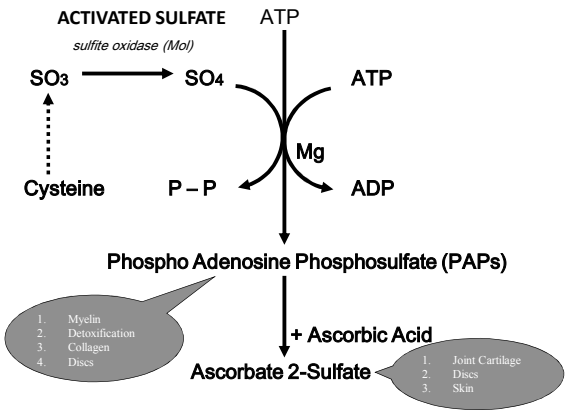
Glucuronidation conjugation is catalyzed by a variety of *glucuronosyl-transferases* with UDP-glucuronic acid as the glucuronyl donor.
Glucuronidation conjugation is the favoured pathway for the metabolism of many neurotransmitters, hormones, phenol and benzoic acid.

Natural Glucuronates

Artichokes
Cashew
Soy
Licorice
Flax
Alfalfa

Sulfation conjugation uses 3-phosphoadenosine-5-phosphosulfate (PAPs), or sulfates or most commonly elemental sulfur or MSM or cysteine or α-lipoic acid as the sulfur donor.
Many neurotransmitters and hormones are conjugated via this pathway.

Natural Sulfate donors
Broccoli
Asparagus
Garlic
Mustard
Dill
Parsnip
Horseradish
Cabbage
Stinging nettle



Chemicals conjugated by Sulfation

1. **Acetone**
2. **DDT / DDE**
3. **Ethylene glycol**
4. **Fluorine**
5. **Toluene**
6. **TRIC**

Acetylation conjugation uses Acetyl CoA as the acetyl donor. The reactions are catalyzed by *acetyltransferases.* Natural acetylaters - Endive, Pea, Cucumber, Watercress, Tomato

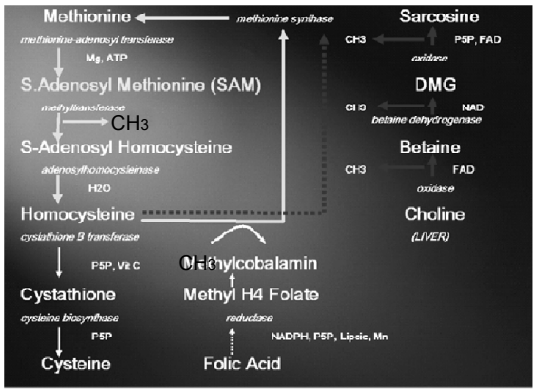
The drug isoniazid used in the treatment of tuberculosis is conjugated by acetylation.

Chemicals conjugated by Acetylation

1. **Petroleum**
2. **Newsprint**
3. **Hypochlorite**

Methylation conjugation is catalyzed by the various *methyltransferases* employing S-Adenosyl methionine as the methyl donor (SAM).

Many hormones are initially hydroxylated, then methylated and lastly conjugated usually by glucuronidation or sulfation.



Amino acid conjugation can use either
Taurine,
Glycine,
Cysteine or
Threonine as conjugating donors.

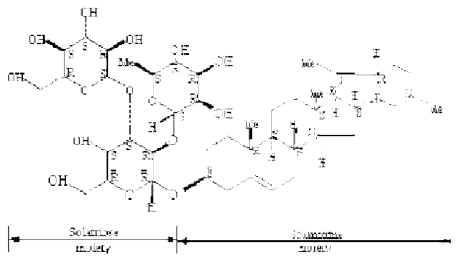
Sodium benzoate is conjugated with glycine.

CONJUGATE	BIOMARKER	NUTRIENTS
XOH + GLUTATHIONE	GLUTATHIONE-S-TRANSFERASE	GLUTATHIONE (NAC, Glutamate, Glycine) B6, Zn
XOH + GLUCURONIDATION	GLUCURONIC ACID	GLUCURONIC ACID
1. XOH + SULFATION 2. SULFITE OXIDASE	1. PAPs 2. SULFITE OXIDASE	PAPs, S, MSM Mol, Fe.
XOH + ACETYLATION	ACETYL CoA	Acetyl CoA (B5, Mg, Acetic acid)
XOH + METHYLATION	SAM	Methionine, MgATP, B12, Folic, Betaine, DMG
XOH + TAURINE	TAURINE	Taurine, NAD, Vit C, Vit A
XOH + THREONINE	THREONINE	Threonine
XOH + GLYCINE	GLYCINE	Glycine, B6, B2, Mg, Folic.
XOH + CYSTEINE	CYSTEINE	Cysteine, NAC, Methionine, B6

Nightshades

Solanidine
An alkaloid produced by the decomposition of solanine, as a white crystalline substance having a harsh bitter taste.

It is a fat soluble neurotoxin



Other acetylcholine blockers are prevalent in Solanine containing foods.

