Metal Toxicity 2009

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History of Metal Detoxifcation as primary medical strategy

- 1960s:Max Daunderer MD in Germany starts using i.v. DMPS to help patients with chronic complex illnesses
- 1970s:NaEDTA chelation therapy evolves in the US as routine treatment for clients with cardio-vascular complaints
- 1980s:increased awareness of link between mercury toxicity from amalgam fillings and chronic illness

  i.v. Vit C, DMSA used increasingly to treat conditions suspected to be caused by metal toxicity
- 1990s:increased recognition world wide of the link between metal toxicity and chronic illness. Safe use of multiple agents. Increased intimidation of physicians by FDA and other self-appointed guardians of pharmaceutical interests
- 21st century: increased understanding of the importance of biochemical, biophysical and emotional limitations: Genes and methylation cycle, glutathion production, mitochondria and ATP production, peroxisomes and PPAR, immune mediated phenomena, induced mineral deficiencies (KPU and HPU), the role of the matrix in storage and release of toxins, synergism of multiple toxins, hormones

Who benefits?

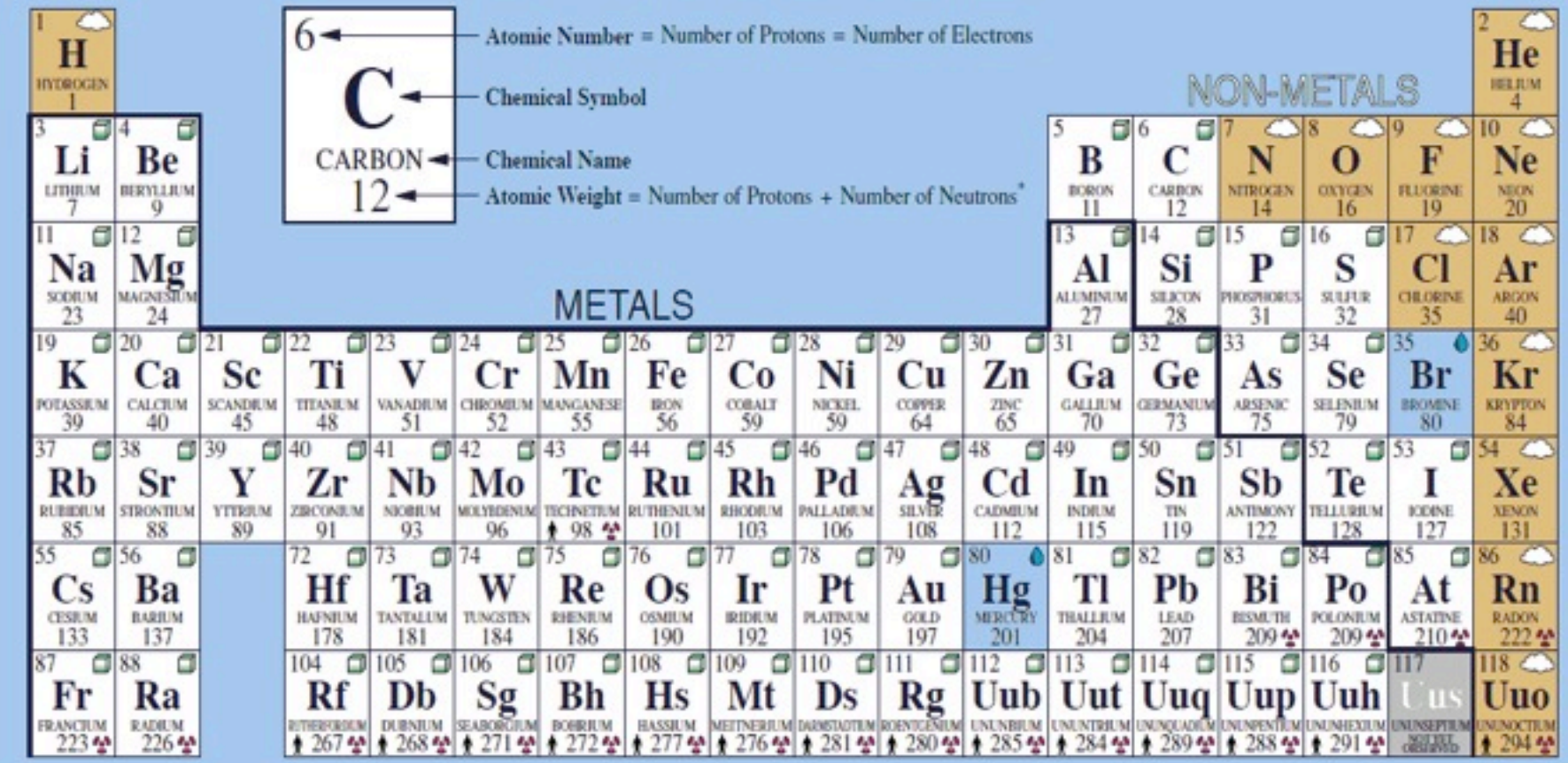
The author does not know of any integrative medical clinic in the US, Canada, Australia, UK, Swizzerland, Germany, Austria or France that does not include metal elimination as one of the primary tools in the treatment of chronic illness

