

Metal Detoxification Agents and Common Dosages

1. Intravenous options

- DMPS: 3-6 mg/kg once per month i.m or slow i.v., more often in acute cases
- IV Vitamin C: 37-50 grams in 500 ml distilled water with 10 ml Ca gluconate
- Glutathione: 600-1200 mg 1-3x weekly, IV push
- Alpha-lipoic acid: 600 mg in normal saline (250 cc) over 1 hr
- Phospholipids (Lipostabil – German product): 2 ampoules diluted with client's blood (50:50) given slow IV over 3 minutes
- Calcium EDTA: 4-10 ml slow IV push once weekly
- Zinc DTPA: 1 vial (5 ml) once weekly (Uranium, plutonium, lead, mercury), 10-15 times

2. General detox agents comparison of ALA, DMPS, DMSA and EDTA

- DMPS – removed 86% of mercury in rabbit renal tissue (controversial in U.S.)
- DMSA – removed 65 % of mercury
- Penicillamine – removed 60%
- Glutathione – removed 50%
- ALA – removed 35%
- EDTA – removed 26%

Keith RL, et al. Toxicology 1997;116:67-75

Alpha Lipoic Acid

- Extends life of other free radical scavengers in the body by replenishing their missing electrons, which were lost by previous radical scavenging activity
- Alpha lipoic acid neutralizes both hydroxyl and singlet oxygen radicals. It can be converted in the body to dihydrolipoic acid, as it is effective in neutralizing peroxy and peroxy nitrite
- Aids in detoxification of heavy metals, but most effective in removing mold mycotoxins

Alpha Lipoic Acid

- Builds and regenerates glutathione levels in cells
- A potent free radical scavenger that regenerates other antioxidants, such as vitamins C and E, and coenzyme Q10.
- Is protective for cells against neurotoxicity and hepatotoxicity of other agents
- Weak heavy metal detoxifier and may mobilize mercury stores in body only to relocate them in other tissues
- Should be used only as an adjunct to other chelators. Limit dosage to antioxidant and insulin receptor enhancing functions. 600mg/day

Alpha Lipoic Acid

- Modulates insulin sensitivity in Type 2 DM
- Reduces inflammatory markers in metabolic syndrome
- Stimulates uptake of glucose via stimulation of GLUT 4 protein (primary glucose transporter in muscle, cardiac, and fat cells)

ALA references

- Jacob S, et al. Free Radical Biology and Medicine 1999;27(3/4): 309-14.
- Sola S, et al. The ISLAND study. Circulation 2005 Jan 25;111(3): 343-8.
- Estrada E, et al. 1996; Diabetes 45:1798-1804.
- Muller et al. 1990; Biochem Biophys Acta 1052:386-91.
- Mullet et al. 1995 J. Cereb. Blood Flow Metab. Jul; 15(4): 624-30.
- Gregus Z. et al. Toxicol Appl Pharmacol 1992;39:67-80.

3. Injections with detox agents: subcutaneous use, nerve blocks, ganglion blocks, segmental therapy

- Desferal: 500 mg in 4 divided doses over 4 days, 500 mg/week or up to 1x monthly (Kruck protocol for Alzheimer's disease)
- DMPS and glutathione: very effective in neural therapy and ganglion blocks (dilute 1 ml DMPS per 5-9 ml of 1% preservative free procaine)
- Not suited: Vit. C, EDTA

4. Oral options

- Chlorella (sound-cracked from BioPure): 4-16 grams/day
- Cilantro (energized from BioPure): 10-15 drops in hot water 4 times a day (before meals and at bedtime), or topical as segmental therapy treatment
- MicroSilica: microscopic silica spheres spiked with 100ds of sulfhydryl groups. Reactivates phase I, II and III detox pathways, extracts all toxic metals out of the intestinal wall. Today by far the most effective early detox agent without side effects
- Matrix Metals (nanonized cilantro and chlorella from BioPure): 1-10 sprays twice daily
- Disulfiram: 250 mg h.s for copper/zinc chelation if indicated
- MEIP: N,N'-bis(2-mercaptoethyl)isophthalamide – safe FDA approved fat soluble DMPS related oral compound from BioPure to increase intra-cellular glutathione and bind/eliminate mercury and its related compounds (ethyl-, methyl Hg, HgCl). Has to be dissolved in 1 tsp Phospholipid Exchange
- Malic acid (aluminum), high dose zinc (lead) or HPU protocol
- Intestinal binding: food fiber, clay (green and red from BioPure– 1 tsp twice daily),
- beta sitosterol, charcoal, chlorella, apple pectin
- DMSA: 10 mg/kg/day in divided doses q3-4 h (3 days on, 11 days off) or 100 mg twice weekly at bedtime in treatment of Lyme disease