Egg plant	**(Aubergine)**
Green peppers	**Paprika**
Potato	**Potato starch**
Tomato	**Tomato paste**
Tobacco	**Relish**
Spices	**Broccoli**
Black pepper	**Chili**

They may cause a variety of symptoms
Joint pains
Abdominal bloating
Urinary bladder weakness
Pupillary dilation
Dry mouth
Skin rashes
Weight gain
Tiredness

Short Term:
Effects on the nervous system included increased heart, pulse, and respiratory rates, sedation, and coma.
Effects resulting from cell membrane disruption included internal hemorrhaging, edema, diarrhea, constriction of the abdominal muscles, and lesions of the stomach and duodenum
Haemorrhagic damage to the gastrointestinal tract as well as to the retina
Higher concentrations inhibited fibroblast cell growth
Abdominal cramps, gas, Diarrhea
PMS
Depressed central nervous system
kidney inflammation
reduced iron uptake
Dizziness
sleepiness
Vision problems including ocular pressure
Mental confusion
Flu like illness in higher dosages
Heart Attack
Death (rare)

Long Term:
Congenital spina bifida
Low thyroid and other endocrine dysfunctions
Vision problems, due to wide iris allowing too much light, that can cause damage
Loss of night vision
Cancers of the brain, breast, endometrium, lung, and thyroid
Loss of memory and thinking ability
Overeating and malnourish due to diarrhea
Birth defects
General weakness
Depression
Immune system dysfunctions
Osteoporosis
Arthritis
Joint Problems
Loss of Concentration
Sexual dysfunctions
Aphrodisiac symptoms over stimulation

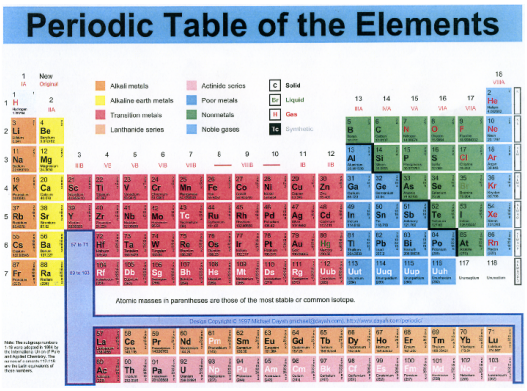
Challenging for toxicity
From weakness with the definitive meridian.

Chemicals vial
Toxic metals vial
Radiation vial

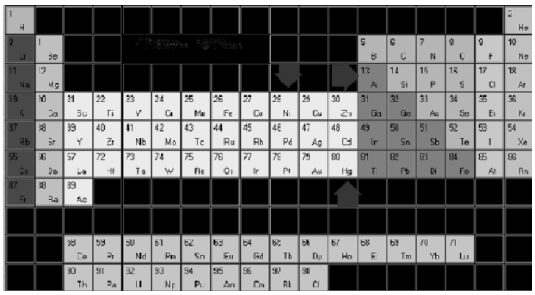
Toxins

Chemicals -
Black walnut
Coriander spice
NAC
Lemon balm
Rosemary
Yarrow
Other spices
Charcoal

Toxic Metals



The Periodic Table



Toxic Metals

Toxic metals inhibit various enzyme pathways.

Many active sites on enzymes are sulphur amino acids.

Toxic metals such as mercury always attack these SH bonds.

Sulfur bearing Amino Acids

1. **Methionine**
2. **Cysteine**
3. **Cystine**
4. **Glutathione**
5. **Taurine**

Metals that have a transient charge (Fe++ and Fe+++) are capable of inducing oxidative stress directly.
Other metals may induce oxidative stress by their reactions with low molecular thiols (glutathione and others) and therefore reduce the antioxidant potential.

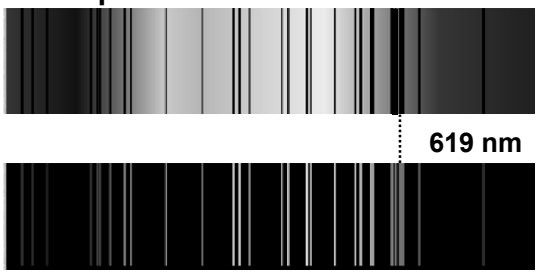
Fe++	**Fe+++**
reduced	**oxidised**
Cu+	**Cu++**

Colours and Toxic Metals

The cone colour that a person weakens to gives some indication of potential toxic metal affinity.

Aluminium

Absorption



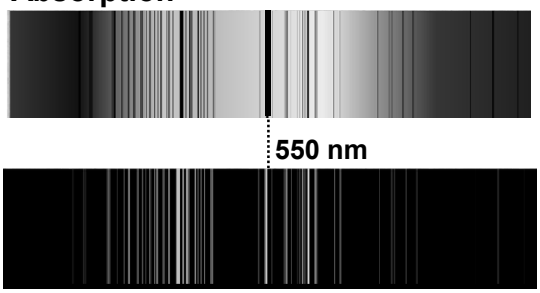
Emission

Aluminium

Salt in tap water as a deflocculant and softener.
Antacid, Anti-inflammatory, antidiarrhoeal medication.
Aluminium silicates in medications.
All foods wrapped with aluminium foil. Oxo cubes.
Insides of milk and fruit juice cartons.
Aluminium take-away cartons.
Aluminium food, soft drinks and beer cans.
Squeezy tubes such as tomato paste.
Baking powder, Self raising flour, Salt and certain food additives. Naturally high levels in Tea, spearmint and peppermint teas, tea bags, instant coffee, Spinach and Potatoes. Processed cheese.
Deodorants, antiperspirants, skin lotions, make-ups, douches, toothpaste.
Saucepans, frying pans, kettles, baking sheets.

Nickel

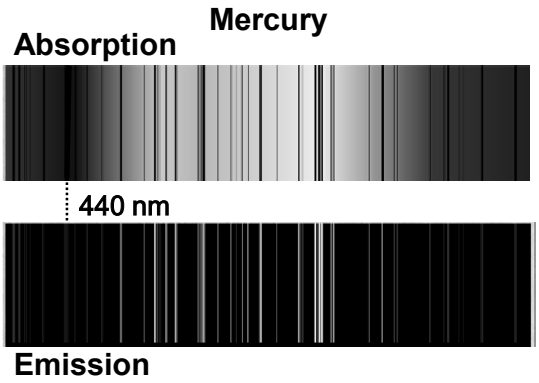
Absorption



Emission

Nickel

Sunflower seeds, Licorice, Hydrogenated oils, Peanut butter, Vegetable shortenings.
Rolled oats. 7% Stainless steel.
Watch straps and glasses frames.
Non silver or gold jewellery such as earrings. Dental fillings and retainers.
Cooking utensils and cappucino machines.
Nickel / cadmium batteries.
Cosmetics and permanent waves.
Tobacco smoke, industrial exposure and ceramics. Superphosphate fertilizers.



Mercury
Dental amalgams. High fructose corn syrup. Sanitary towels, Cotton balls and buds, Dental floss, Toothpicks, Paints, Explosives, Batteries, Mercurial diuretics, Fungicides, Laxatives containing camomel, Hemorroid suppositories, Fluorescent lamps, Cosmetics, Hair dyes. Fibreglass, Manufacture and delivery of petroleum. Sewage sludge.
Methylmercury chlorine bleaches. Fabric softeners, Polishes, wood preservers, Latex, Solvents, Plastics, Inks used by printers and tatooists, some Paints.
Salt, Fish from contaminated water such as tuna.
Vaccines (thermerasol)

Potentially toxic elements

RED CONE

Aluminium, Lead, Fluoride, Indium, Palladium, Copper, Manganese, Vanadium

BLUE CONE

Mercury
Gallium
Thallium

GREEN CONE

Arsenic **Nickel**
Cobalt

Diagnosis

Any enzymatic pathway, which exhibits acquired inhibition.

Most common positive meridians are

Kidney and Bladder

Procedure

Positive meridian will negate against the TOXIC METAL nosode.

Patient will weaken to a specific toxic metal(s).
Best to test with full strength toxic metal solution from strength to weakness.

Treatment

Often the best chelating agent is adjacent the toxic metal in the periodic table.

Toxins

Toxic metals – **Black walnut**
Coriander herb
Coriander spice
Lemon balm
Lipoic acid
Yarrow
Glutathione

Vitamin C for nickel

NAC

Toxic metals in the water soluble components of the body will chelate easily with any of the previous nutrients.

Toxic metals in the fat soluble components of the body may need a solvent such as alkylglycerol from Chlorella from algae.

Amalgam extraction

Chlorella 2 caps immediately before extraction. 2 caps immediately after extraction. 2 caps one hour later. Use Liquid Selenium as a mouthwash during amalgam extractions as it bonds with mercury to form selenates. Spit out after rinsing the mouth each time.

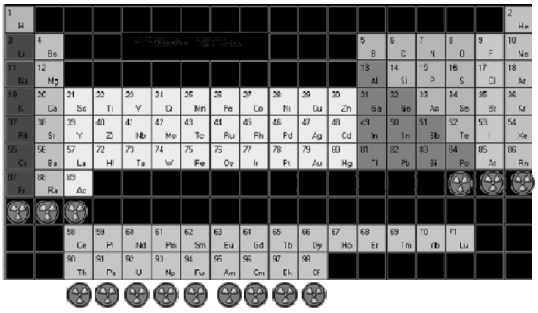
RADIATION

Ionising Radiation

Ionising radiations come from alpha and gamma particles from the radioactive isotopes of certain elements.

All the elements past number 83 are unstable and radioactive.

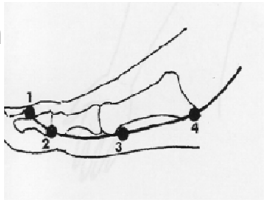
The Periodic Table



Ionising Radiation

May also come from exposure to UV light and cosmic radiations in high altitude jet travel

DIAGNOSIS
Positive meridian will negate with the RADIATION nosode. Identify causative element.



Spleen 4

Toxins

Radiation -
- Chlorella
- Coriander spice
- Smart Vitamin C (Rutin)
- Turmeric
- Yarrow