The most consistent successes are reported in neurological illnesses (chronic pain (Hg and lead detox), AD (Desferal and iv DMPS), MS (removal of amalgam fillings and Hg detox), in cardio vascular disease (EDTA, DMPS) and in the triad of CFIDS, MCS and FMS (DMPS).

In recent years it has become evident, that chronic infections are a major cofactor in neurological illnesses and psychiatric conditions and have to be adressed as well

When a group of people is exposed to the same risk factors only about 20% become chronically ill. It appears that genetics plays a major role in the susceptibility (defective genes or polymorphisms). In recent studies sponsored by special interests, these patients are typically eliminated before the study – leading to dangerous misinterpretations

The Periodic Table of Elements



The role of metals in the body

- Ions are potential regulators (conductors of charges by very rapid exchanges)

  Sodium: extracellular – maintains osmotic pressure, electric conductivity, potassium: intracellular – maintains acid base balance inside the cell. Equilibrium requires ATP dependent ion pumps
- Stabilizing ions, such as magnesium and calcium (many metabolic events depend on calcium, muscular contractility, rupture of neurotransmitter vesicles, magnesium stabilizes DNA double helix, affects DNA polymerase)
- Superacidic catalysts, such as zinc: speed up enzymatic reactions to make life possible against entropy (example: zinc speeds up carboanhydrase more then 100 times $H_2O + CO_2 + H_2CO_3$). Metals (dipolar groups) determine the shape of the enzyme and its affinity to the substrate by its smallness, its electronegative charge and its electrovalence. We have more then 1600 enzymes, most are dependent on catalytic metals (metallo-enzymes)
- Catalysts of redox reactions (iron, copper, cobalt)

Metallo-Enzymes

Metallo Enzymes: the enzyme is structurally and functionally dependent on the metal. If it looses its metal, it looses all its catalytic properties

- 1. iron/heme related enzymes (ferric enzymes): hemoglobin, catalase, NADPH cytochrome c- reductase, peroxidase etc.
- 2. cupro enzymes : oxidation of suitable substances with oxygen, leading to formation of H2O2, L-ascorbate oxidase, cytochrome oxidase
- 3. zinc enzymes: carbo anhydrase, carbopeptidases, dehydrogenases, alcohol deydrogenase

Metal activated enzymes

- Metal activated enzymes: form reversible momentary bond with metal. Metal acts as exciter and potentiator. Chelators remove this metal easily. In absence of most suited metal, it can be replaced with toxic metals (Pb, Hg, etc.) or less effective other, non-toxic metals (Cu, Se, etc.).
- Example: peptidases: work best with manganese and cobalt, less effective with zinc and magnesium
- Phosphopyruvate hydratase: works best with Mag++, but this can be substituted with any other 2-valent metal cation
- The enzyme –zinc bond is the least stable. In HPU and other chronic toxic states Zinc is replaced by other 2 valent toxins: Hg, Pb, Cd, Sb, etc.

GENOVATIONS

PHASE II Detoxification: Conjugation of Toxins and Elimination

In Phase II detoxification, large water-soluble molecules are added to toxins, usually at the reactive site formed by Phase I reactions. After Phase II modifications, the body is able to eliminate the transformed toxins in the urine or the feces (through the bile).

Methylation

(COMT SNP) higher risk for depression, bipolar disorder, ADHD and alcoholism.

Result	Gene	SNP Location	Internet Information	Affects
- -	COMT	V158M	www.genovations.com/gdv158m	Liver/Gut

Your Results: Catechol-O-methyl transferase is the enzyme primarily responsible for breaking down the neurotransmitters dopamine, epinephrine, and norepinephrine.

Acetylation (N-acetyl transferase)

(NAT SNP) both slow and rapid acetylators are at increased risk for developing lung, colon, bladder, or head & neck cancer.

SLOW METABOLIZER POLYMORPHISM

Result	Gene	SNP Location	Internet Information	Affects
- -	NAT1	R64W	www.genovations.com/gdr64w	All Cells
- -	NAT1	R187Q	www.genovations.com/gdr187q	Liver/Gut
- -	NAT2	I114T	www.genovations.com/gdi114t	Liver/Gut
+-	NAT2	R197Q	www.genovations.com/gdr197q	Liver/Gut
- -	NAT2	G286E	www.genovations.com/gdg286e	Liver/Gut
- -	NAT2	R64Q	www.genovations.com/gdr64q	Liver/Gut

FAST METABOLIZER POLYMORPHISM

- -	NAT2	K268R	www.genovations.com/gdk268r	Liver/Gut

Your Results: N-acetyl Transferase detoxifies many environmental toxins, including tobacco smoke and exhaust fumes. Polymorphisms can result in slower than normal or faster than normal addition of an acetyl group to these toxins. Slow acetylators have a build up of toxins in the system and rapid acetylators add acetyl groups so rapidly that they make mistakes in the process. Both slow and rapid acetylators are at increased risk for toxic overload if they are exposed to environmental toxins. If the toxin exposure is reduced, the risk is reduced.

Glutathione Conjugation (Glutathione s-transferase)

(GST SNP) The GST isoforms (M1, P1, and T1) are more or less prevalent in various tissues; all catalyze the conjugation of electrophilic compounds with glutathione. Defects in GST activity can contribute to fatigue syndromes, and to various cancers throughout the body.

Result	Gene	Location	Internet Information	Affects
NULL	GSTM1	1p13.3	www.genovations.com/gdgstm1	Liver/Kidney
+-	GSTP1	I104V	www.genovations.com/gdgstp1	Brain/Skin
- -	GSTP1	A113V	www.genovations.com/gda113v	Brain/Skin

Your Results: Glutathione-S-transferase detoxifies many water-soluble environmental toxins, including many solvents, herbicides, fungicides, lipid peroxides, and heavy metals (e.g., mercury, cadmium, and lead). The various forms of GST work together to eliminate toxins. Decreased glutathione conjugation capacity may increase toxic burden and increase oxidative stress.

Oxidative Protection

(SOD SNP) SOD1 is present in the cytosol; SOD2 is present in the mitochondria. Changes in the SOD enzyme are associated with changes in risk for neurodegenerative disorders like ALS.

Result	Gene	SNP Location	Internet Information	Affects
- -	SOD1	G93A	www.genovations.com/gdg93a	Cytosol
- -	SOD1	A4V	www.genovations.com/gda4v	Cytosol
+-	SOD2	A16V	www.genovations.com/gda16v	Mitochondria

Your Results: Superoxide Dismutase is an enzyme that protects cells from increased oxidative stress and free radical damage to cell structures like membranes, mitochondria, DNA, and proteins.

Key		
- -	Neither chromosome carries the genetic variation.	Homozygous negative or wild type
+ -	One chromosome (of two) carries the genetic variation.	Heterozygous positive
++	Both chromosomes carry the genetic variation.	Homozygous positive
NR / NULL / IND	See commentary	
(You inherit one chromosome from each parent)		

Diagnosis of Metal Toxicity

1. High index of suspicion: no chronic illness without it
2. Symptoms: there is no medical symptom that cannot be caused - or contributed to - by metal toxicity (M. Daunderer, numerous other experts)
3. In severe toxicity symptoms may suggest a particular causative agent. In chronic toxicity symptoms of all neurotoxins overlap: mold mycotoxins, Lyme-Neuroborreliosis, mycoplasma infections, neurotropic viruses, neurotoxic chemicals and metals
4. Conclusion: metals are primary neurotoxins and trigger the neurotoxic response that is typical to this particular individual. Symptoms present in chronic illness are not suited to reliably differentiate the causative agent
5. Neurological exam: the triad hyperreflexia, ankle clonus and positive Babinski is found in advanced neurotoxicity. Lesser signs include hyperreflexia, fine motor vibration, paraesthesias and dysaesthesias, cranial nerve problems (tinnitus, facial nerve waekness, visual problems, etc.), decreased microcirculation and skin changes.
6. Clinical response to therapeutic trial: aggrevation or improvement after a short therapeutic trial with an appropriate agent

Metals and consciousness: what can homepathy teach us? A.Peppler www.ckh.de

Physical and psychological symptoms of toxicity

1. **Antimon (Sb):**

physical: nausea, vomitting, diarrhea with “rice-water”stools

Psychological: *lost in worshipping idols and common trends. No perception of one’s own positive sense of direction and aliveness*

Arsenic (As):

Phys.: Paralyzed capillaries, disturbed blood formation, fatty degeneration, cancer, CNS damage. 3 forms: G.i. presentation, cerebrospinal and paralytic

Psych.: *existential fear: “I’d rather die, then change”*

Lead (Pb):

Phys.: fatigue, anemia, periodontal disease, tooth decay, osteoporosis, asymmetric paralysis of motor nerves/muscles, constipation or diarrhea, lead colic, insomnia, confusion

Psych.: *pretending and acting, to escape reality*

Homeopathy – Antonie Peppler

- **Cadmium (Cd):** *high ideals and abilities/gifts prevent true expression of self. Cadmium is found in high amounts in all grains, vegetables and fish (also oysters, squid, etc.). Damages kidneys, bone health and is a carcinogen*
- **Copper (Cu**): *leaning on someone else, even belonging to someone else - out of deep feelings of weakness*
- **Gold (Au):** *lack of self worth*
- **Iron (Fe):** *life is a struggle*
- **Manganese (Mn**): *lack of courage to take life by the horns*
- **Mercury (Hg):** *the vital force of a person does not find appropriate expression and structure. He/she channels their vitality through someone else and sacrifices it in that way.* Treatment: give your life your own structure
- **Nickel (Ni):** *disconnection between head and heart*
- **Palladium (Pd):** *the "good" child wants to be acknowledged and admired*
- **Platinum (Pt):** *deeply hurt, elevates him/herself above others and becomes untouchable*

- Iron Chelation for ALS

- J Neurosci. 2009 Jan 21;29(3):610-619.
  Dysregulation of Iron Homeostasis in the CNS Contributes to Disease Progression in a Mouse Model of Amyotrophic Lateral Sclerosis.Jeong SY, Rathore KI, Schulz K, Ponka P, Arosio P, David S.

  Amyotrophic lateral sclerosis (ALS), characterized by degeneration of spinal motor neurons, consists of sporadic and familial forms. One cause of familial ALS is missense mutations in the superoxide dismutase 1 (SOD1) gene. Iron accumulation occurs in the CNS of both forms of ALS; however, its contribution to the pathogenesis of ALS is not known. We examined the role of iron in a transgenic mouse line overexpressing the human SOD1 (G37R) mutant. We show that multiple mechanisms may underlie the iron accumulation in neurons and glia in SOD1(G37R) transgenic mice. These include dysregulation of proteins involved in iron influx and sensing of intracellular iron; iron accumulation in ventral motor neurons secondary to blockage of anterograde axonal transport; and increased mitochondrial iron load in neurons and glia. We also show that treatment of SOD1(G37R) mice with an iron chelator extends life span by 5 weeks, accompanied by increased survival of spinal motor neurons and improved locomotor function.

- **These data suggest that iron chelator therapy might be useful for the treatment of ALS**.

Using Biophysics for Detoxification

- **Chronic fatigue syndrome and mitochondrial dysfunction**

  Int J Clin Exp Med (2009) 2, 1-16

  Sarah Myhill, Norman E. Booth, John McLaren-Howard

  Mitochondrial function and ATP production is dependent on energy delivered via bioluminescence and electrons. Biochemical compounds (Carnitine, B-vitamins, minerals, ribose, galaktose and other sugars) are used as biophoton carriers and may not be needed for their physical aspects

  ATP is needed to fuel all intracellular detox enzymes

Free Radical Biology & Medicine, Vol. 27, Nos. 11/12, pp. 1203–1207, 1999

HARMFUL SINGLET OXYGEN CAN BE HELPFUL

LILLEMOR MATTSSON HULT´EN, MARC HOLMSTR¨OM, and BASSAM SOUSSI

Abstract—Highly reactive harmful singlet oxygen O2(1Dg)can be helpful while relaxing to its triplet ground state
The energy emitted during this relaxation from the excited energy state is discernable at 634 nm. We report
here on the effect of this energy as photon illumination and as energy transfer in air on the production of reactive oxygen
species (ROS) by human monocytes, measured as isoluminol enhanced chemiluminescence. We demonstrate up to 60% decrease in the secretion of ROS after 2-min illumination of the monocytes stimulated with phorbol myristate acatate
(PMA). The results provide in vitro documentation of the utility of singlet oxygen energy in modifying cellular behaviour.

Inhaled singlet oxygen (**Valkion**): singlet oxygen passes the blood brain barrier and supplies the mitochondria in the brain with oxygen and energy. Used by athletes to improve performance and by children with neurological impairment

From the content of the study

Singlet oxygen can be formed photochemically by energy transfer from an excited photosensitizer.

The purpose of many studies has been to prevent or attenuate toxicity from various oxygen species. The natural scavenger enzymes, such as superoxide dismutase (SOD)and catalase, show effectiveness in vitro but not in vivo. The basic problem that remains is the administration of materia and how to make it reach its target through cellular barriers.

The energy emitted by excited singlet oxygen during its relaxation to ground state oxygen is denoted "singlet oxygen energy (SOE)"

Singlet oxygen energy was produced by Valkion equipment (Goeteborg, Sweden)

When monocytes were exposed to SOE for the short period of 2 min, the production of superoxide anion and hydrogen peroxide was significantly decreased compared with control cells.

There was no effect on cell viability by SOE treatment, suggesting physiological conditions during the experiment.

This energy transfer attenuates oxidative stress by inhibition of the respiratory burst of NADPH oxidase activated monocytes.

These findings suggest that treatment with SOE by air diffusion or illumination can decrease the production of reactive oxygen species from monocytes, thus limiting excessive tissue damage during reperfusion or inflammation.

Improved energetic recovery of skeletal muscle in response to ischemia and reperfusion injury followed by in vivo 31-P magnetic resonance spectoscropy

J Lundberg, A Lindgard et al

Microsurgery 22: 158-164 (2002)

It is of great clinical interest to improve postischemic tissue recovery during microsurgical transfers. The effect of singlet oxygen energy (SOE) as photon illumination at 634 nm on rat skeletal muscle during ischemia and postischemic reperfusion was investigated noninvasively and continuously by in vivo ^{31}P-magnetic resonance spectroscopy (^{31}P-MRS). A model of pedicled rat rectus femoris muscle was used, where phosphorous metabolites were followed before onset of ischemia (control), after 4 h of ischemia, and after 1 h of reperfusion. Two groups were studied: one control group (n = 10), and one SOE-treated group (n = 10). Blood perfusion was measured by laser Doppler flowmetry (LDF) during the study. After 4 h of ischemia, ATP levels were 72% and 51% of normal control values in the illuminated group and the control group, respectively ($P < 0.05$). After 1 h of postischemic reperfusion, phosphocreatine (PCr) recovered to 79% and adenosine triphosphate (ATP) to 71% in the illuminated group, whereas in the control group, the recovery was 57% and 51%, respectively ($P < 0.05$). It is concluded that singlet oxygen energy has a beneficial effect on the energy state of skeletal muscle during ischemia and postischemic reperfusion.

MICROSURGERY 22:158–164 2002