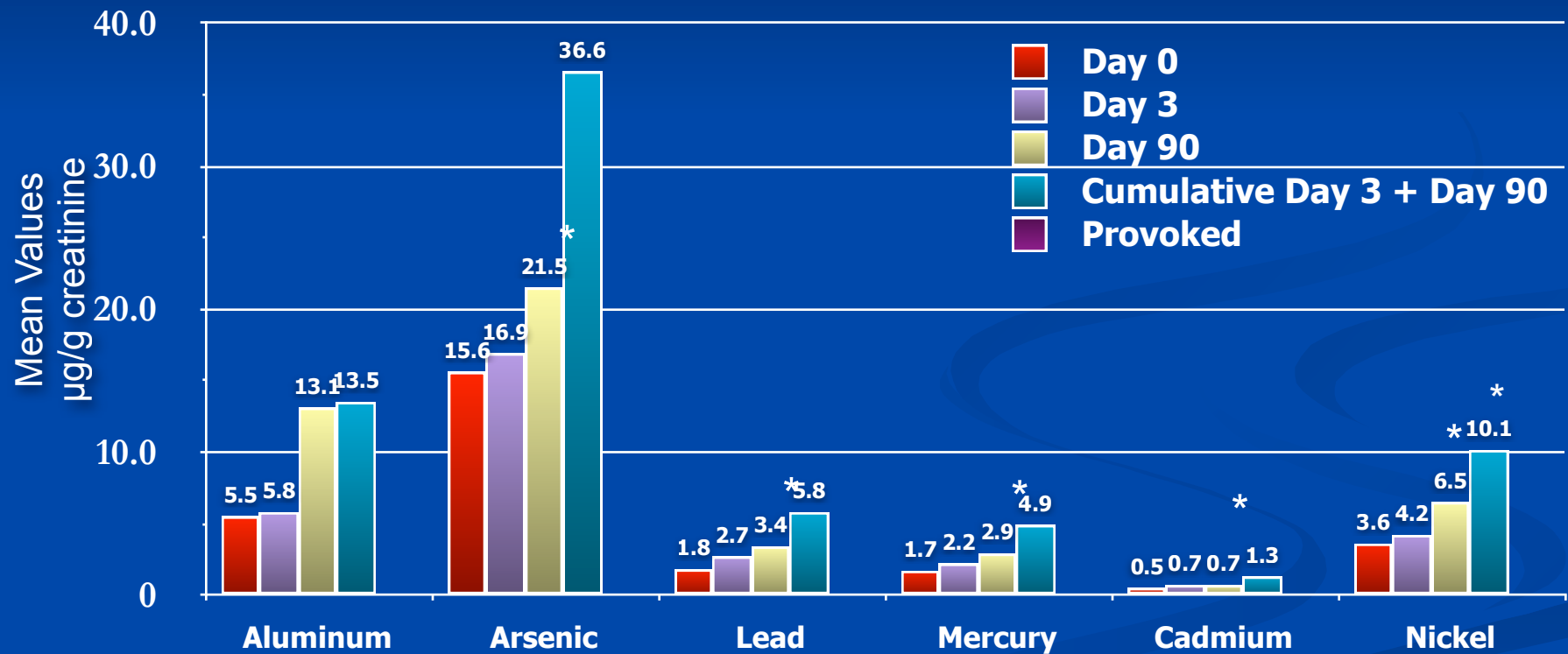
DMSA

- Approved by FDA
- Chelates both inorganic and organic mercury
- Has been tested in children and found to be safe and effective
- Though approved only for lead, it does remove mercury and other metals
- Must drink adequate amounts of water with DMSA for best results
- Triggers TNF alpha – imp. to address inflammation
- Dosage: Per individual tolerance, 100mg. at bedtime q.o.d. at night. Replete minerals on off nights. Child's dosing: 1/8 – 1/2 mg./lb.

EDTA: Clinical Pilot Study Summary

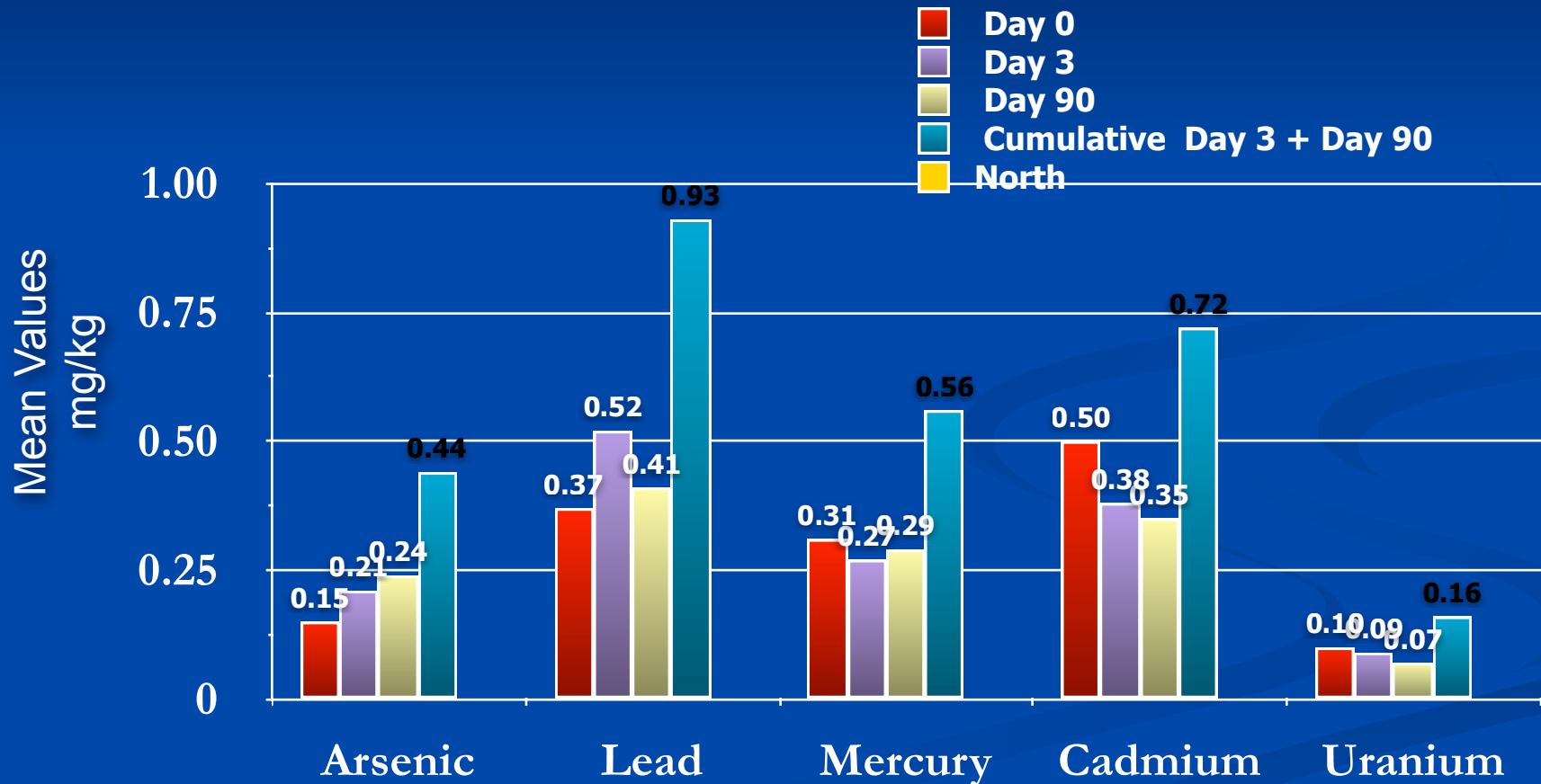
- Significant excretions observed
 - Fecal
 - Ar, Pb, Cd, Ni
 - Urine
 - Ar, Pb, Hg, Cd, Ni
- Average change in pre and post DMSA
 - Fifty percent for Al, Ar, Pb, Hg, Ni
 - No difference with Cd

EDTA: Excretion of Toxic Metals in Urine



*Significantly different from Day 0 ($p < 0.05$)

EDTA: Excretion of Toxic Metals in Feces



* Significantly different from Day 0 ($p < 0.05$)

EDTA Safety

■ Comprehensive Metabolic Panel

- Albumin - Total Protein
- Total Bilirubin - Sodium
- Calcium - AST (SGOT)
- Chloride - Urea Nitrogen (BUN)
- Creatinine, Serum - Bicarbonate (CO₂)
- Glucose - ALT (SGPT)
- Alkaline Phosphatase - C-Reactive Protein
- Potassium

No statistical difference in above lab parameters between pre and post treatment with EDTA in all subjects

Cilantro (*Coriandrum sativum*)

- A European herb in the parsley family
- Accelerates the elimination of mercury, lead, and aluminum through the urine
- Improves effectiveness of anti-viral and antibiotics in subjects with localized deposits of Hg and Pb which often co-exist with chlamydia, herpes, and cytomegalovirus organisms.
- Dosage: 1-3 dropperfull in hot water daily in divided doses (If digestion is a problem, give cellulase.)

Omura, Y. et al. :

Acupunct. Electrother. Res. 1995; 20(3-4): 195-229.

Omura, Y. et al:

Acupunct. Electrother. Res. 1996; 1(2): 133-60

D. Karunasagar, M.V. Balarama Krishna, S.V. Rao, J. Arunachalam

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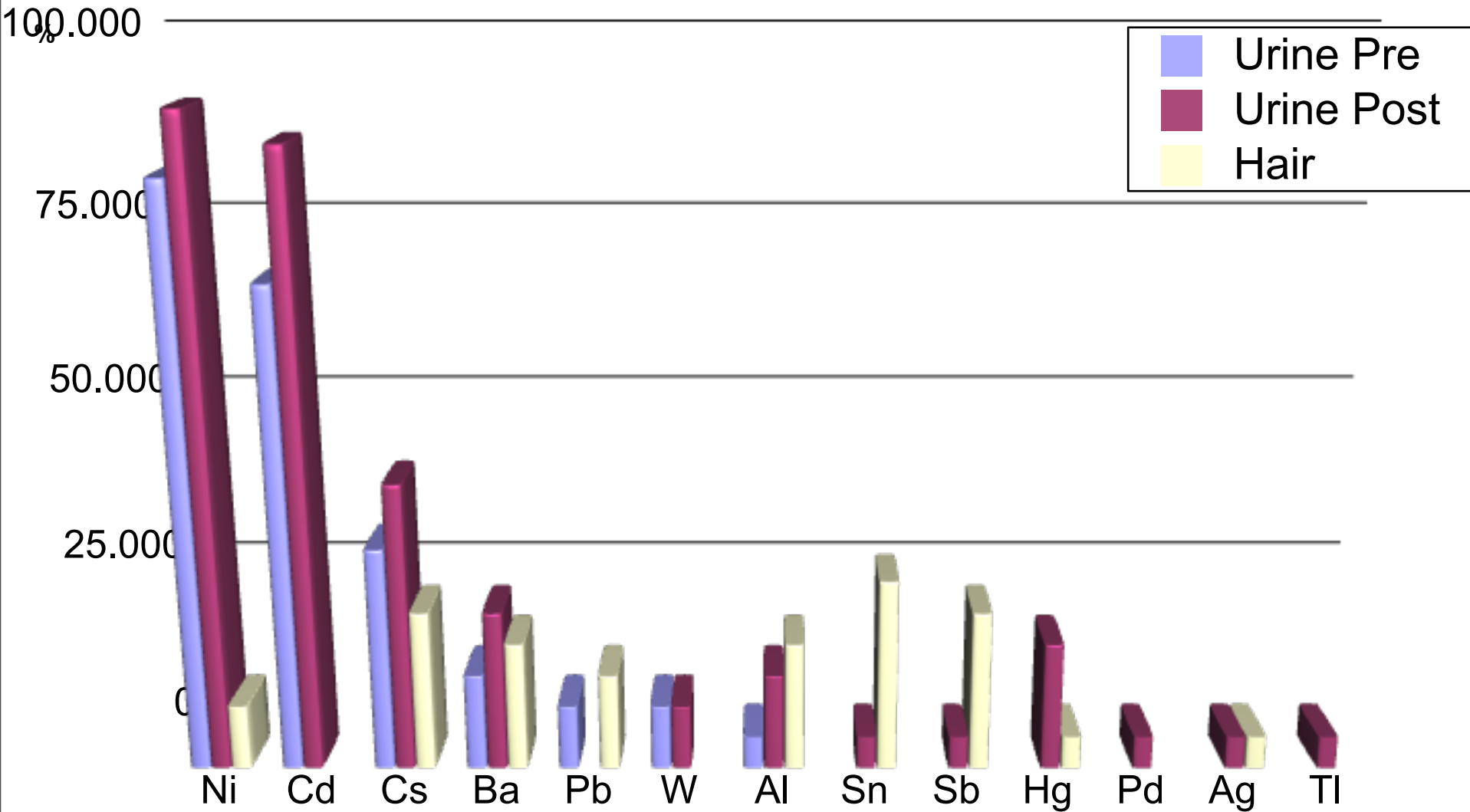
(National Center for Compositional Characterization of Materials (CCCM), Bhabha Atomic Research Centre)

“Removal and preconcentration of inorganic and methyl mercury from aqueous media

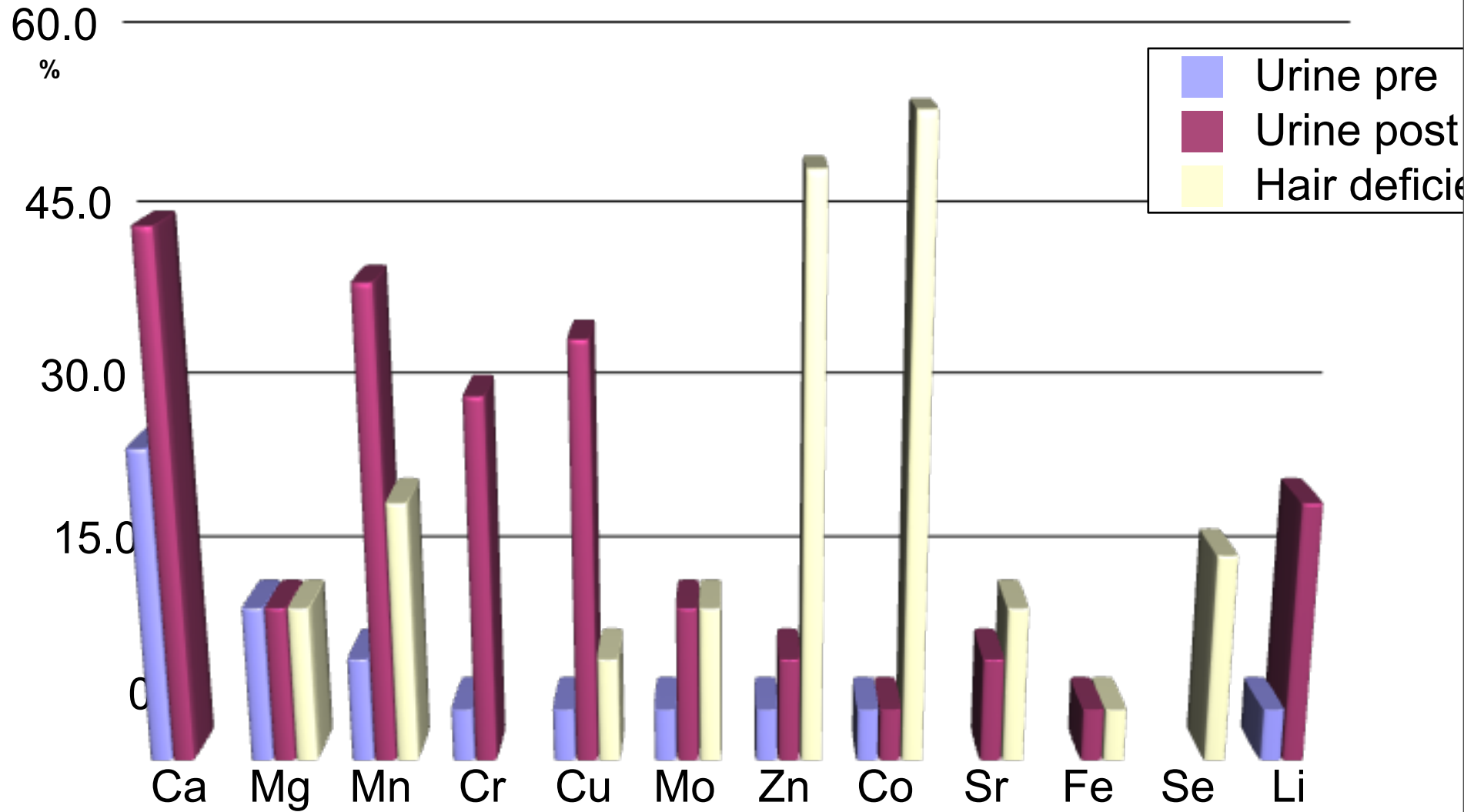
Metal ions in urine and hair before and after cilantro provokation

Hair	Urine pre-	Urine post
Zn-, Ca+, Mg+, Sr+, Sb+, Ba+, Ni+,	Se-, Ca+, Pb+, Cd+, Ni+,	Ca+, Cu+, Mn+, Zn+, Al+, Ba+, Cd+, Pd+, Hg+, Li+, Sr+
	Se-, Cu+, Mn+, Zn+, Ba+, Pb+, Cd+, Ni+, Li+	Se-, Fe-, