

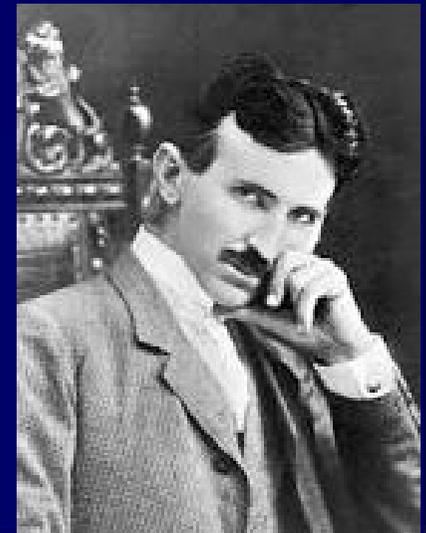
# **Module 15**

## **Toxic metals and Radiation**



There is no more fascinating subject more worthy of study than **nature**. To understand this great mechanism, to discover the forces which are active and the laws that govern them, is the highest aim of the human intelligence.

Nikola Tesla (10 July 1856 – 7 January 1943)

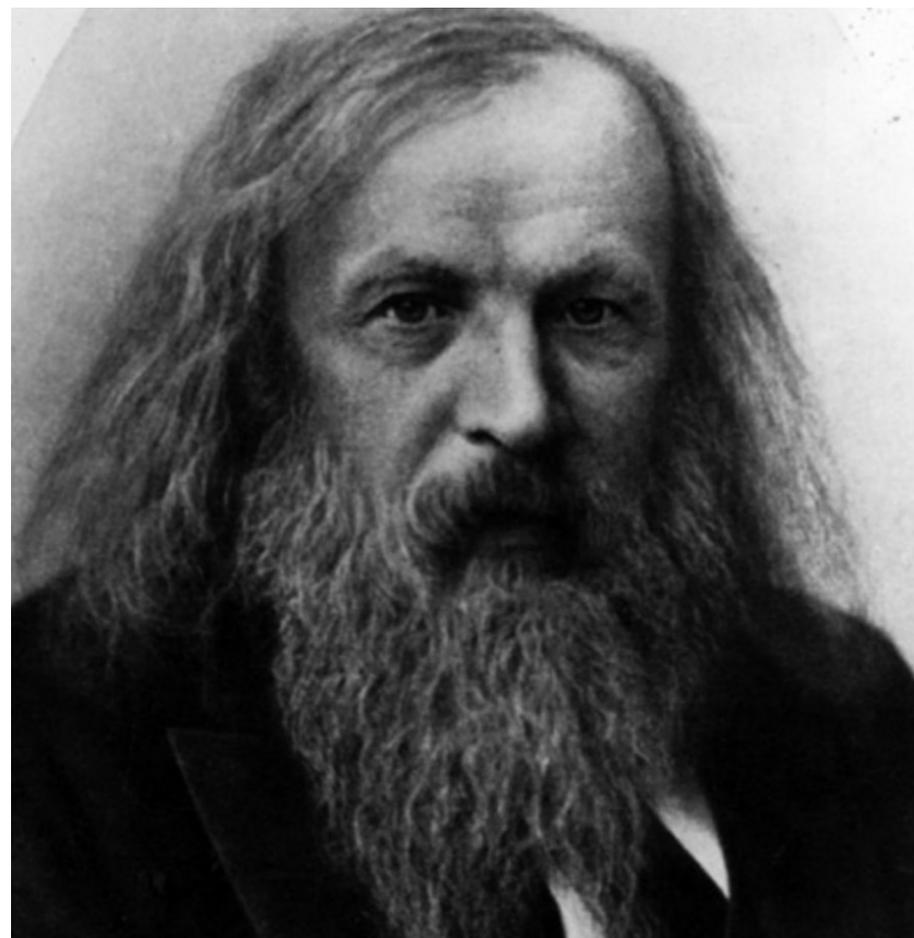


# Mendeleev's The Periodic Table

1 H																	2 He	
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	57-71	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
87 Fr	88 Ra	89-103	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo	
		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu		
		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr		

**1834 – 1907 was a Russian chemist and inventor. He formulated the Periodic Law, created a farsighted version of the periodic table of elements, and used it to correct the properties of some already discovered elements and also to predict the properties of eight elements yet to be discovered.**

## **Dmitri Ivanovich Mendeleev**



## Essential minerals

Boron

Calcium

Copper ↑↓

Chromium ↑↓

Indium

Iodine

Iron ↑↓

Magnesium

Manganese ↑↓

Molybdenum

Platinum

Potassium

Selenium

Silica

Silver

Sulphur

Zinc

## Toxic minerals

Aluminium

Antimony

Arsenic\*

Beryllium\*

Bismuth

Bromine

Cadmium\*

Caesium

Chlorine

Cobalt

Fluorine

Lead

Lithium

Mercury

Nickel\*

Palladium

Promethium\*

Radium

Radon

Thallium

Thorium

Uranium

Known to be \*

Carcinogenic

# Toxic Metals

hydrogen 1 <b>H</b> 1.0079																	helium 2 <b>He</b> 4.0026	
lithium 3 <b>Li</b> 6.941	beryllium 4 <b>Be</b> 9.0122											boron 5 <b>B</b> 10.811	carbon 6 <b>C</b> 12.011	nitrogen 7 <b>N</b> 14.007	oxygen 8 <b>O</b> 15.999	fluorine 9 <b>F</b> 18.998	neon 10 <b>Ne</b> 20.180	
sodium 11 <b>Na</b> 22.990	magnesium 12 <b>Mg</b> 24.305											aluminum 13 <b>Al</b> 26.982	silicon 14 <b>Si</b> 28.086	phosphorus 15 <b>P</b> 30.974	sulfur 16 <b>S</b> 32.065	chlorine 17 <b>Cl</b> 35.453	argon 18 <b>Ar</b> 39.948	
potassium 19 <b>K</b> 39.098	calcium 20 <b>Ca</b> 40.078	scandium 21 <b>Sc</b> 44.956	titanium 22 <b>Ti</b> 47.867	vanadium 23 <b>V</b> 50.942	chromium 24 <b>Cr</b> 51.996	manganese 25 <b>Mn</b> 54.938	iron 26 <b>Fe</b> 55.845	cobalt 27 <b>Co</b> 58.933	<b>Ni</b> 28 <b>Ni</b> 58.693	copper 29 <b>Cu</b> 63.546	zinc 30 <b>Zn</b> 65.39	gallium 31 <b>Ga</b> 69.723	germanium 32 <b>Ge</b> 72.61	arsenic 33 <b>As</b> 74.922	selenium 34 <b>Se</b> 78.96	bromine 35 <b>Br</b> 79.904	krypton 36 <b>Kr</b> 83.80	
rubidium 37 <b>Rb</b> 85.468	strontium 38 <b>Sr</b> 87.62	yttrium 39 <b>Y</b> 88.906	zirconium 40 <b>Zr</b> 91.224	niobium 41 <b>Nb</b> 92.906	molybdenum 42 <b>Mo</b> 95.94	technetium 43 <b>Tc</b> [98]	ruthenium 44 <b>Ru</b> 101.07	rhodium 45 <b>Rh</b> 102.91	palladium 46 <b>Pd</b> 106.42	silver 47 <b>Ag</b> 107.87	cadmium 48 <b>Cd</b> 112.41	indium 49 <b>In</b> 114.82	tin 50 <b>Sn</b> 118.71	antimony 51 <b>Sb</b> 121.76	tellurium 52 <b>Te</b> 127.60	iodine 53 <b>I</b> 126.90	xenon 54 <b>Xe</b> 131.29	
caesium 55 <b>Cs</b> 132.91	barium 56 <b>Ba</b> 137.33	* 57-70	lutetium 71 <b>Lu</b> 174.97	hafnium 72 <b>Hf</b> 178.49	tantalum 73 <b>Ta</b> 180.95	wolfram 74 <b>W</b> 183.84	reuterium 75 <b>Re</b> 186.21	osmium 76 <b>Os</b> 190.23	iridium 77 <b>Ir</b> 192.22	platinum 78 <b>Pt</b> 195.08	gold 79 <b>Au</b> 196.97	mercury 80 <b>Hg</b> 200.59	thallium 81 <b>Tl</b> 204.38	lead 82 <b>Pb</b> 207.2	bismuth 83 <b>Bi</b> 208.98	polonium 84 <b>Po</b> [209]	astatine 85 <b>At</b> [210]	radon 86 <b>Rn</b> [222]
francium 87 <b>Fr</b> [223]	radium 88 <b>Ra</b> [226]	** 89-102	lanthanum 103 <b>Lr</b> [262]	rutherfordium 104 <b>Rf</b> [261]	dubnium 105 <b>Db</b> [262]	seaborgium 106 <b>Sg</b> [266]	bohrium 107 <b>Bh</b> [264]	hassium 108 <b>Hs</b> [265]	meitnerium 109 <b>Mt</b> [268]	unnilium 110 <b>Uun</b> [271]	ununium 111 <b>Uuu</b> [272]	unbinium 112 <b>Uub</b> [277]	unquadrum 114 <b>Uuq</b> [289]					

\* Lanthanide series

\*\* Actinide series

lanthanum 57 <b>La</b> 138.91	cerium 58 <b>Ce</b> 140.12	praseodymium 59 <b>Pr</b> 140.91	neodymium 60 <b>Nd</b> 144.24	<b>Pm</b> 61 <b>Pm</b> [145]	samarium 62 <b>Sm</b> 150.36	europium 63 <b>Eu</b> 151.96	gadolinium 64 <b>Gd</b> 157.25	terbium 65 <b>Tb</b> 158.93	dysprosium 66 <b>Dy</b> 162.50	holmium 67 <b>Ho</b> 164.93	erbium 68 <b>Er</b> 167.26	thulium 69 <b>Tm</b> 168.93	ytterbium 70 <b>Yb</b> 173.04
actinium 89 <b>Ac</b> [227]	thorium 90 <b>Th</b> 232.04	protactinium 91 <b>Pa</b> 231.04	uranium 92 <b>U</b> 238.03	neptunium 93 <b>Np</b> [237]	plutonium 94 <b>Pu</b> [244]	americium 95 <b>Am</b> [243]	curium 96 <b>Cm</b> [247]	berkelium 97 <b>Bk</b> [247]	californium 98 <b>Cf</b> [251]	einsteinium 99 <b>Es</b> [252]	fermium 100 <b>Fm</b> [257]	mendelevium 101 <b>Md</b> [258]	nobelium 102 <b>No</b> [259]

# **Toxic Metals & Chronic Diseases**

- **Toxicity underlying all modern chronic diseases**
- **Alzheimer's, asthma, chronic fatigue syndrome, syndrome x, multiple chemical sensitivities, allergies, ankylosing spondylitis, arthritis, dermatitis, psoriasis**

# **Toxic Metals & Chronic Diseases**

**Body systems affected:**

- **Neurological**
- **Immune disorders**
- **Mental conditions**
- **Allergic conditions**
- **Cancer**

# **Toxic Metals & Chronic Diseases**

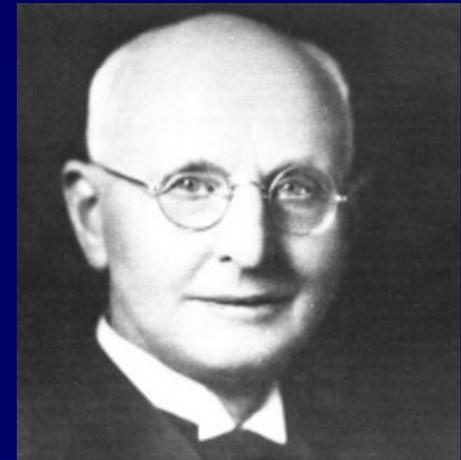
- **Chronic inflammation**
- **Heart and circulation**
- **Reproductive difficulties**
- **Tinnitus and hearing**
- **Diabetes**

# **Toxic Metals**

- **Toxic insults on body behind the rise of MCDs**
- **The symptoms depend on the nature of the toxin and the individual genotype**
- **In time overwhelm the body's detoxification system**

## **Toxic metals**

- Quantity of toxins may be small but damage is enormous
- “Symptoms produced are out of proportion to the amount of toxin released and can be anywhere or in any system of the body” Dr Weston Price



# **Toxic metals**

- **Symptoms are a result of the types, concentration & duration of exposure**
- **Event can be a trigger. The reserves of the body have been reduced, gradual build up**

# Toxic metals

- Recovery time is proportional to length of time of exposure to toxins as well as genetic make-up and mental attitude
- “a toxin is anything that acts as a poison and can cause allergy”

# Toxic metals

- **Poison is dose dependant. Slow and shut down body functions. Interfere with feedback mechanisms, corrupt messenger molecules, stop oxygen utilisation**

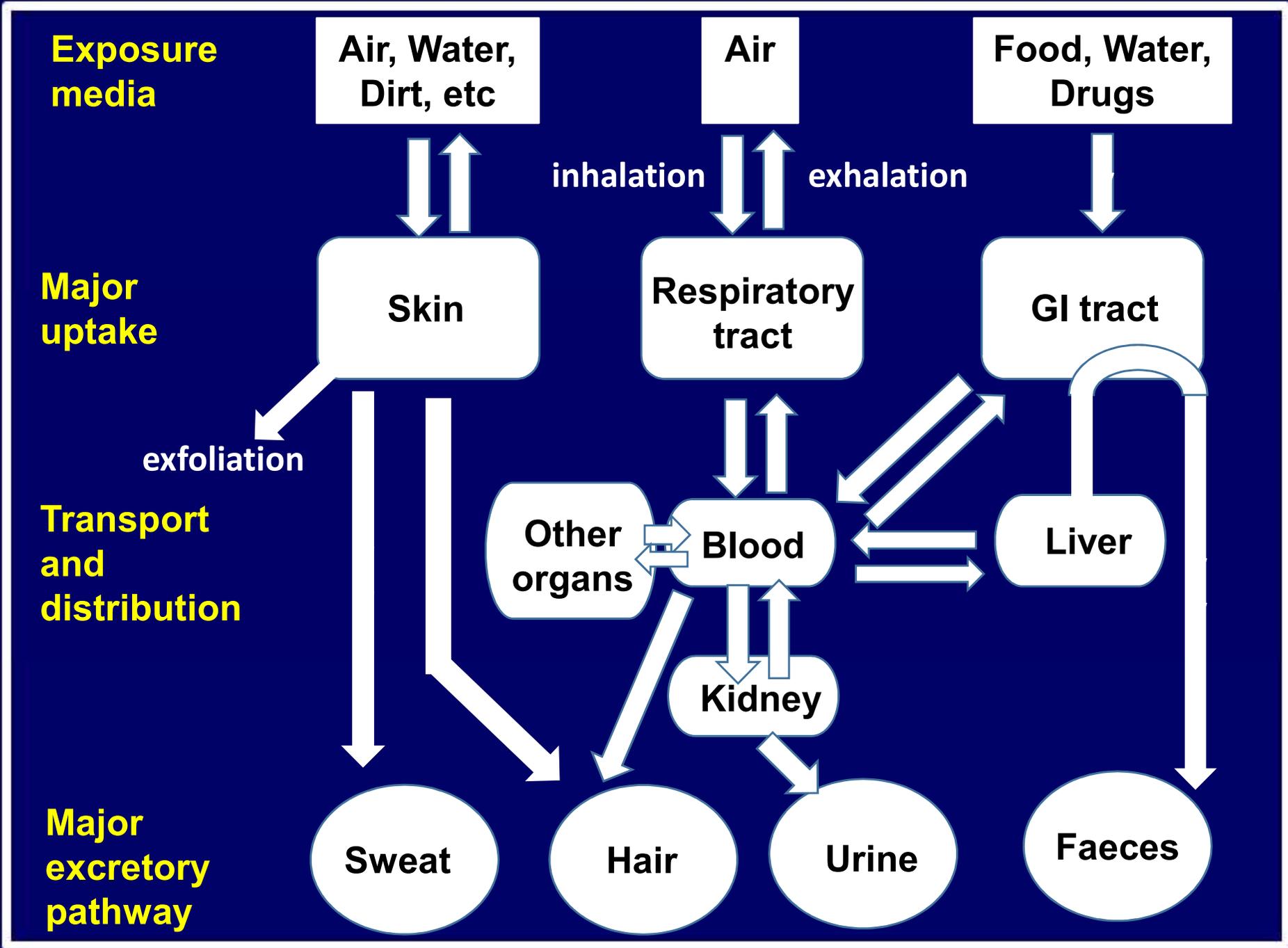
# **Toxic metals**

- **Allergy or sensitivity – not dose dependant. Triggers the immune system into a reaction.**
- **Most patients have both**
- **Poor nutrition reduces effectiveness of body to deal with toxins**

## Toxic metals

- Candice Pert – mental state has a direct effect on physical workings of the body. Lowers the resistance to infection and toxin.
- Lowers immune system. Weakened by toxins>infections





## **How Toxic metals affect the body**

- **Target specific biochemical processes (enzymes)**
- **Disrupt the co-factors for enzymes particularly when the toxic metal is similar physical and chemical properties to the essential metal – e.g. Hg and Zn in carbonic anhydrase**

# **How Toxic metals affect the body**

- **Disrupt cell membranes**
- **e.g. Lead interferes with the calcium dependent release of neurotransmitters**
- **Lead disrupts the activation of Vitamin D to its hydroxylated forms**

**Lead, calcium and iron (and cadmium and iron) interfere with the GI homeostasis mechanism.**

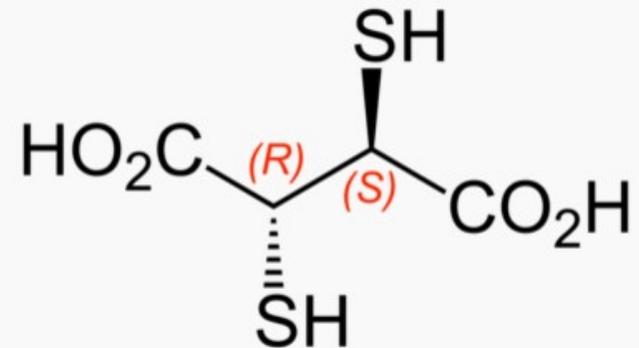
**Vitamin C reduces the absorption of lead and cadmium because of an increased absorption of ferrous iron.**

## **Anecdotal observed benefits from chelation of toxic metals:**

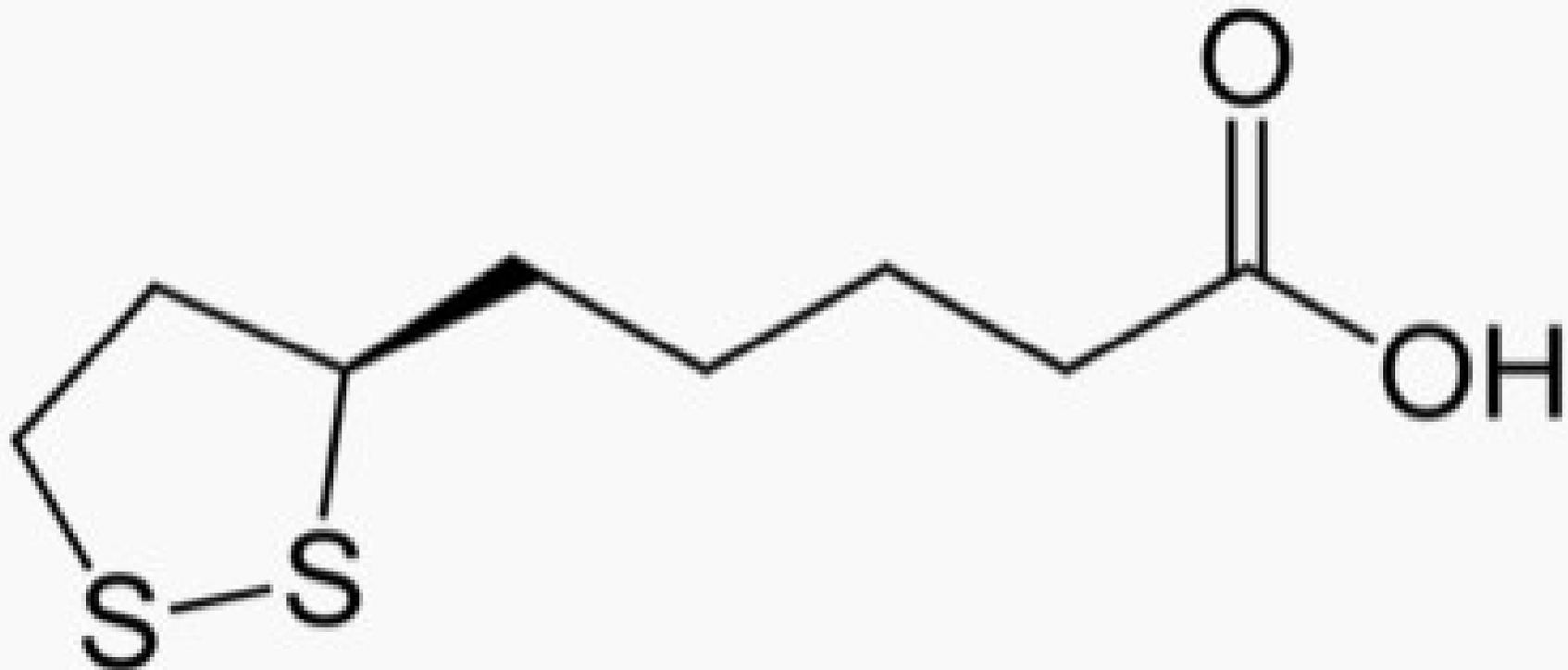
- **Reduction of liver-produced cholesterol.**
- **Lowered insulin requirements in diabetics.**
- **Reduced high blood pressure.**
- **Normalization of cardiac arrhythmias.**
- **Relief from leg-muscle cramps.**
- **Reduction in allergic symptoms.**
- **Normalized weight.**
- **Improved psychological and emotional status.**
- **Enhanced sensory input: better sight, hearing and taste.**
- **Reversal of impotence.**
- **Cold extremities warmed.**

**Chelation therapy** is a medical procedure that involves the administration of chelating agents to remove heavy metals (As, Cd, Hg, Pb) from the body.

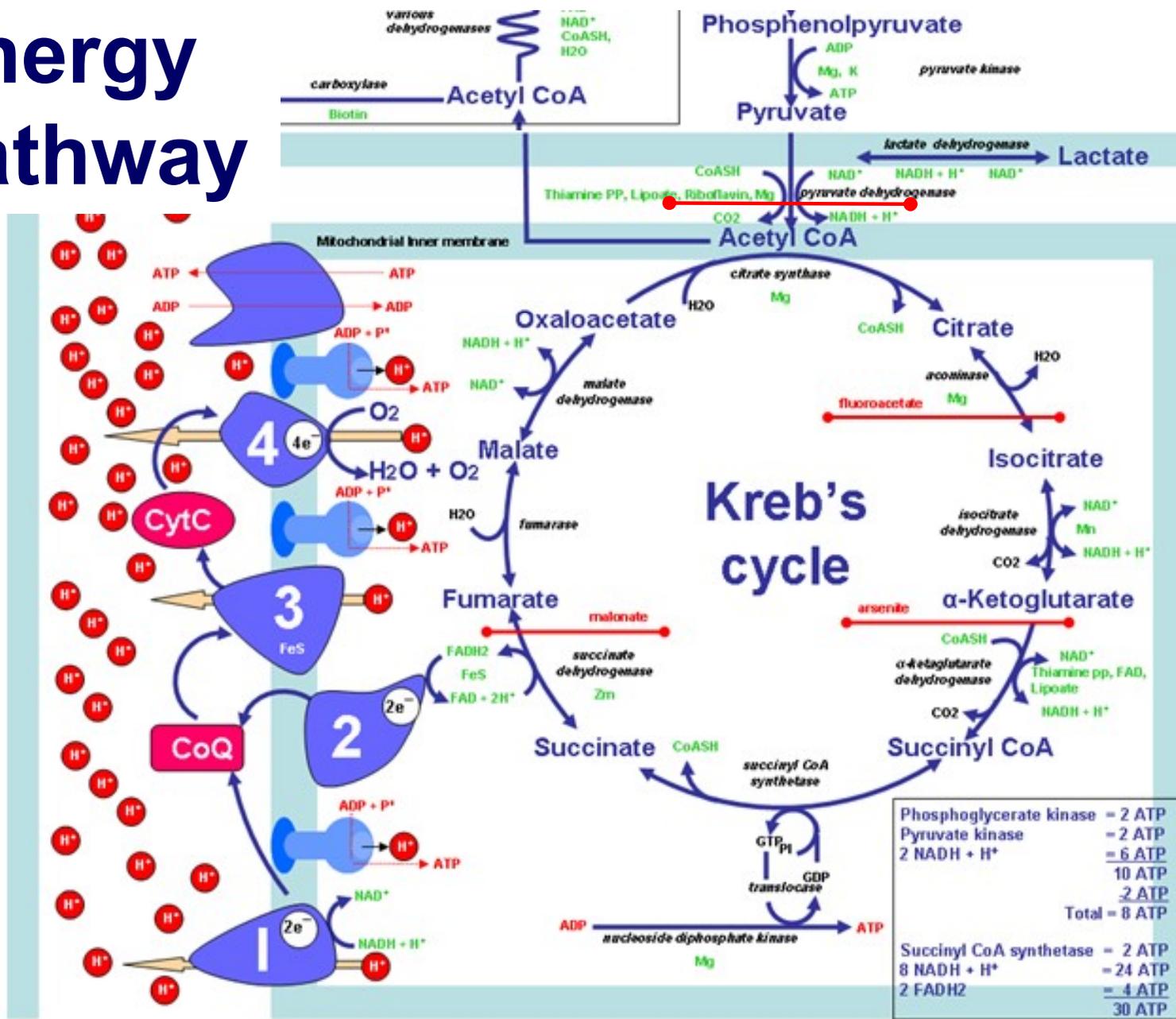
**Dimercaptosuccinic acid (DMSA)**



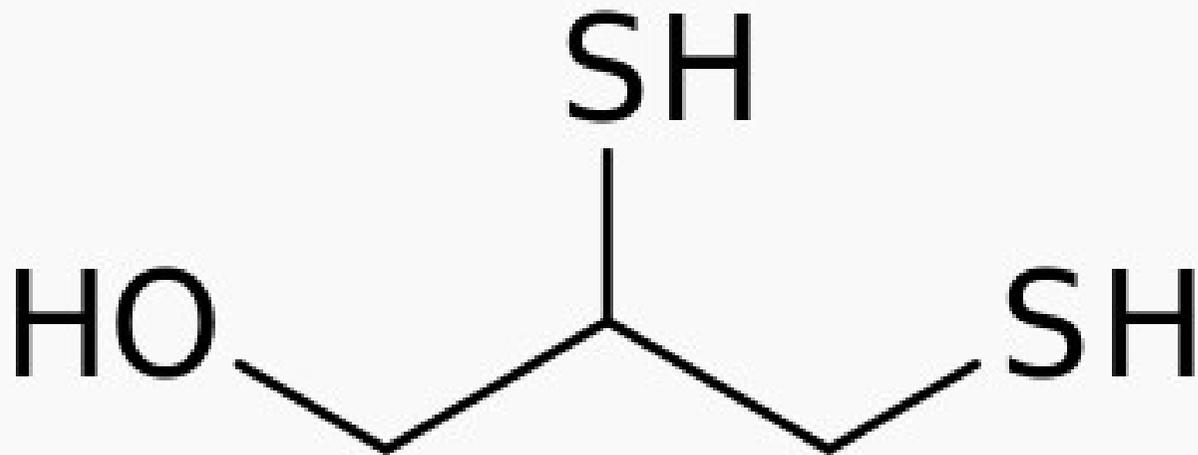
# Alpha lipoic acid (ALA)



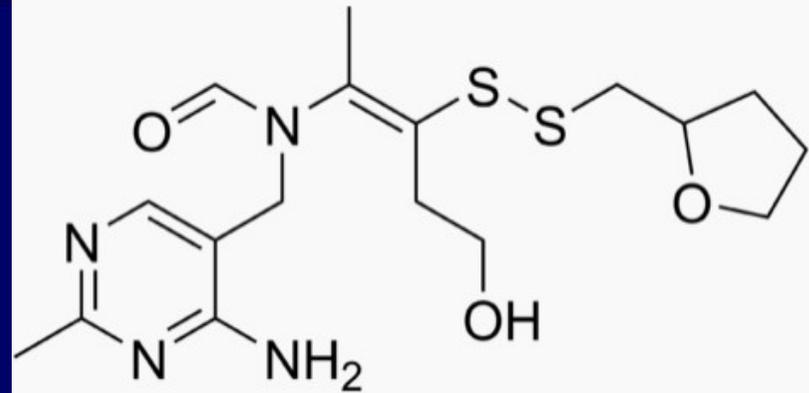
# Energy pathway



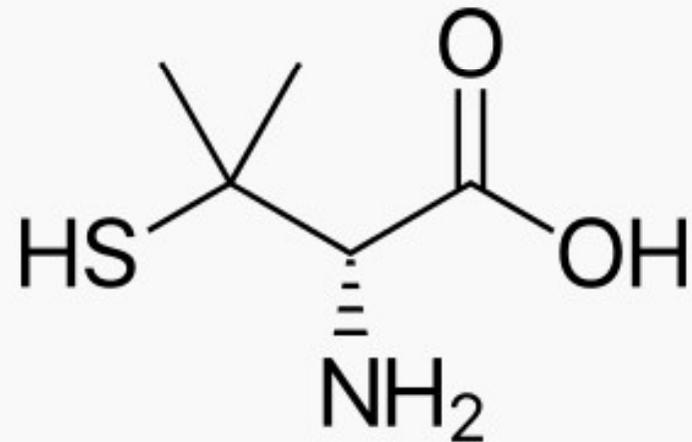
**Dimercaprol (British anti-Lewisite;  
BAL) designed  
specifically to  
chelate As**



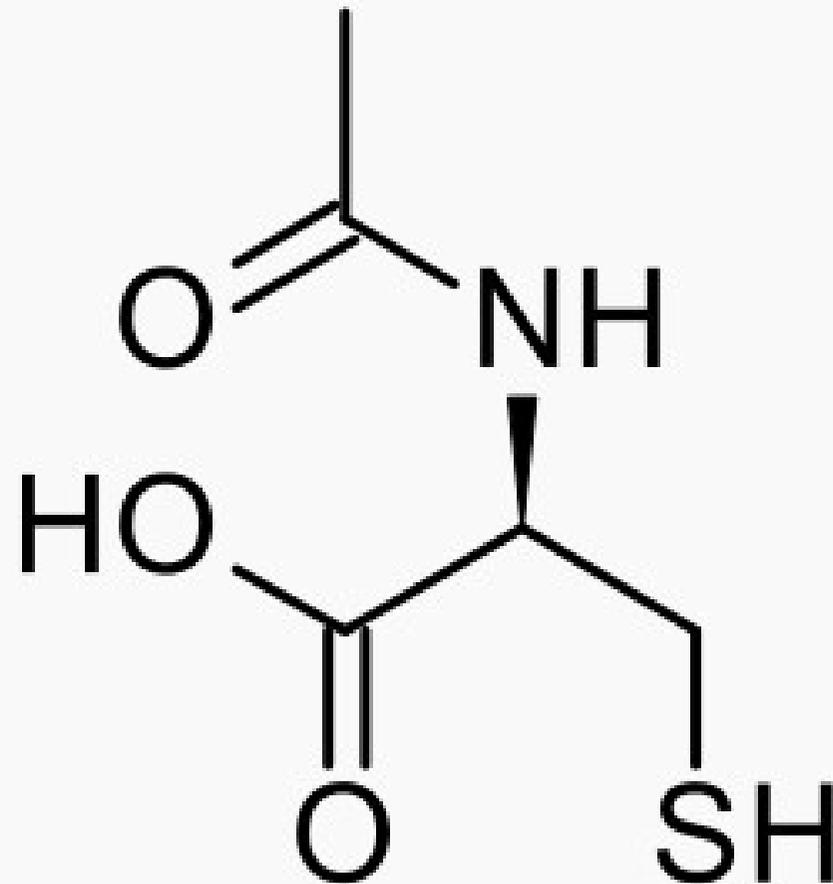
**Thiamine  
tetrahydrofurfuryl  
disulfide (TTFD).**



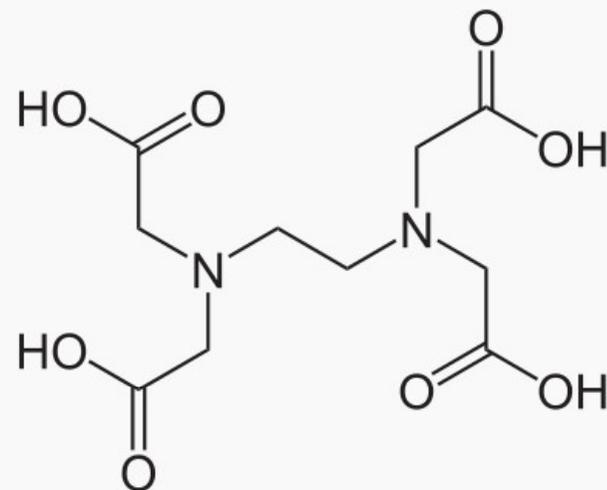
**Penicillamine**



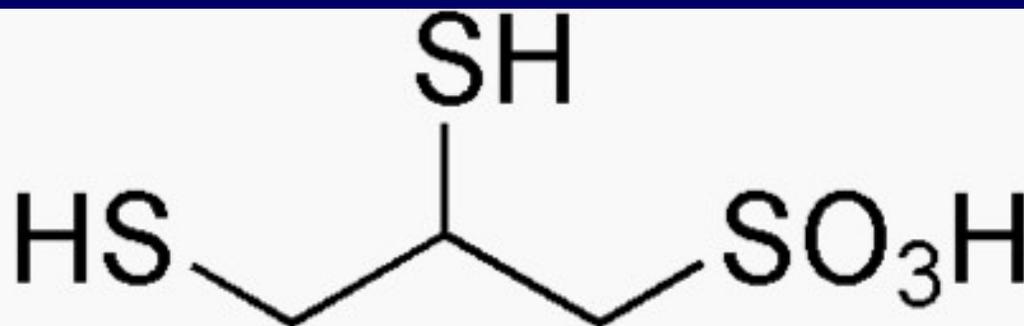
# N. Acetylcysteine (NAC)

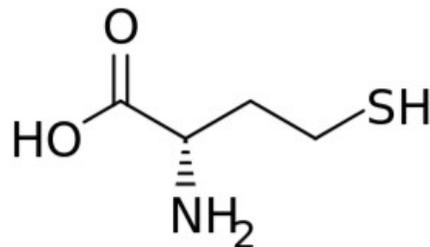


# Ethylenediaminetetraacetic acid (EDTA)



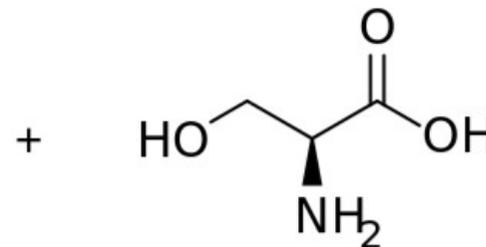
# 2,3-Dimercaptopropanesulfonic acid (DMPS)



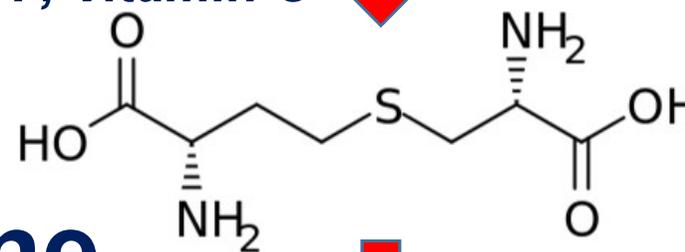
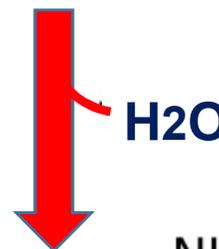


**Homocysteine**

*cystathionine beta synthase*  
(heme dependant) P-5-P, Vitamin C

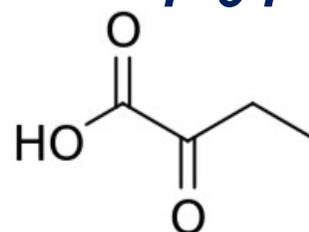
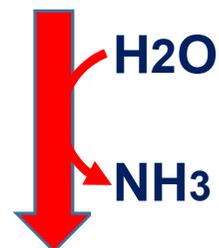


**Serine**

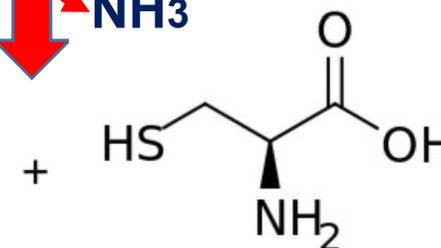


**Cystathionine**

*cystathionine gamma-lyase*  
P-5-P

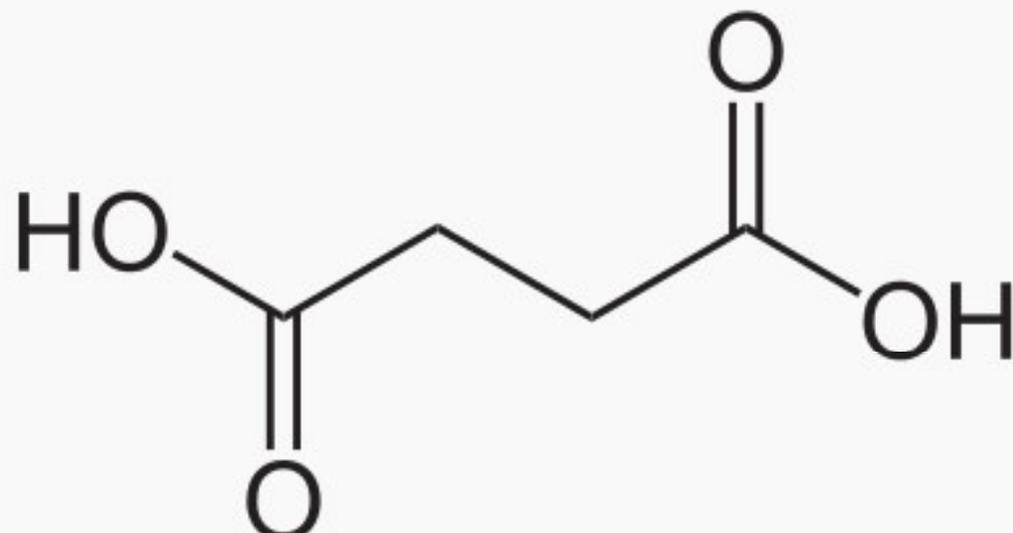


**α-Ketobutyrate**



**Cysteine**





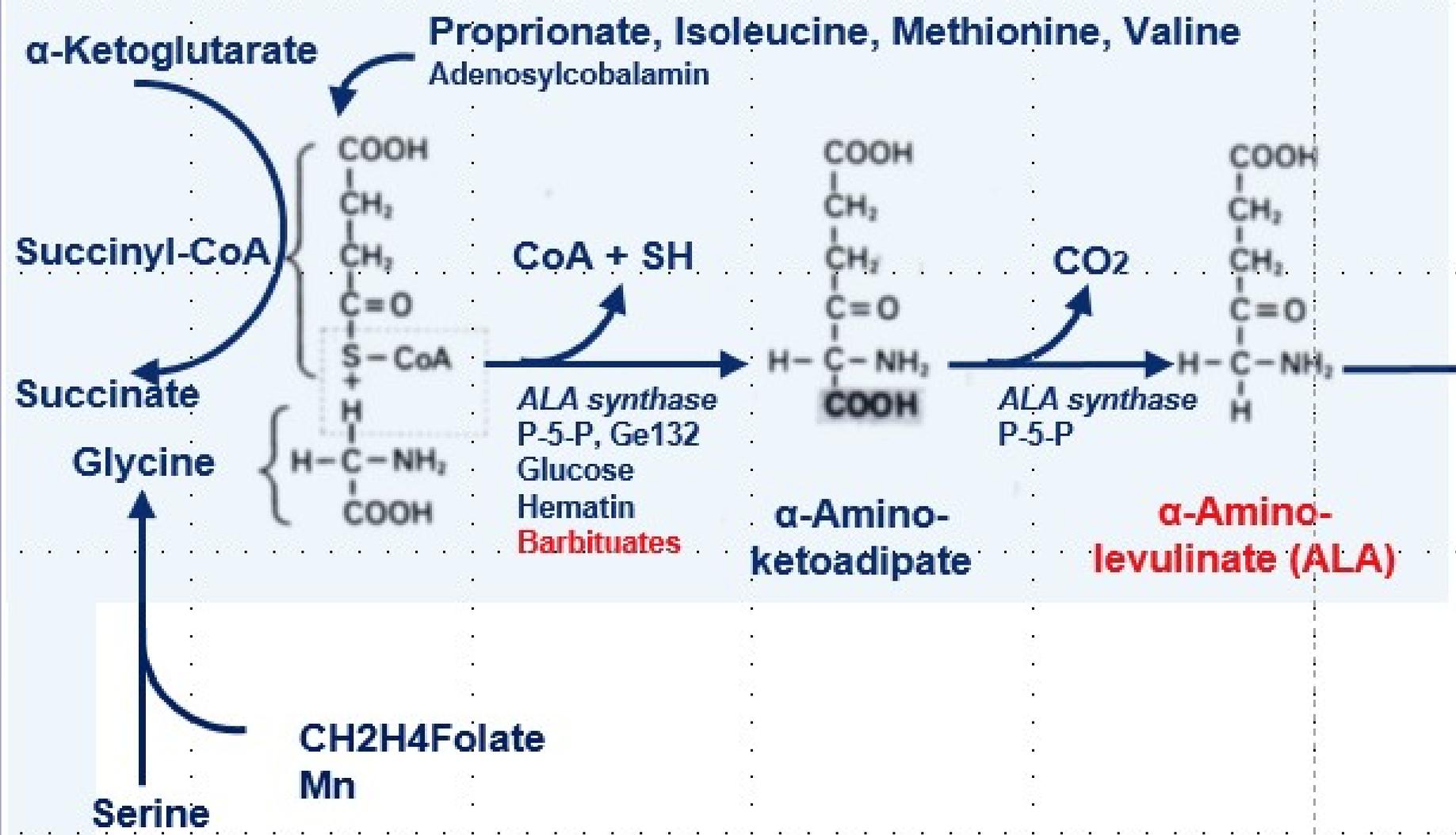
**Succinic  
acid**

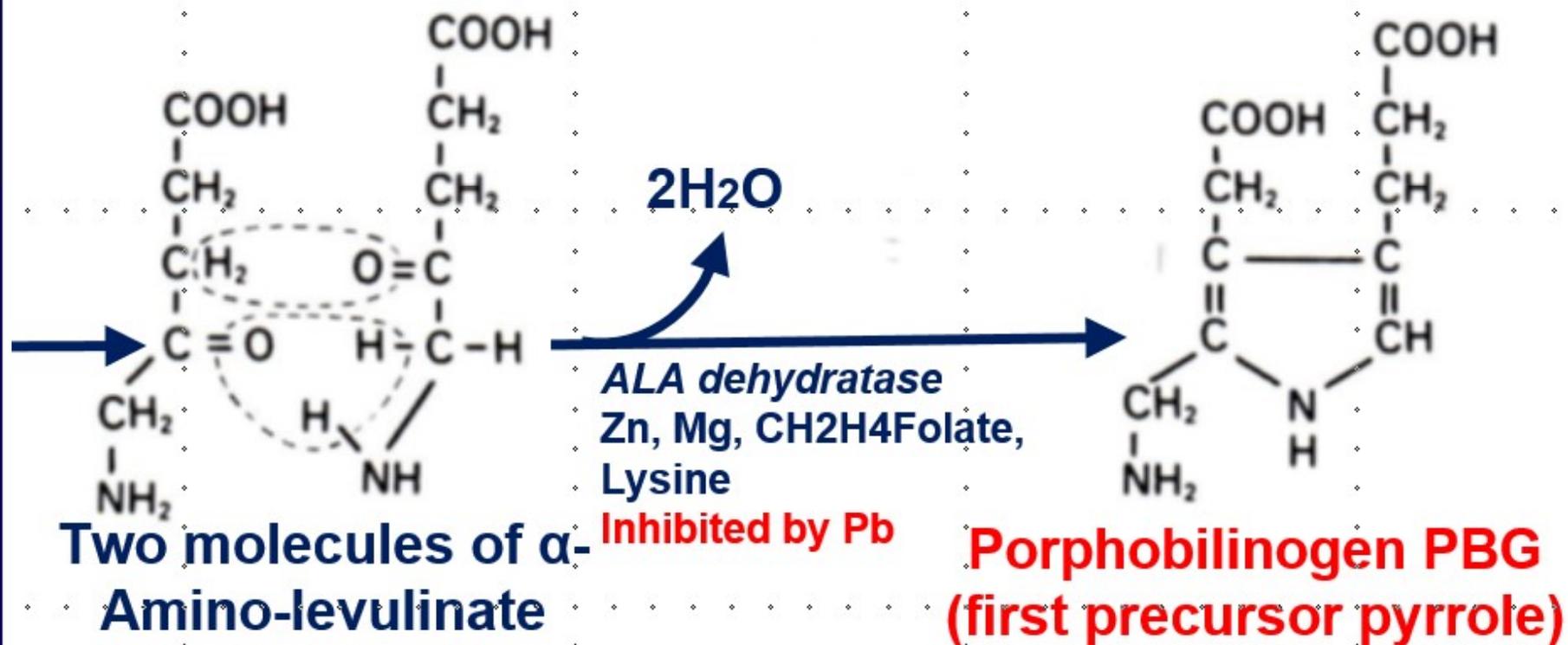


**Ornithine**

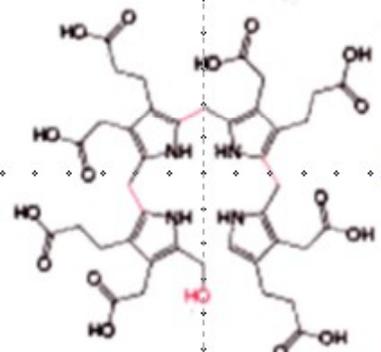
Ornithine succinate's usefulness arises because of its role as a ligand and chelating agent, i.e., its ability to "sequester" metal ions such as Cd, Hg. After being bound metal ions remain in solution but exhibit diminished reactivity and flush through the kidneys.





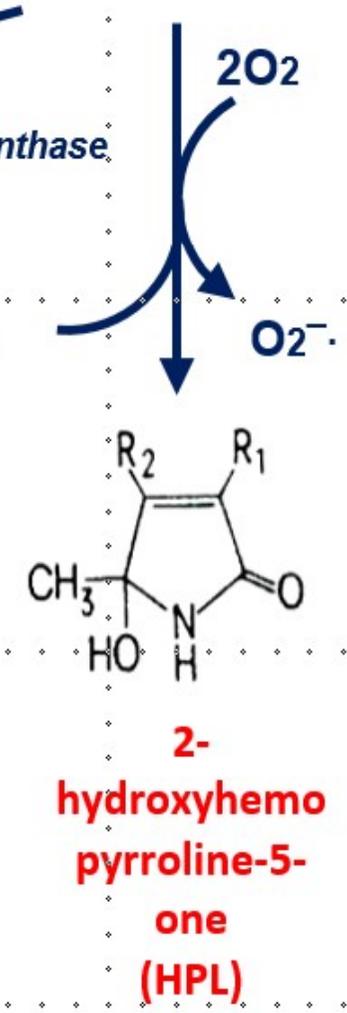
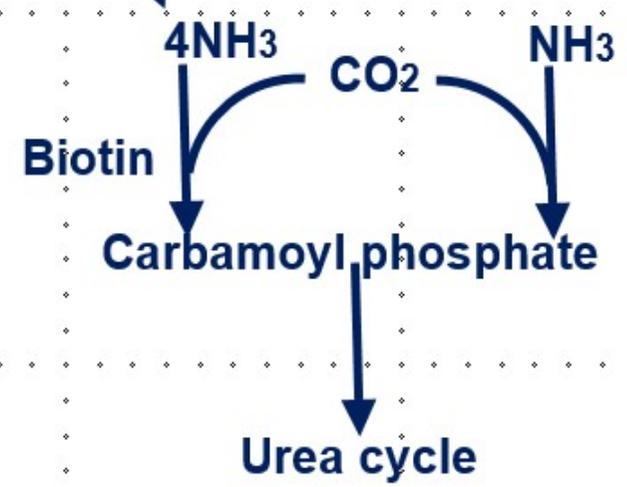


**Porphobilinogen PBG**  
**(first precursor pyrrole)**

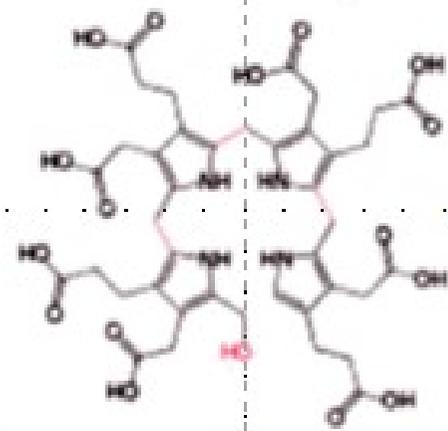


**Hydroxymethylbilane (HMB)**

*uroporphyrinogen 1 synthase*  
*(PBG deaminase)*  
P-5-P, H4Biopterin?

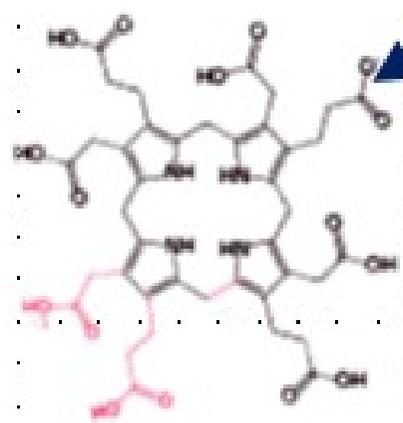


**Porphobilinogen**



**Hydroxymethylbilane (HMB)**

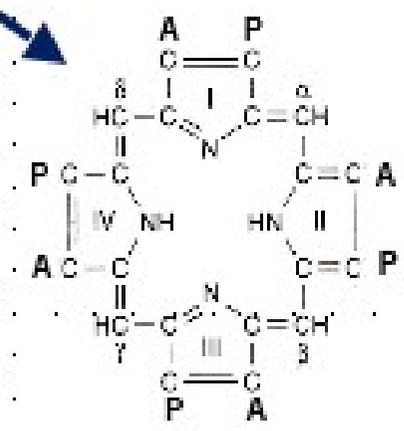
*uroporphyrinogen III synthase*  
Ca, Mg  
**Inhibited by Cu, Hg, Cd, NH<sub>4</sub>**



**Uroporphyrinogen III (UPG)**

*spontaneous*

H<sub>2</sub>O

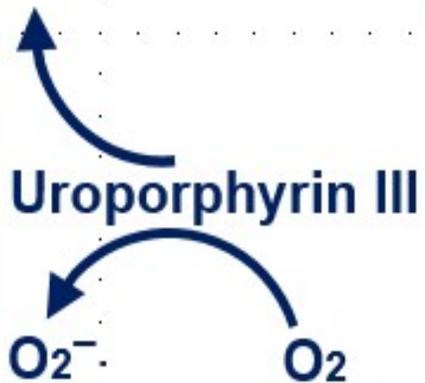


**Uroporphyrinogen I**

# Hydroxymethylbilane

H<sub>2</sub>O

adenosyl-L-homocysteine + precorrin-2



6H

light

Uroporphyrinogen III (UPG)

4CO<sub>2</sub>

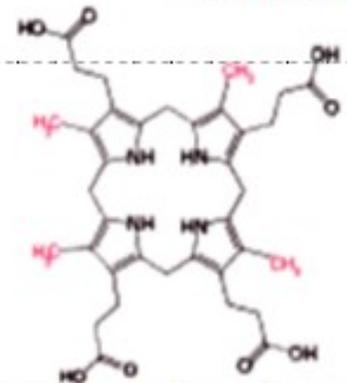
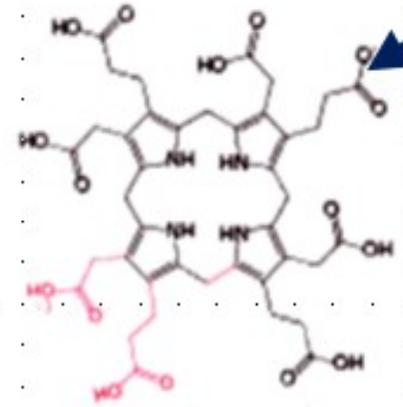
uroporphrinogen decarboxylase  
P-5-P  
Inhibited by Cu



6H

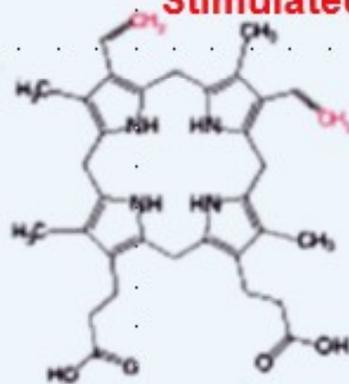
light

Coproporphyrinogen III (CPG)



Mitochondrial membrane

*coproporphrinogen oxidase*  
FAD  
P-5-P, Mn  
**Inhibited by Hg,**  
**Stimulated by Metholtrexate**



O<sub>2</sub>

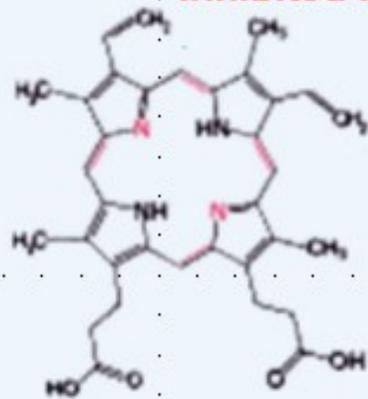
Coproporphrinogn III

CO<sub>2</sub>

Protoporphrinogen IX (PPG)

3O<sub>2</sub>

*protoporphrinogen oxidase*  
FAD  
**Inhibited by fluorine (in pesticides)**



3H<sub>2</sub>O<sub>2</sub>

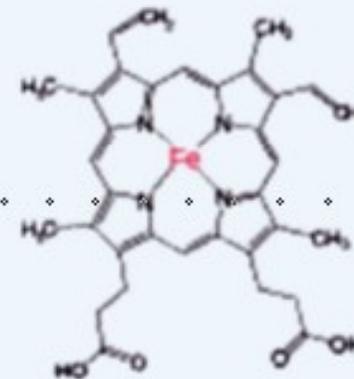
Protoporphrin IX

*Ferrochelatase*  
Ferrous iron  
Vit C  
Cysteine



## Protoporphyrin IX

Inhibited by Pb (Pb induces aplastic anaemia)  
Cd, Mn, Hg



Heme B

Hemoglobin, Myoglobin  
Cytochrome c (oxidase)  
Cytochrome P450  
Catalase  
Myeloperoxidase  
Nitric oxide synthase  
Cystathione synthase  
Sulfite oxidase

Proteins



Hemoproteins

# **Heme dependant enzymes**

**Hemoglobin – Carries Oxygen in red blood cells**

**Myoglobin – Stores Oxygen in muscle fibres**

**Catalase - Reduces H<sub>2</sub>O<sub>2</sub> to water**

**Cyclo-oxygenase – Synthesizes PgE1, PgE2 and PgE3**

**Cystathionine synthase – Converts Homocysteine to Cysteine**

**Cytochrome C – Transfers electrons from Complex III to  
Complex IV**

**Cytochrome C oxidase – Transfers electrons in Complex IV to  
Oxygen**

**Cytochrome p450 - Detoxifies endogenous and exogenous  
chemicals**

**Myeloperoxidase – Synthesises Hypochlorite from H<sub>2</sub>O<sub>2</sub>**

**Nitric oxide synthase – Synthesises Nitric oxide from Arginine**

**Peroxidases – Reduce H<sub>2</sub>O<sub>2</sub> to water**

**Sulfite oxidase – Synthesises Sulfate from Cysteine sulphite**

# Mendeleev Periodic Table

	Group 1	Group 2	Transition metals										Group 3	Group 4	Group 5	Group 6	Group 7	Group 0
1	H 1																	He 2
2	Li 3	Be 4											B 5	C 6	N 7	O 8	F 9	Ne 10
3	Na 11	Mg 12											Al 13	Si 14	P 15	S 16	Cl 17	Ar 18
4	K 19	Ca 20	Sc 21	Ti 22	V 23	Cr 24	Mn 25	Fe 26	Co 27	Ni 28	Cu 29	Zn 30	Ga 31	Ge 32	As 33	Se 34	Br 35	Kr 36
5	Rb 37	Sr 38	Y 39	Zr 40	Nb 41	Mo 42	Tc 43	Ru 44	Rh 45	Pd 46	Ag 47	Cd 48	In 49	Sn 50	Sb 51	Te 52	I 53	Xe 54
6	Cs 55	Ba 56	57-71	Hf 72	Ta 73	W 74	Re 75	Os 76	Ir 77	Pt 78	Au 79	Hg 80	Tl 81	Pb 82	Bi 83	Po 84	At 85	Rn 86
7	Fr 87	Ra 88	89-103	Rf 104	Db 105	Sg 106	Bh 107	Hs 108	Mt 109	Uun 110	Uuu 111	Uub 112	Uut 113	Uuq 114	Uup 115	Uuh 116	Uus 117	Uuo 118

Lanthanide Series														
La 57	Ce 58	Pr 59	Nd 60	Pm 61	Sm 62	Eu 63	Gd 64	Tb 65	Dy 66	Ho 67	Er 68	Tm 69	Yb 70	Lu 71
Ac 89	Th 90	Pa 91	U 92	Np 93	Pu 94	Am 95	Cm 96	Bk 97	Cf 98	Es 99	Fm 100	Md 101	No 102	Lr 103
Actinide Series														

4

Be

Beryllium

## **Beryllium (Be) 4**

- **Easily absorbed through the skin and lungs**
- **Immune system problems with hypersensitivity reactions**
- **Electronic components, metal alloys, aerospace applications, treated lenses, in steel,**

## **Beryllium (Be) 4**

- **Bicycle wheels, fishing rods and many household items**
- **Damage lungs and cause pneumonia**
- **Most common effect – berylliosis**
- **Persistent lung disorder, also damages other organs, heart**

# Beryllium (Be) 4

- Can cause allergies in people hypersensitive to this metal
- Chronic Beryllium Disease (CBD) | develop anorexia and blueness of hands and feet
- Carcinogenic



Mendeleev  
Periodic Table

1	2											3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20											21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40											41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
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9

F

Fluorine

# Fluorine (F) 9

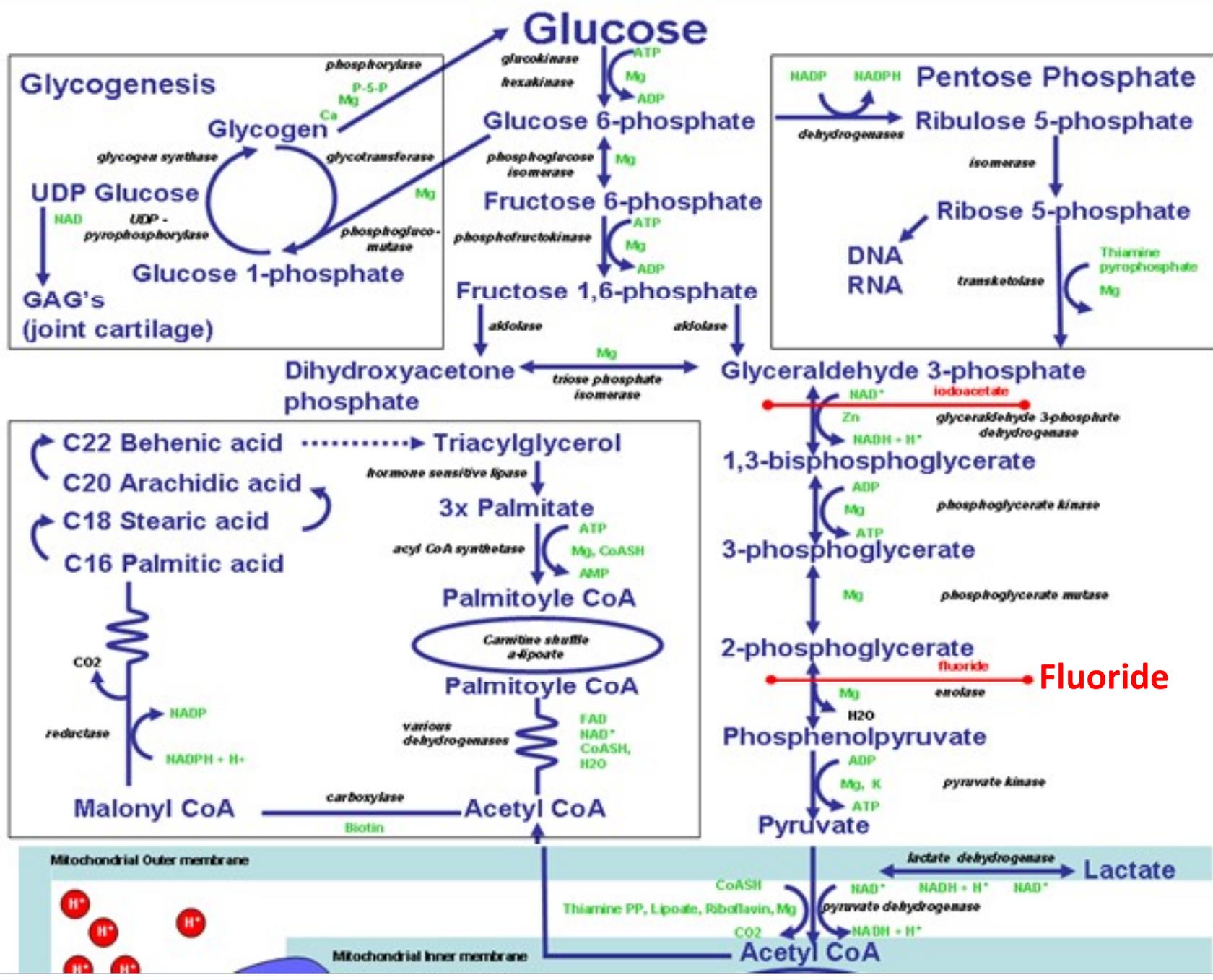
- Halogen family
- Chemically very similar to iodine
- Displaces iodine in thyroid gland
- Added to drinking water 1ppm
- Foods, medications, chemicals
- Accumulates in body

## **Fluorine (F) 9**

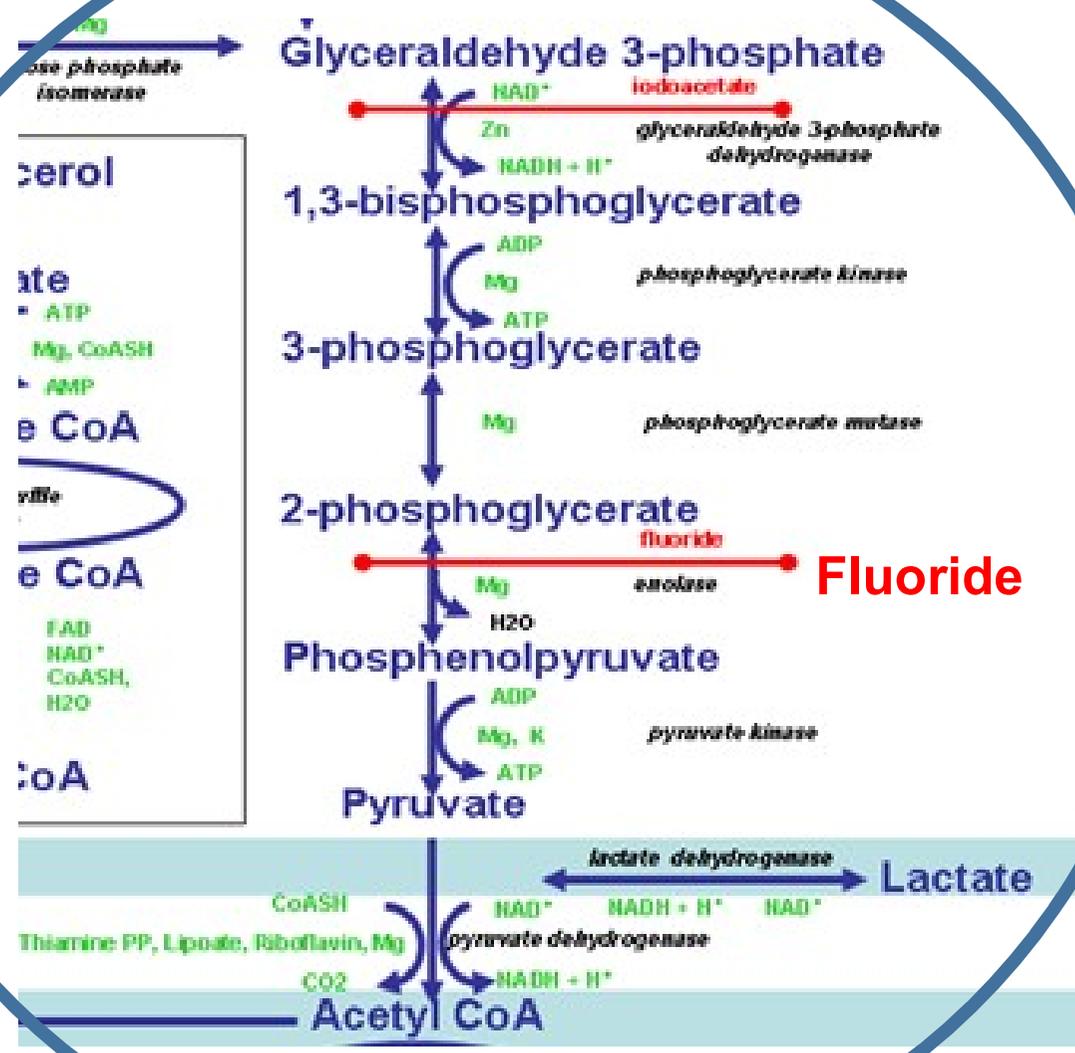
- **Slows down the production of T3 and T4 by interfering with the enzymes**
- **Inhibits the secretion of TSH**
- **Competes with TSH for receptor sites on the thyroid gland**

## **Fluorine (F) 9 - Sources**

- **Drinking water**
- **Toothpaste. Higher in Sensodyne toothpaste**
- **Tea – accumulates more fluoride than any other edible plant**
- **Fluoride pesticides**
- **Soft/carbonated drinks**
- **Medication eg SSRI**

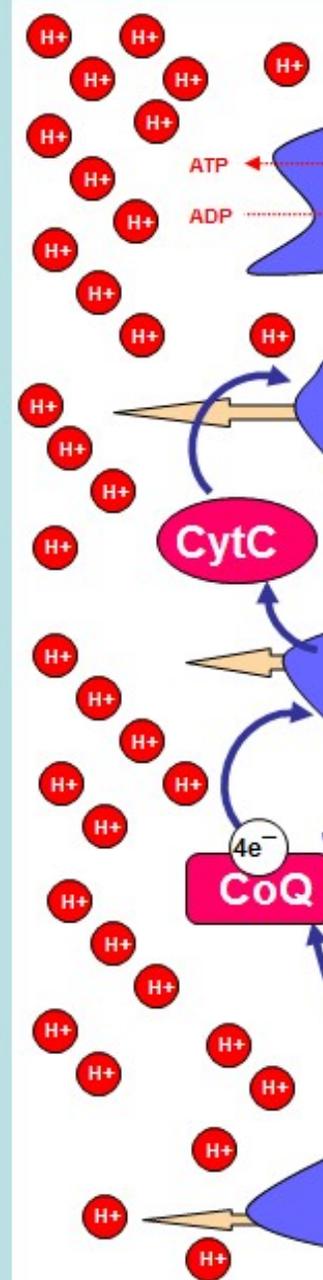


**Fluoride**

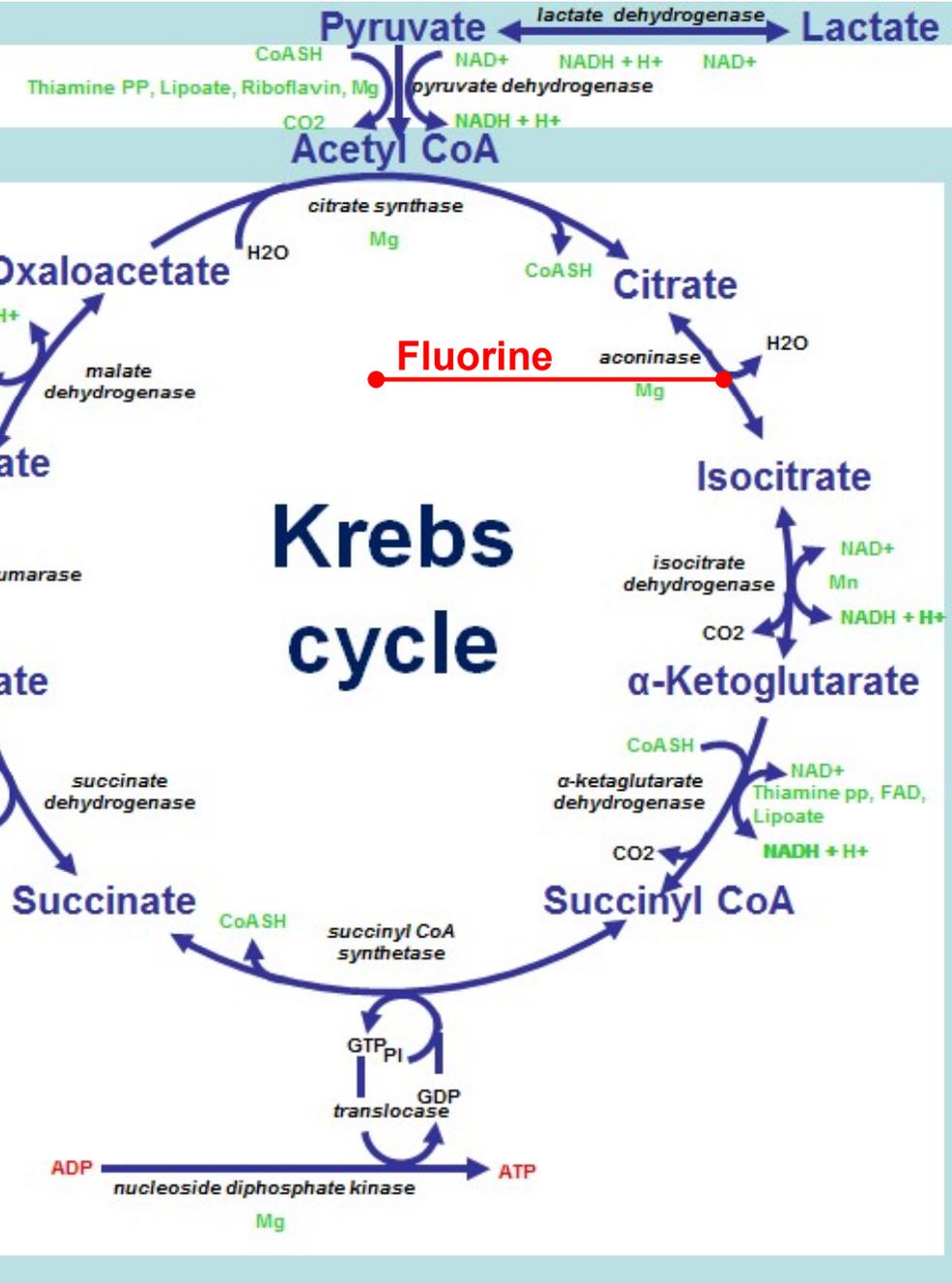
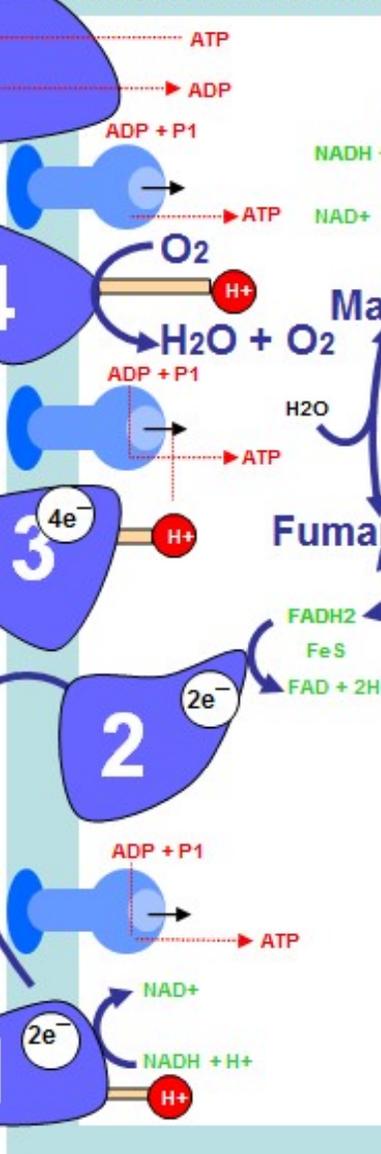


- $\text{Mg}$
- $\text{NAD}^+$
- $\text{ATP}$
- $\text{Mg, CoASH}$
- $\text{AMP}$
- $\text{CoA}$
- $\text{FAD}$
- $\text{NAD}^+$
- $\text{CoASH, H}_2\text{O}$
- $\text{CoA}$

Mitochondrial Outer membrane



Mitochondrial Inner membrane



# Krebs cycle

Fluorine

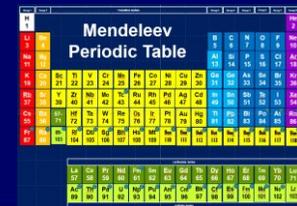
**Biomarker for Fluoride toxicity  
and maybe requirement.  
The teeth require calcium  
hydroxyfluoroapatite for their  
enamel.**

## **Products**

**Calcium fluoride 100ml**

**Calcium phosphate 100ml**

**Fluoride catalyzes the diffusion of calcium and phosphate into the tooth surface, which in turn remineralizes the crystalline structures in a dental cavity. The remineralized tooth surfaces contain fluoridated hydroxyapatite and fluorapatite.**



Mendeleev  
Periodic Table

A small, colorful periodic table of elements is located in the bottom right corner of the slide. It features the title 'Mendeleev Periodic Table' and displays the standard layout of elements with their symbols and atomic numbers.

13

Al

Aluminium

# Aluminium (Al) 13

- **Most widely distributed metal on the planet**
- **Cookware, soft drink cans, foil, deodorant**
- **Processed and frozen food packaging**



## **Aluminium (Al) 13**

- **Antacids, aspirin, vaccine, flour, table salt**
- **Accumulates in kidney, liver, lungs, thyroid where it competes with calcium for absorption and can affect skeletal mineralisation**
- **Targets CNS. Brain disease.**

## **Aluminium (Al) 13**

- **Linked to degenerative brain diseases such as Alzheimer's**
- **Accumulates with age leading to elderly cognitive impairment**
- **Autopsy study found elderly to have 20+ times more than middle aged group**

# Aluminium (Al) 13

- Agency for Toxic Substances and Disease states Al is one of the metals to affect neurological system
- Mining, factory, welding. Vapours in a super absorption state – to blood, bones, brain



# 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.



**Dr Goodheart says**

Always think about  
**aluminium toxicity** in low  
phosphorus cases.

**Aluminium** removes the phosphorus from  
the phospholipid cell membranes.

## **Antacids containing Aluminium**

**Aluminium combines with phosphorus and calcium preventing optimal absorption. Aluminium can be absorbed into bones leading to osteomalacia.**

**Look also for other sources of aluminium such as cans and pans.**

17

Cl

Chlorine

# Chlorine (Cl) 17 - Sources

- Water purification, swimming pools, disinfectants and bleach
- Depletes P-5-P, inhibits pathway to make P-5-P
- Paper production, paints, plastics and solvents
- Most cancer patients weaken to Chlorine.



Mendeleev Periodic Table

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**28**

**Ni**

**Nickel**

## **Nickel (Ni) 28**

- **Dental metal in crowns, bridges, dentures, inlays, implants**
- **Metals in combination in dental alloys**
- **Used to be gold, silver, platinum, palladium, copper**
- **Now nickel, chrome - cheaper**

## **Nickel (Ni) 28**

- **Faraday's law – dissimilar metals corrode when in contact**
- **Different alloys in mouth – different dentists and times**
- **Same alloy – different amounts of each metal, not evenly mixed**

## **Nickel (Ni) 28**

- **Orthodontics may contain Ni**
- **In contact with saliva, acidic fluids and temperature change – the UK Bristol Dental Hospital warns of corrosion and ingestion**

## **Nickel (Ni) 28**

- **NY University School of Medicine found increased risk of lung cancer, CV, neurological problems, development in children, high Bp**
- **Free radicals lead to oxidative de damage**

## Nickel (Ni) 28



- Damages kidney and liver
- University of California have linked Ni to breast cancer. Binds to oestrogen receptors
- Can damage reproductive health, infertility, miscarriage, birth defects, nervous system defects

## **Nickel (Ni) 28**

- **Jewellery – nickel plating gives a shiny look**
- **Silver and gold contain varying amounts of nickel**
- **Study in Saudi Arabia “Ni induced cytotoxicity, oxidative stress and apoptosis negated by antioxidant curcumin”**

## 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.

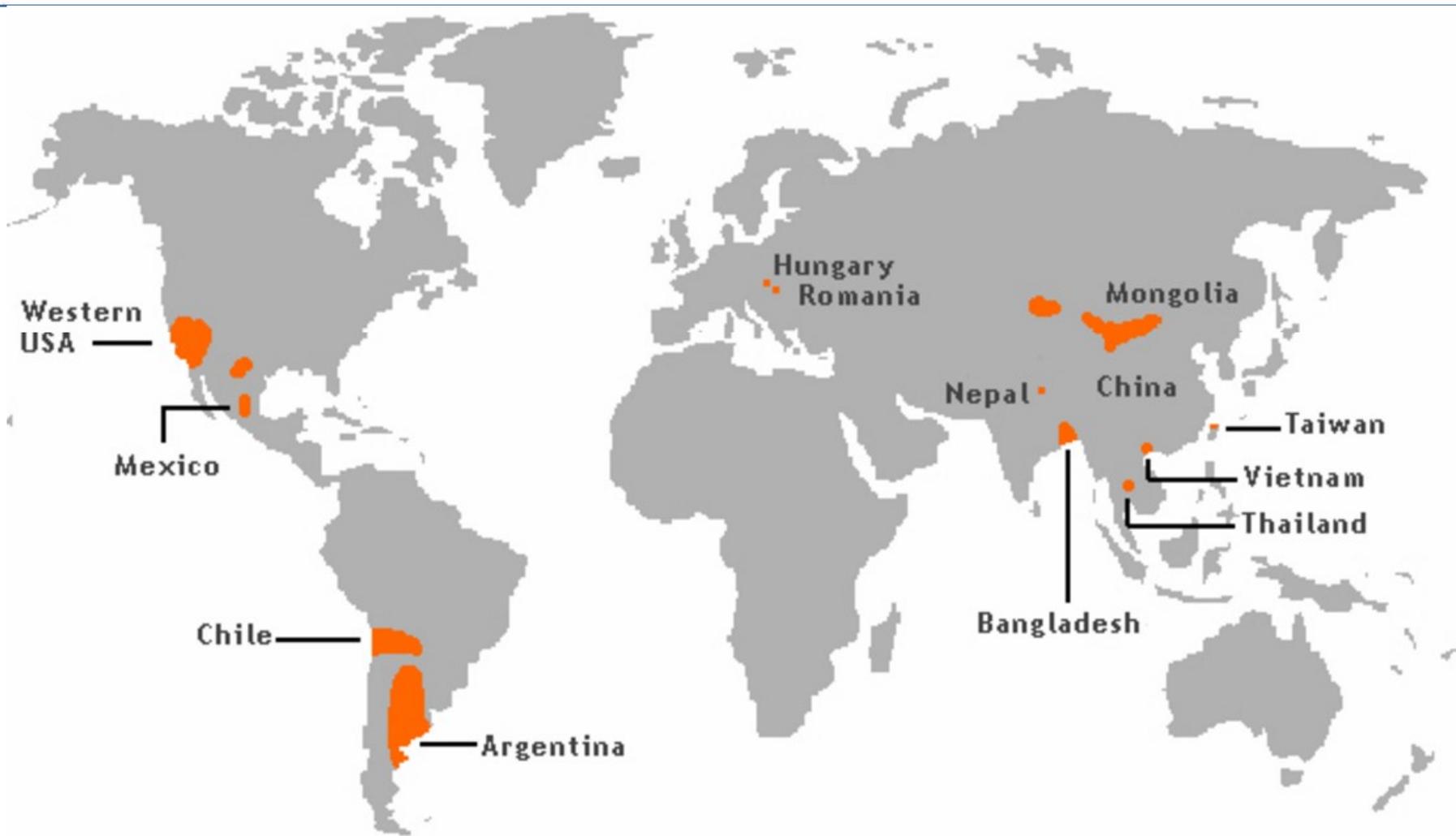
Cosmetics and permanent waves.

Tobacco smoke, industrial exposure and ceramics. Superphosphate fertilizers.

33

As

Arsenic



**Arsenic poisoning is a global problem arising from naturally occurring arsenic in ground water.**

# Symptoms of Arsenic Poisoning

- Initial – headaches, confusion, severe diarrhea, drowsiness
- Convulsions and fingernail pigmentation (leukonychia striata – Mees' lines)
- Acute – diarrhea, vomiting, vomiting blood,



# **Symptoms of Arsenic Poisoning**

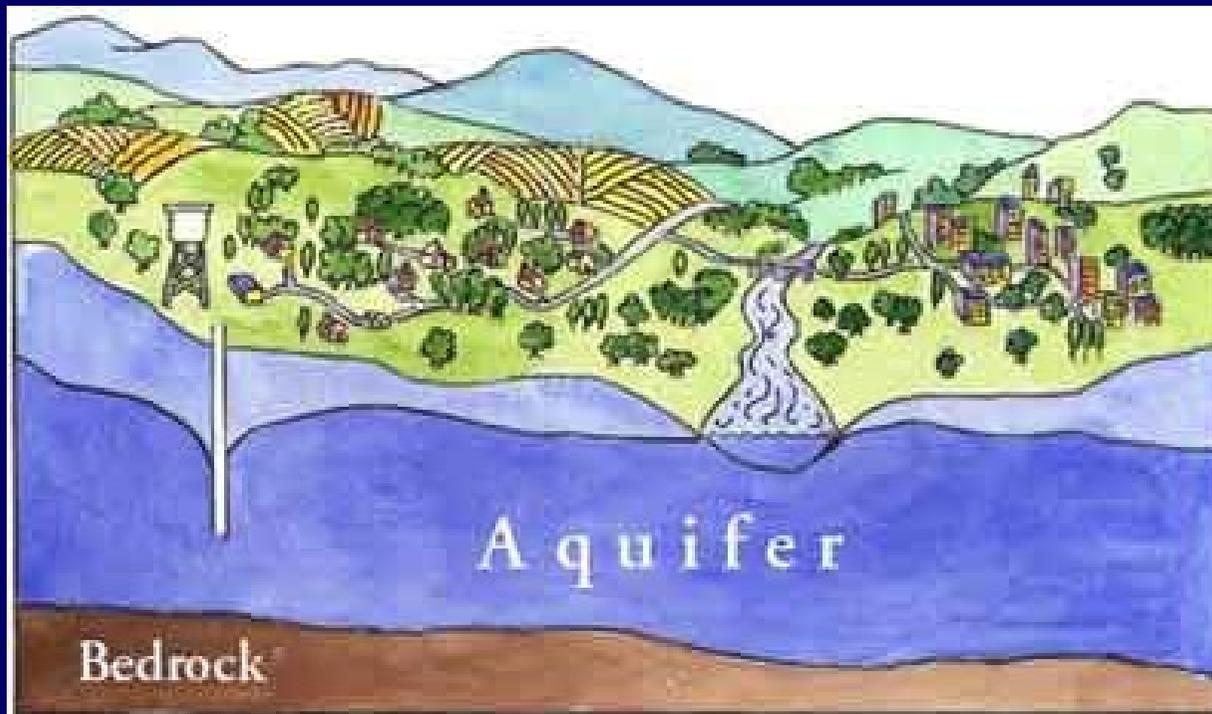
- **Blood in the urine, cramping muscles, hair loss, stomach pain and more convulsions**
- **Final result is coma and death**
- **The acute minimal lethal dose in adults is between 70 to 200mg or 1 mg/kg/day**

# **Symptoms of Arsenic Poisoning**

- **Inorganic arsenites (arsenic III) in drinking water have a much higher acute toxicity than organic arsenates (arsenic(V))**
- **Chronic arsenic poisoning results from drinking contaminated well water over a long period of time**

# Symptoms of Arsenic Poisoning

- Many aquifers contain high concentrations of arsenic salts



## **Sources of Arsenic**

- **In Asia it is still a popular pesticide. Inorganic rice particularly brown**
- **Rice is susceptible to accumulation of As from the soil**
- **Found in commercially grown chicken due to the feed**

## **Sources of Arsenic**

- **Feed additives roxarsone and nitarsone which are used to control the parasitic infection coccidiosis and to increase weight and skin colouring of the poultry**
- **In 2015 high levels found in 83 Californian wines**

## **Sources of Arsenic**

- **Seafood.** The current biological exposure index for U.S. workers of 35 ug/L total urinary arsenic may easily be exceeded by a healthy person eating a seafood meal

## **Sources of Arsenic**

- **Drinking water. Varying amounts can be present in water**
- **Occurs naturally at low levels in many groundwater sources as a result from leaching from certain types of sedentary rock**
- **In certain areas background**

## **Sources of Arsenic**

- **levels are higher because of the type of rock through which the raw water passes**
- **In 2004 based on WHO advice the EU tightened limit to 10ug/L, 5 times lower than previous standard**

**Inorganic arsenic trioxide found in ground water particularly affects voltage-gated potassium channels, disrupting cellular electrolytic function resulting in neurological disturbances -**

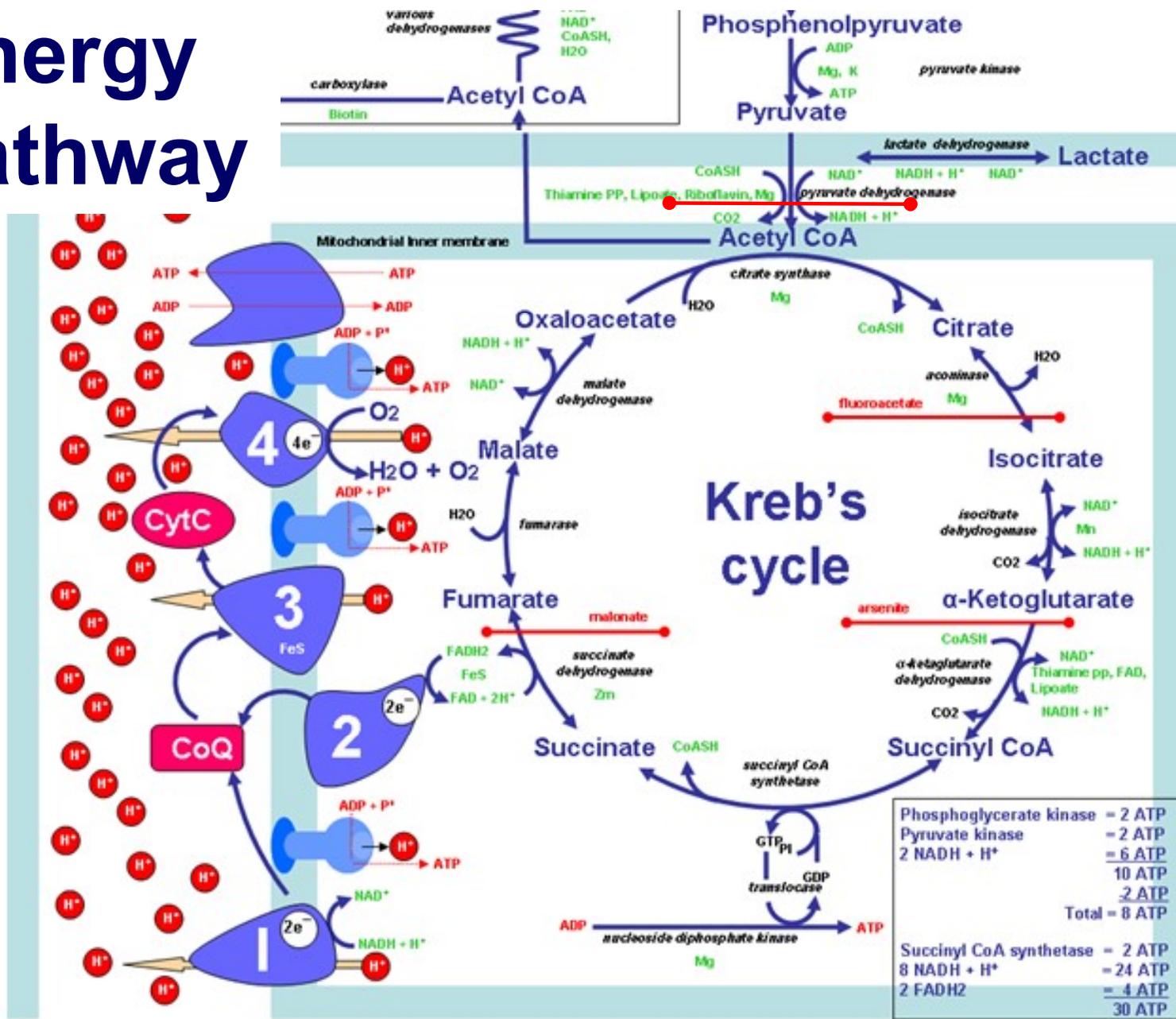
**cardiovascular episodes such as prolonged QT interval, neutropenia, high blood pressure, central nervous system dysfunction, anemia, and death.**

**Tobacco plants essentially take up arsenic naturally present in the soil. Also, in the past, the potential for elevated arsenic exposure was much greater when tobacco plants used to be treated with lead arsenate insecticide.**

# **Arsenic and Chronic Diseases**

- **Heart disease, hypertension-related CV disease**
- **Cancer**
- **Stroke (cerebrovascular diseases)**
- **Chronic lower respiratory**
- **Diabetes**

# Energy pathway



**Arsenic interferes with cellular longevity by allosteric inhibition of an essential metabolic enzyme *pyruvate dehydrogenase complex*, which catalyzes the oxidation of pyruvate to acetyl-CoA by NAD<sup>+</sup>.**

**Also inhibits *alpha-ketoglutarate dehydrogenase enzyme*.**

**With the enzyme inhibited, the energy system of the cell is disrupted resulting in a cellular apoptosis episode. Biochemically, arsenic prevents the use of thiamine resulting in a clinical picture resembling thiamine deficiency.**

**By competing with phosphate it uncouples oxidative phosphorylation, thus inhibiting energy-linked reduction of NAD<sup>+</sup>, mitochondrial respiration, and ATP synthesis.**

**Poisoning with arsenic can raise lactate levels and lead to lactic acidosis.**

**Chronic exposure is related to vitamin A deficiency which is related to heart disease and night blindness.**

## **As & Cardiovascular disease**

- **Vascular endothelial dysfunction as it inactivates nitric oxide synthase, leading to a reduction in the generation and bioavailability of nitric oxide, causing vasodilation problems**
- **Induces high oxidative stress affects the function of CVS**

## **As & Cardiovascular disease**

- **Induce atherosclerosis by increasing the platelet aggregation and reducing fibrinolysis**
- **Can cause arrhythmia by accelerating the cellular calcium overload**

## **As & Cardiovascular disease**

- **Low potassium levels in the cells increases the risk of experiencing a life-threatening heart rhythm problem from arsenic trioxide**

## **As & Inflammation**

- **As in cells stimulates the production of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>)**
- **When H<sub>2</sub>O<sub>2</sub> reacts with certain metals like iron and copper it produces the highly reactive hydroxyl radical**

## **As & Inflammation**

- **Chronic exposure upregulates the expression of tumour necrosis factor- $\alpha$ , interleukin-1, vascular cell adhesion molecule and vascular endothelial growth factor – all of which induce CV pathogenesis**

## **Chelation**

**Dimercaprol and dimercaptosuccinic acid are chelating agents that sequester the arsenic away from blood proteins and are used in treating acute arsenic poisoning. The most important side effect is hypertension.**

## Nutrition

Supplemental potassium decreases the risk of experiencing a life-threatening heart rhythm problem from arsenic trioxide.

A-Lipoic acid is the principle natural chelator.

Taurine + Colloidal silver, silica, ornithine, sulphur, selenium



Mendeleev Periodic Table

1	2											3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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48

Cd

Cadmium

## **Cadmium (Cd) 48**

- **Exposure through plant derived food, phosphate fertilisers, batteries**
- **Component of cigarettes – every cigarette involves 1.4 mcg reducing antioxidant activity**
- **Can increase the thickness of the basal membrane of capillaries, reducing circulation**

## Cadmium (Cd) 48

- Sources – Liver, Kidney, Shellfish, Agriculture sludge used as a fertilizer



## Cadmium (Cd) 48

- In women disrupts uterine circulation leading to premature birth or foetal deformities, size
- US EPA – impact – reproductive, pulmonary, kidneys, eyes, brain, prostate, testosterone, bone and dopaminergic in young



## **Cadmium (Cd) 48**

- **Hypertension**
- **Reduces glutathione peroxidase, SOD and Catalase.**
- **Affects the mitochondria at Complex IV.**
- **Lung and prostate cancer and sarcomas.**

## **Cadmium (Cd) 48**

- **Carcinogen and linked to pancreatic cancer**
- **Detrimental effect on CNS Decreased attention & memory. Induces neuron cell death**
- **Induces calcium excretion especially when Vitamin D levels are low.**

## **Toxic metals disrupt the thyroid**

- **Cadmium blocks the action of selenium and zinc and depletes levels in the body. So with cadmium toxicity supplement with zinc, selenium and cobalt (Vitamin B12)**
- **These are required for conversion of T4 to T3**
- **Lead suppresses conversion of T4 to T3**

**Cadmium inhibits decarboxylase  
enzymes**

**e.g. Histamine decarboxylase**

**L.DOPA decarboxylase**

**Tryptamine decarboxylase**

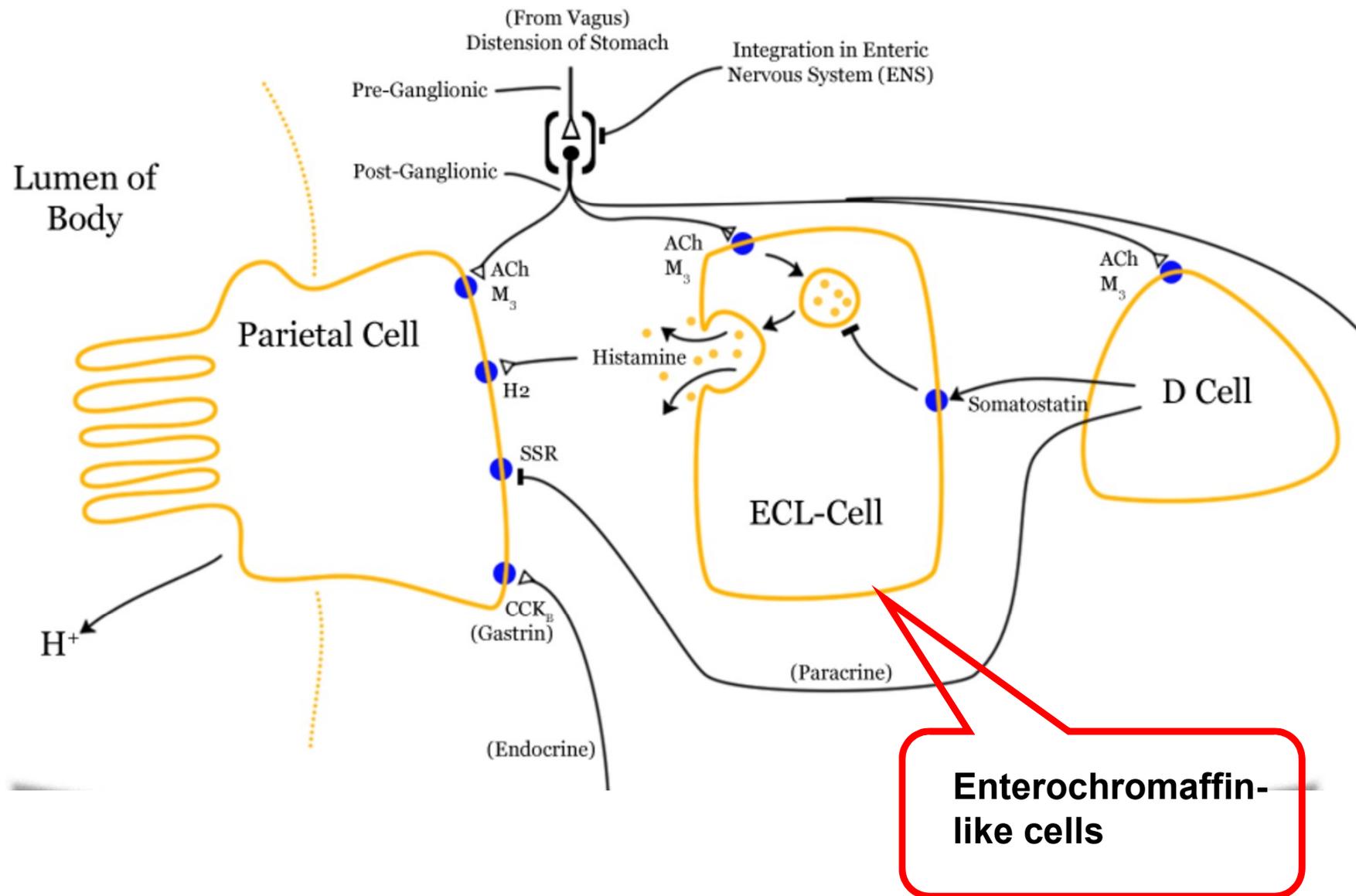


**Cadmium inhibits the secretion of gastrin.**

**Gastrin is a peptide hormone that stimulates secretion of gastric acid (HCl) by the parietal cells of the stomach and aids in gastric motility.**

**It is released by G cells in the pyloric antrum of the stomach, duodenum, and the pancreas.**

**It mediates the release of histamine which in turn stimulates the parietal cells to secrete H<sup>+</sup> ions.**



**Enterochromaffin-like cells**

**HISTADINE**

**CO<sub>2</sub>**

**Vit B6 (or Vit B1)**

**Mg, Zn**

*decarboxylase*

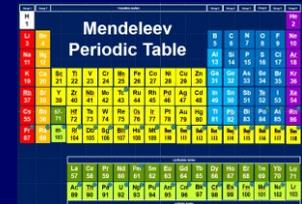
*(inhibited by high levels of CO<sub>2</sub>*

*Cadmium)*

**HISTAMINE**

# Cadmium and enzymes

- Cadmium inhibits decarboxylase enzymes (P5P)
- L. DOPA to Dopamine
- 5HTP to Serotonin
- Histidine to Histamine



Mendeleev Periodic Table

A small, colorful version of the Mendeleev periodic table is located in the bottom right corner of the slide. It features the standard layout of elements with their symbols and atomic numbers, color-coded by groups.

51

Sb

Antimony

## **Antimony (Sb) 51**

- **Naturally occur as ore deposit or as a white powder**
- **Mica – mineral powder foundation and make up**
- **Flame retardant – toys, car seat covers, kids' clothing, uniform for fire fighters**
- **Brake pads on heavy vehicles**

## Antimony (Sb) 51

- EPA and EU have standards for drinking water. But in UK need to be careful of drinking juice concentrates. Discovered levels exceeding tap water requirements



# Antimony (Sb) 51

- Mail online 2010. “Fruit juice cancer warning as scientists discover harmful chemical in 16 drinks”
- Sb can leak from plastic bottles into water. California law 2009 test for Sb in water



Mendeleev Periodic Table

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80

Hg

Mercury

## Mercury (Hg) 80

- Only liquid metal at room temperature. Emits very toxic fumes
- Accumulates in fish, particularly large fish like tuna
- Inoculation with vaccines
- Dental amalgams



## **Mercury (Hg) 80**

- **Amalgams in the mouth with other dental metals react and cause up to 10 times more mercury to be released**
- **An alloy on top of an amalgam drives the Hg thorough the nerves of teeth directly to brain**

## **Mercury (Hg) 80 - Neurological**

- **Vapour emitted during the life of the amalgam. Goes into the lungs and deposited in brain and vital organs**
- **In Multiple Sclerosis and Parkinson's, high levels found in CSF**

## **Mercury (Hg) 80 - Neurological**

- **Autism Research Institute convinced that mercury is the prime cause**
- **Prof Boyd Haley shown that autistic children lack the mechanism for excreting Hg**
- **Vaccines deliver a dose 64 times**

# **Mercury (Hg) 80 - Neurological**

- **Greater than the adult allowed exposure**
- **Mg from mother's amalgams passing through the umbilical cord**
- **Hg in breast milk**

## **Mercury (Hg) 80 – Learning**

- **Hg stored in the foetus and concentrated in mother's milk**
- **If mother drinks alcohol the amount of mercury deposited in the foetus increases**
- **Reduces intelligence, learning ability and risk of hyperactivity**

## **Mercury (Hg) 80 – Alzheimer's**

- **High levels found in brains of Alzheimer's patients**
- **Rats and monkeys given same amount of Hg show same changes in brain**
- **Remedy Acetyl-L-carnitine. Made from methionine. Hg depletes methionine in body**

## **Mercury (Hg) 80 – Alzheimer's**

- **APOE4 – 2 arginine molecules instead of cysteine. Cysteine gives protection against Hg**
- **Prof Boyd Haley “Mercury poisoning bears all the diagnostic hallmarks of Alzheimer's disease”**

## **Mercury (Hg) – Mental conditions**

- **Psychosis discovered in children of 12 years – selenium remedy**
- **Anxiety and depression**
- **Obsessive compulsive behaviour**
- **Memory loss**
- **Decreased self confidence**

# **Mercury (Hg) – Mental conditions**

- **Inability to comprehend or accept new ideas**
- **Sleep disturbances**
- **Eye problems**
- **tremor**

## **Mercury (Hg) 80 – Dentists**

- **In tests dentists who worked with Hg compared to those who did not**
- **Reduced hand co-ordination**
- **Reduced concentration**
- **Reduced memory**
- **Reduced intelligence**

## **Mercury (Hg) 80 – The Gut**

- **Hg lodges in the gut**
- **Alters gut bacteria because Hg is so toxic only certain bacteria can survive**
- **Leads to growth of unwanted organisms causing gut inflammation and leaky gut**

## **Mercury (Hg) 80 – The Gut**

- **Food leaks out and reacts with the immune system causing multiple allergies**
- **This increases body's acidity which reduces the resistance to Hg overall. Reduced nutrition.**
- **Vicious circle leading to MCDs**

## **Mercury (Hg) 80 – The Gut**

- **Hg causes the bacteria in the gut to become antibiotic resistant**
- **These pass on the resistance not only to their offspring but to other species of bacteria**
- **Antibiotic resistant bacteria is an ever increasing problem**

# **Toxic metals disrupt the thyroid**

- **Mercury – reduces production of T4 and inhibits conversion of T4 to T3**
- **Selenium antagonist and selenium is required by enzyme that converts T4 to T3**

# Mercury

Dental amalgams. Vaccines

High fructose corn syrup

Sanitary towels, Cotton balls and buds, Dental floss,

Toothpicks, Paints, Explosives, Batteries,

Mercurial diuretics, Fungicides, Laxatives containing camomel, Hemorrhoid suppositories,

Fluorescent lamps, Cosmetics, Hair dyes. Fibreglass,

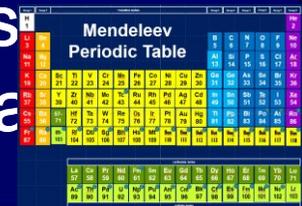
Manufacture and delivery of petroleum. Sewage sludge.

Methylmercury chlorine bleaches. Fabric softeners,

Polishes, wood preservers, Latex, Solvents, Plastics,

Inks used by printers and tattooists, some Paints

Salt, Fish from contaminated water such as tuna



Mendeleev  
Periodic Table

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82

Pb

Lead

## Lead (Pb) 82

- Lead based paint banned – older buildings
- Banned from petrol but still in aviation fuel
- Soil contaminant as will not decay, not biodegradable. Root crops in particular. Chickens.



## **Lead (Pb) 82**

- **One study looked at accumulation in bones and noted higher concentrations in elderly linked to cognitive decline**
- **Associated with learning difficulties in children, lower IQ, hearing loss**

## **Lead (Pb) 82**

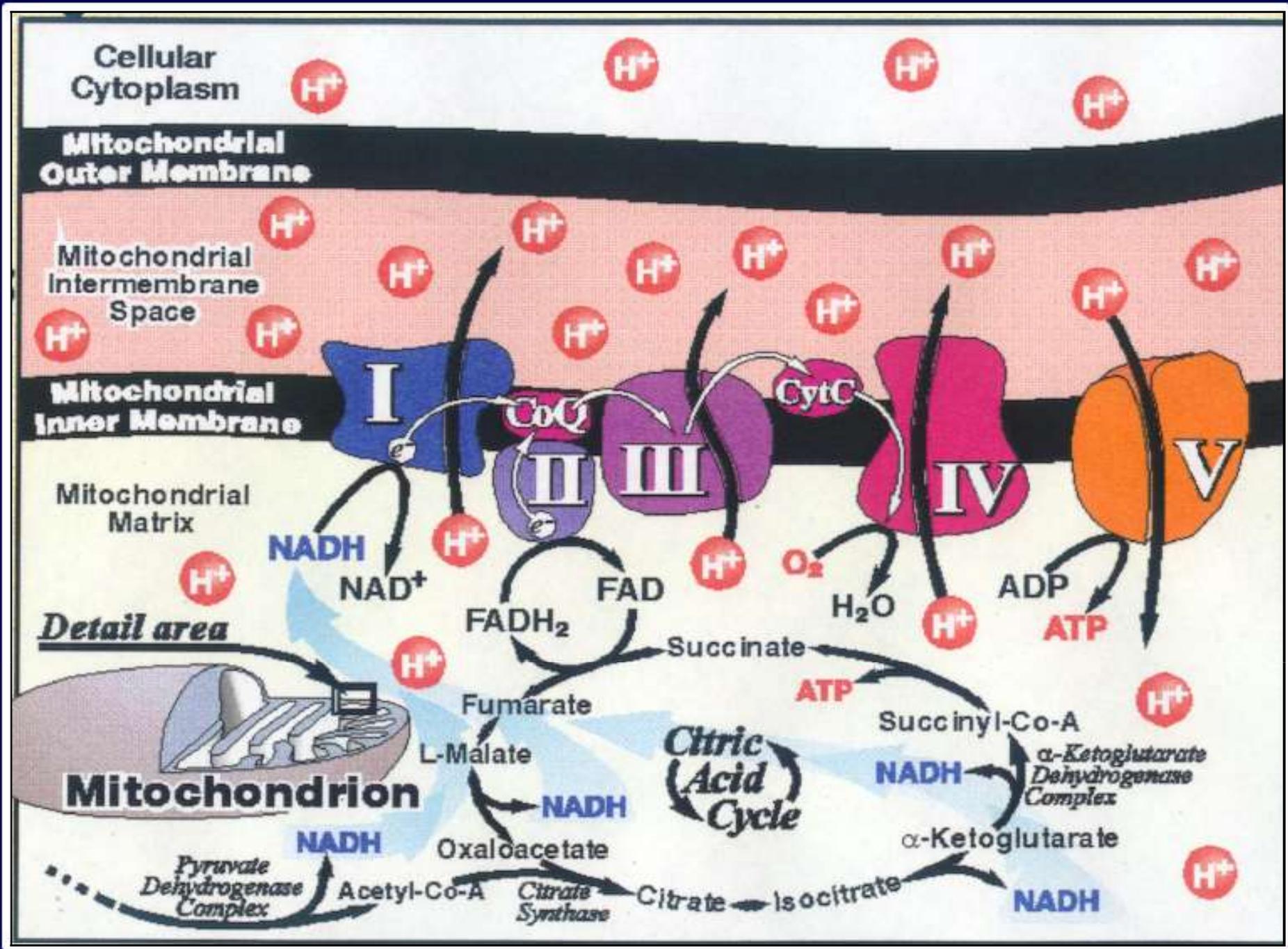
- **Pb interacts with glutathione, glutathione peroxidase and selenium so blocking our antioxidant defence mechanism**
- **Blocks the porphyrin pathway so inhibiting production of heme**
- **Lead suppresses conversion of T4 to T3**

## **Lead (Pb) 82**

- **Causes spasm in smooth muscles of digestive system leading to abdominal pain**
- **Causes hyper tension**
- **Renal impairment**
- **Changes in cell membrane of red blood cells leading to hemolysis**

## **Lead (Pb) 82**

- **Cysteine maybe good chelator along with selenium, turmeric.**



# Complex IV Cytochrome c oxidase

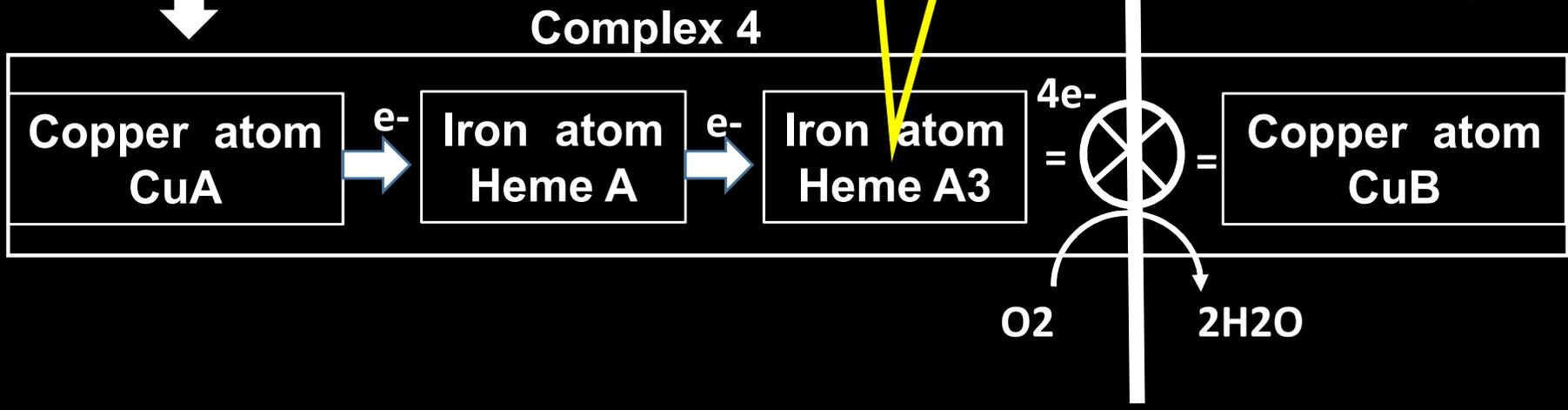
Complex 1  
 $2e^-$   
CoQ10

Complex 2  
 $2e^-$   
CoQ10

Complex 3  
 $4e^-$   
cytochrome c

**Lead inhibits  
Complex IV at  
Heme A3**

Complex 5  
 $4H^+$  → *ATP synthase*  
ADP → ATP



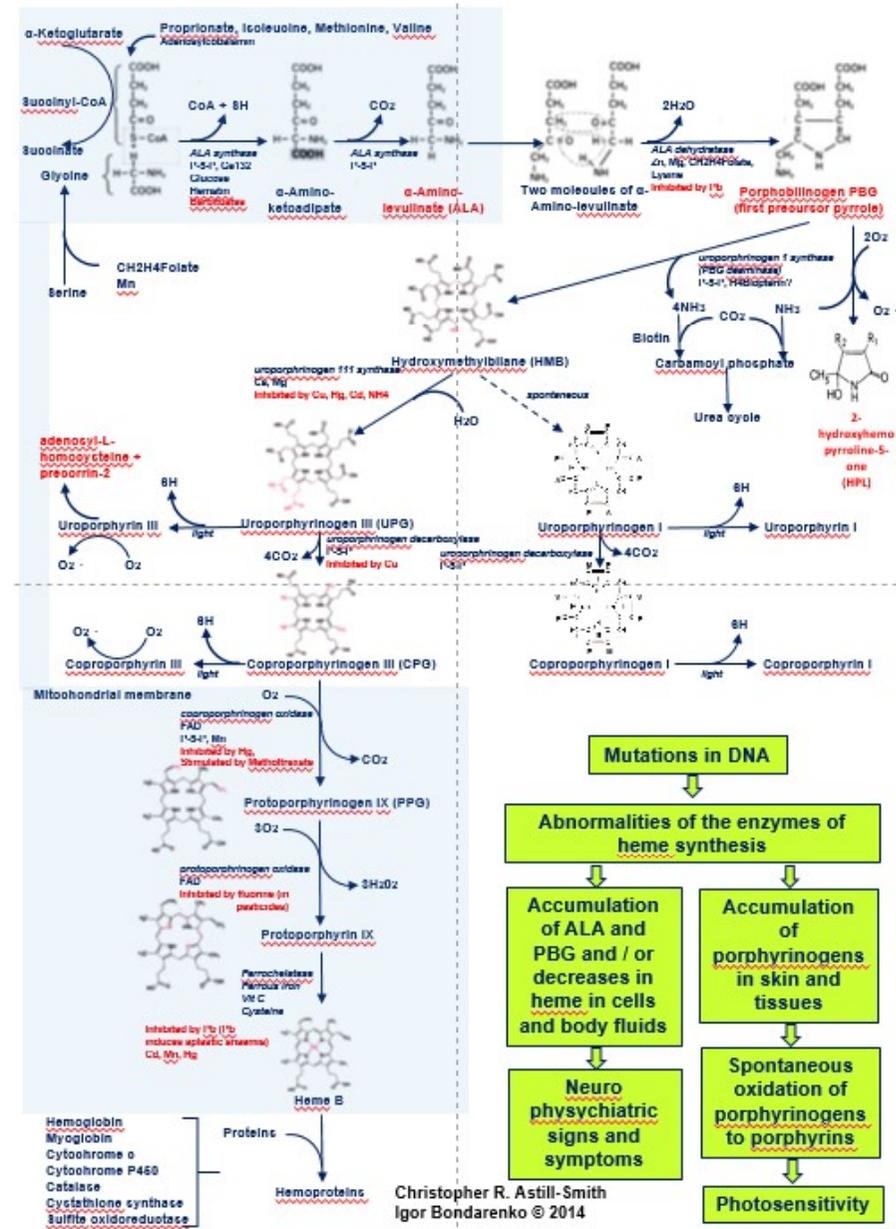
**Lead inhibits Glycine to ALA,  
ALA to BPG  
Protoporphyrin IX to Heme**

**Mercury inhibits HMB to UPG  
CPG to PPG  
Protoporphyrin XI to Heme**

**Cadmium inhibits HMB to UPG  
Protoporphyrin XI to Heme**

**Fluorine inhibits PBG to  
Protoporphyrin XI**

## Porphyrin and Hemoglobin Synthesis



# NORADRENALIN

$O_2 + H_2O$

*monoamine oxidase*

$Cu^+$  FAD

$H_2O_2$

Dihydroxymandelic acid +  $NH_2$

*catechol-O-methyltransferase*

*inhibited by Lead*

SAM

$Mg^{++}$

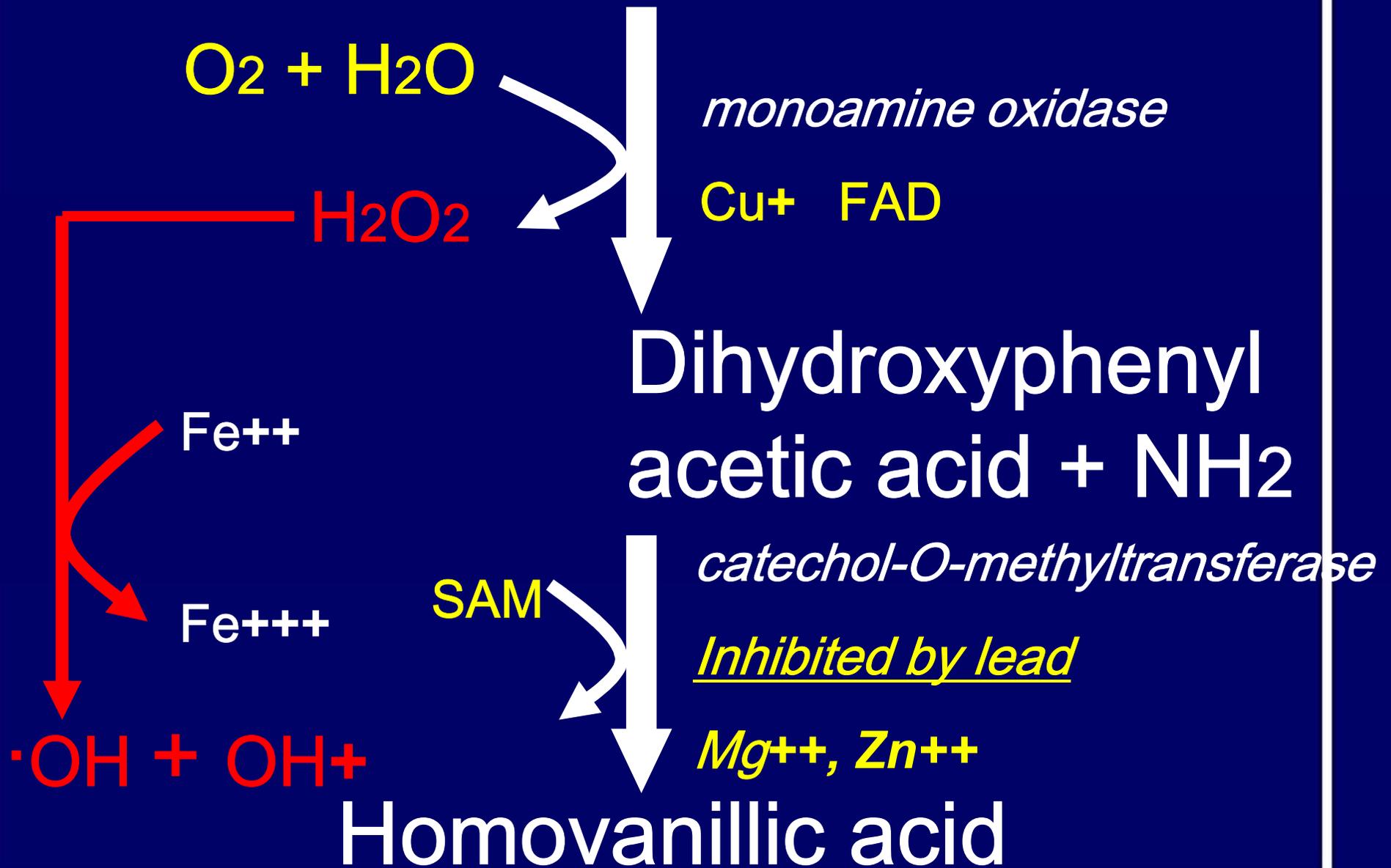
$Fe^{++}$

$Fe^{+++}$

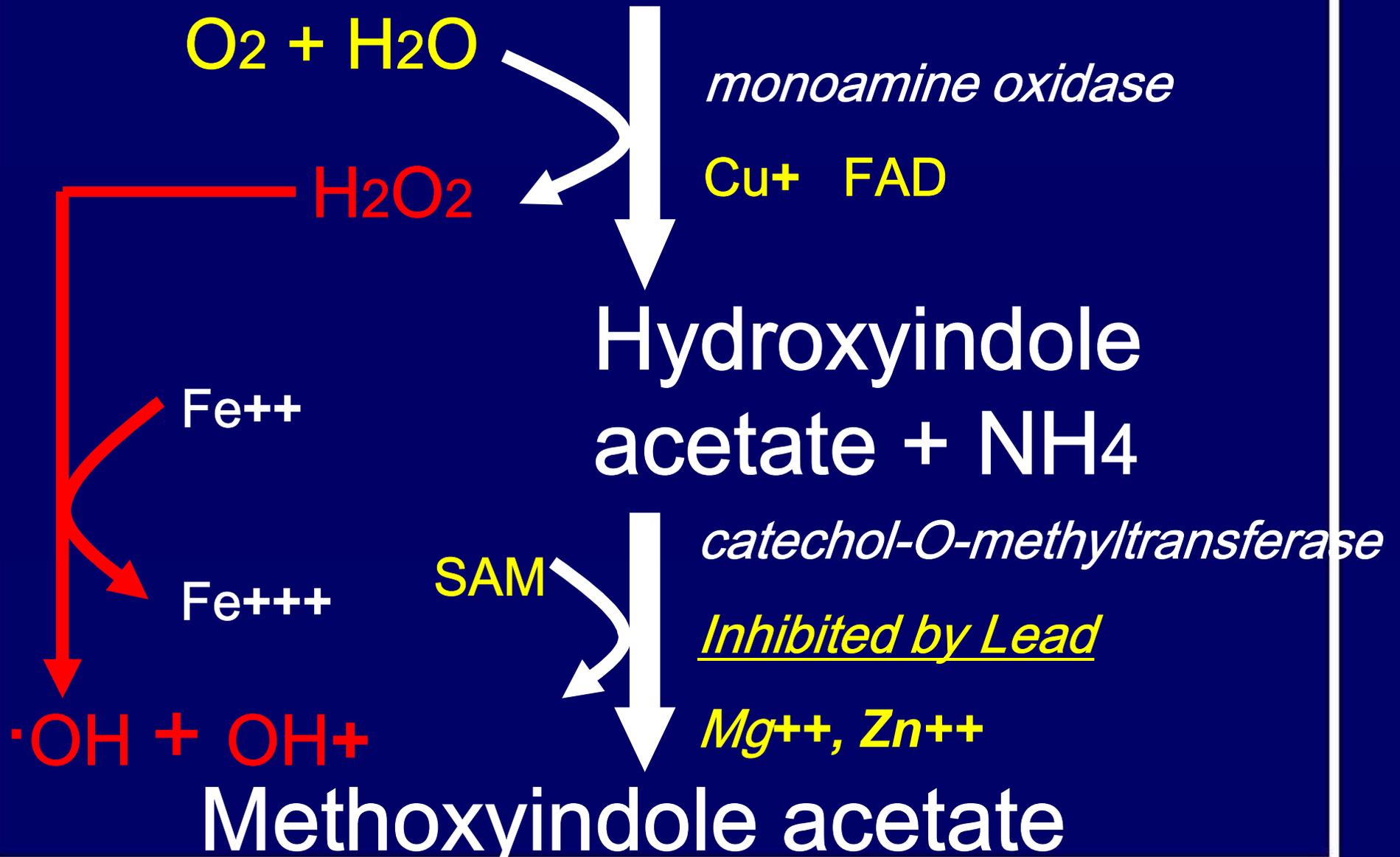
$\cdot OH + OH^+$

Vanillylmandelic acid

# DOPAMINE



# SEROTONIN



# HISTAMINE

*Methyltransferase  
inhibited by Lead*

SAM  
Methylcobalamin  
Methyltetrahydrofolate  
Betaine

**Methylhistamine**

*monoamine oxidase*  
O<sub>2</sub>  
(Fe<sup>++</sup>,  
Adenosylcobalamin)

FMN / FAD  
Cu

**Methyl imidazole acetic acid**

*diamine oxidase*

O<sub>2</sub>  
(adenosylcobalamin)

Vit C  
Fe<sup>++</sup>  
P5P

**Imidazole acetic acid**

*(systemic histamine)*  
**Natural anti histamines -  
Vit E, Zn, Mg,  
Bioflavonoids**

*aldehyde oxidase*

O<sub>2</sub>  
(adenosylcobalamin)

NAD, FAD  
Mol, Fe<sup>++</sup>  
K, Thiols

## **Glutathione conjugation**

(cysteine, glycine and glutamic acid) is catalyzed by *glutathione-S-transferase*.

This enzyme is present mostly in the cell cytosol.

This enzyme is inhibited by Lead

# Hydroxylated toxin

~~glutathione  
-S-  
transferase  
Zn<sup>++</sup>~~ **Lead**

glutathione reductase  
NADPH

GSH

**Glycine**  
P-5-P  
**Glutamic acid**  
**Cysteine**

ATP



GSSG

glutathione peroxidase  
Selenium

**Glutathione conjugate**



83

Bi

Bismuth

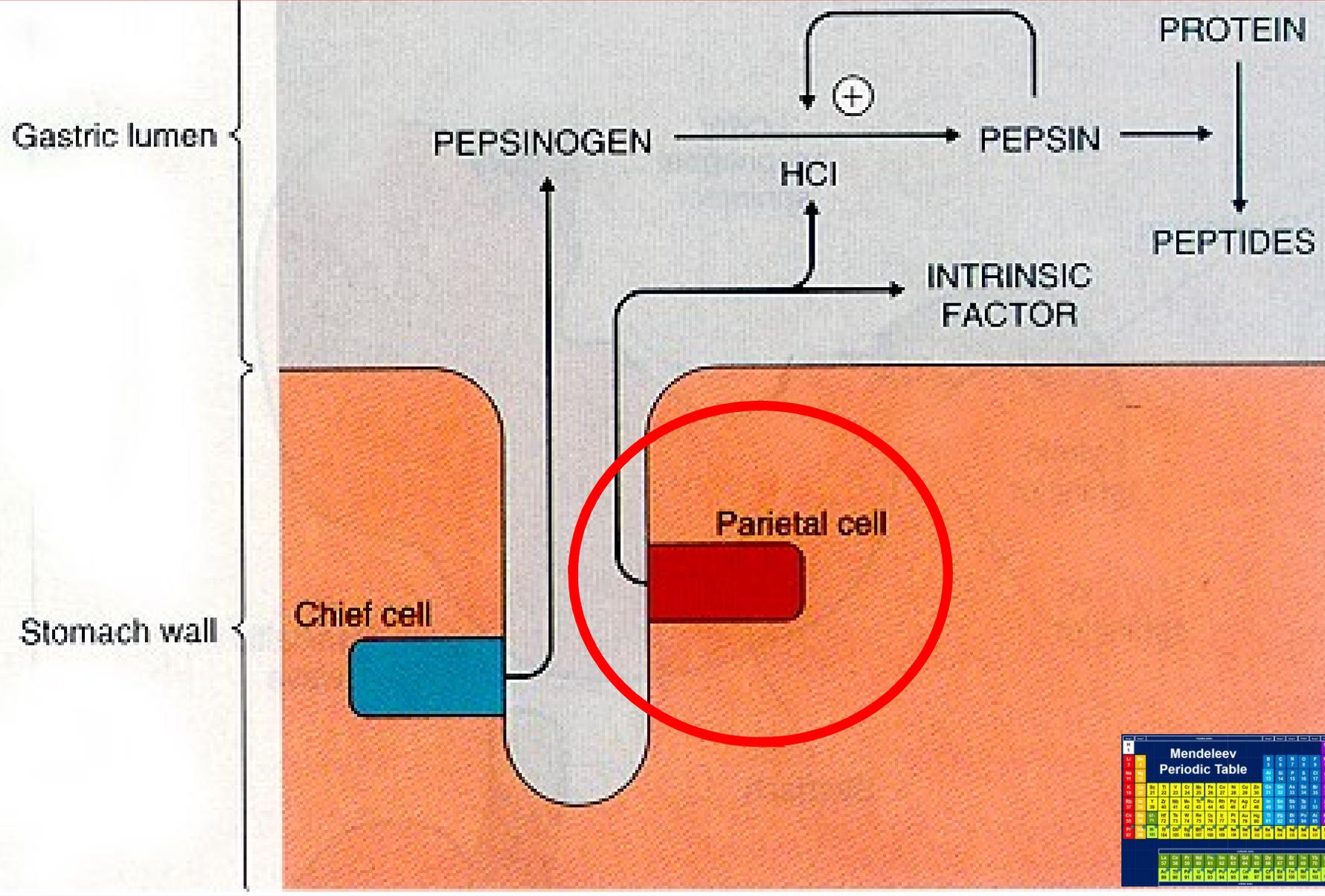
## **Bismuth (Bi) 83**

- **Bismuth subsalicylate used in over the counter medication, antacid tablets**
- **Bismuth oxychloride used in cosmetics, face powder**
- **Bismuth subgallate – to help flatulence odour**

## **Bismuth (Bi) 83**

- **Manufacture of solder, plumbers may be affected by inhaling solder fumes**
- **University of Tubingen in Germany found anaemia, reduced sperm metabolism**

Bismuth inhibits the production of HCl from the parietal cells which alongside secrete intrinsic factor. So bismuth creates B12 deficiency.



84

PO

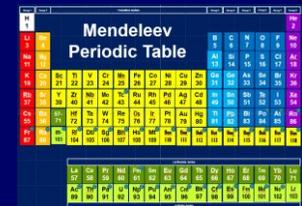
Polonium

**All polonium isotopes are radioactive.**

**Uranium > Radium > Radon >**

**Polonium > Lead.**

**Polonium has been found in tobacco  
smoke from tobacco leaves grown  
with phosphate fertilizers.**



Mendeleev  
Periodic Table

1	2											3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20											21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40											41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
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86

Rn

Radon

## **Radon (Rn) 86**

- **Naturally occurring radioactive gas**  
– odourless and tasteless
- **Formed from the radioactive decay of uranium**
- **U found in most rocks & soils**

## **Radon (Rn) 86**

- **U slowly breaks down to other products like Radium (Ra), which breaks down to Rn**
- **One of the densest substances that remains as a gas and it is radioactive**

## **Radon (Rn) 86**

- **US EPA estimates that indoor Rn exposure leads to 21,000 lung cancer deaths annually**
- **Radon may be second only to smoking as a cause of lung cancer**

## **Radon (Rn) 86**

- **Rn is responsible for the majority of public exposure to ionising radiation**
- **Single largest contributor to a person's radiation dose and is the most varied from location to location**

## **Radon (Rn) 86**

- **A significant indoor contaminant**
- **Emanates from the ground and building materials wherever uranium or thorium is high and soils containing granite or shale – more uranium**

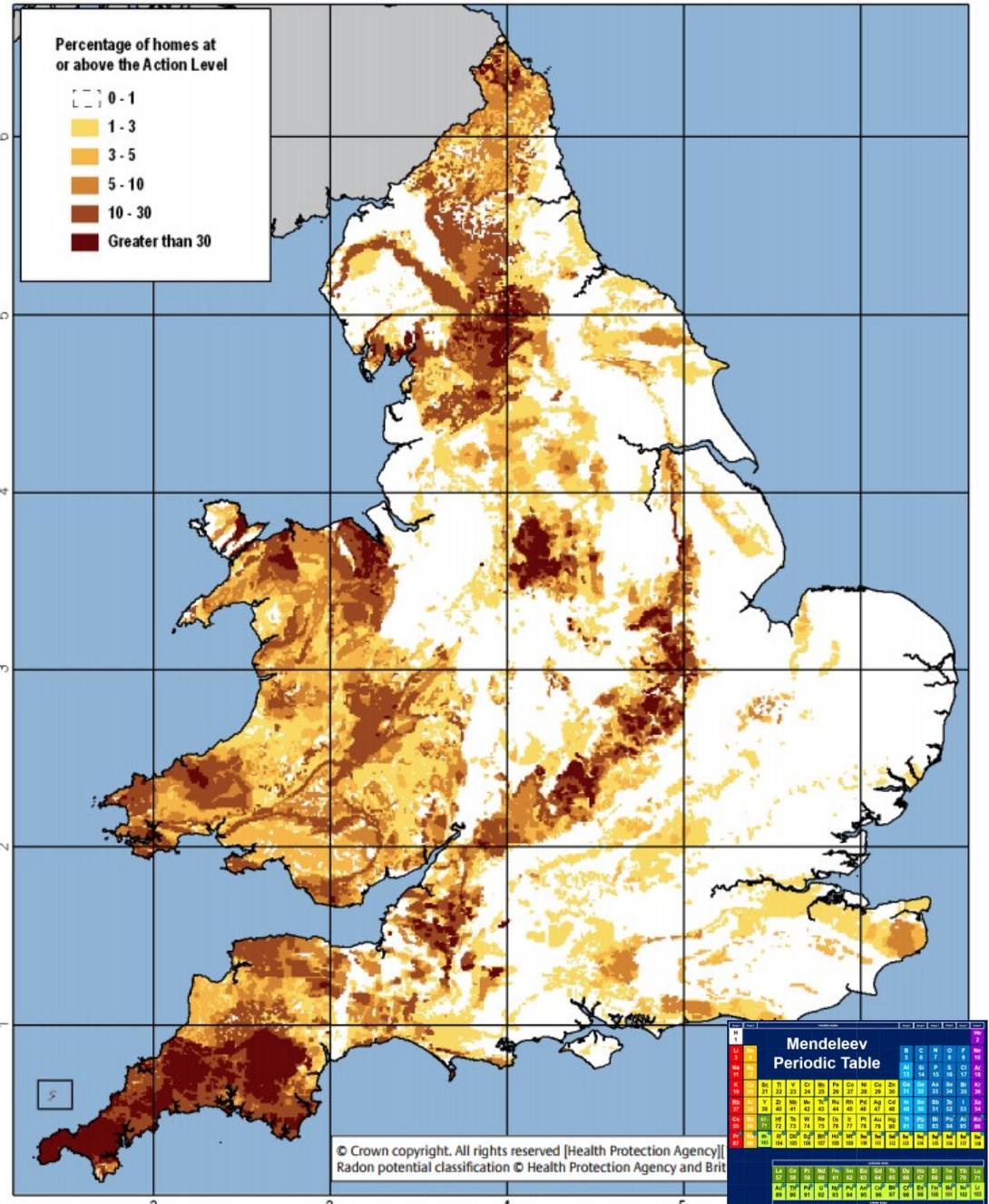
## **Radon (Rn) 86**

- **International Agency for Research on Cancer – stated Rn is carcinogenic to humans**
- **Inhalation. Danger from the radioactive products in the decay of Rn. Radiation induced cancer – lung cancer**

## **Radon (Rn) 86**

- **Found in some petrol**
- **Same boiling point as propane so freshly separated propane can be radioactive due to Rn**
- **Residues from the oil and gas industry often contain radium and its daughters**

**Every building contains radon but the levels are usually low. The chances of a higher level depend on the type of ground. Public Health England has published a map showing where high levels are more likely. The darker the colour the greater the chance of a higher level. The chance is less than one home in a hundred in the white areas and greater than one in three in the darkest areas.**



92

U

Uranium

## Uranium (U) 92

- U has been present since the earth was formed and its most common isotope has a very long half-life – 4.5 billion years
- U, Ra and Rn will continue to occur for millions of years in same concentrations as now

## **Uranium (U) 92**

- **Half lives of the 6 naturally known isotopes – uranium 233-238 varying between 69 years and 4.5 billion**
- **Unique radioactive properties used in nuclear power stations and nuclear weapons**

## **Uranium (U) 92**

- **Fallout from nuclear accidents – fish?**
- **2004 review of U toxicity in Journal of Toxicity & Environmental health**
- **Damage to kidney, reproductive system**

## **Uranium (U) 92**

- **Brain/CNS – decreased performance on neurocognitive tests**
- **DNA – reports of cancer**
- **Immune – chronic fatigue, ear/eye infections, hair/weight loss**

# Treatment

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

# **Toxins**

**Toxic metals –**

- Black walnut**
- Coriander herb**
- Yellow dock**
- Coriander spice**
- Lemon balm**
- Lipoic acid**
- Yarrow**
- Glutathione**
- NAC**
- Vitamin C for Nickel**

**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 or Shark liver oil.****

## **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.**

# Ionising Radiation



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

**Use Ornithine.**



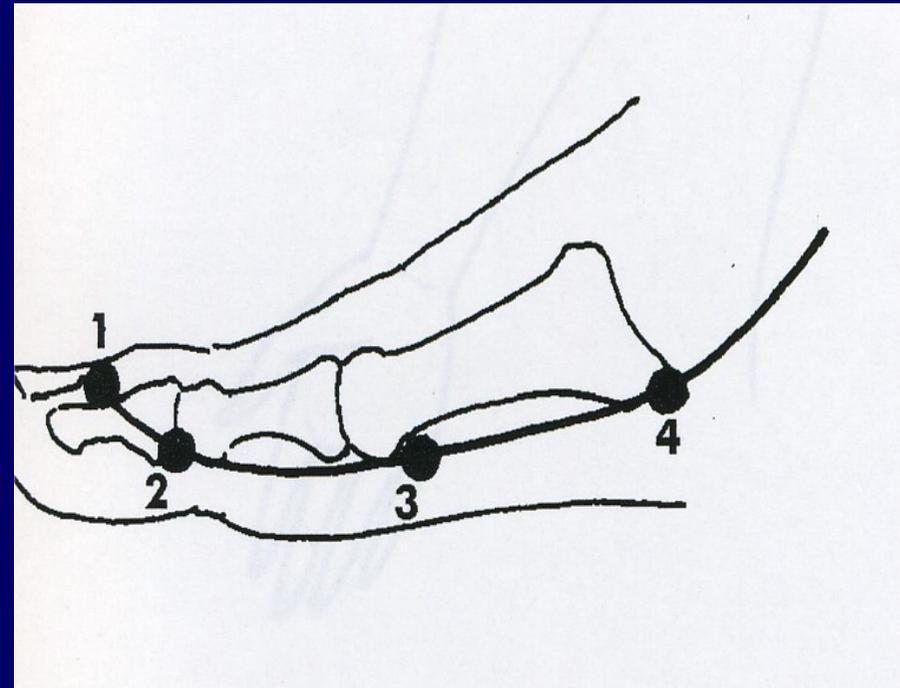
# DIAGNOSIS

Positive meridian  
will negate with  
the **RADIATION**

nosode. (Radium bromide  
1000x, Phosphorus 60x, Silica  
60x)\*

Identify  
causative  
element.

\*Vega test kit



**Spleen 4**

**Radiation -**

**Chlorella**

**Coriander spice**

**Ornithine**

**Vitamin C complex**

**(Rutin)**

**Turmeric**

**Yarrow**

## **Healthy home tips**

**Don't wear shoes in your home as they track in chemicals from outside.**

**Open windows everyday. If you don't have fresh air ventilation for at least 15 minutes daily.**

**This will dilute the chemicals in the air, rebalances the ions with nature and it rebalances the humidity.**

**Use cross ventilation.**

**Use a fan in stagnant windowless rooms.**

**Use a MERV (minimum efficiency rated value) 11 filter and change them regularly**

**Most protectors are ineffective.  
Remove or shielding is best.  
Active magnetic cancellation  
does work.**

# Summary

1. **Electricity off to bedrooms or distance yourself from the sources.**
2. **No electrical appliances near the bed**
3. **Check for static magnetics**
4. **No metal in the bed that has static magnetism – use a compass**
5. **Natural materials**
6. **No sources for a magnetic field – use a gauss meter. Possible shielding against radio waves such as foil**
7. **Timer switch for WiFi**
8. **Install a device against torsion radiation**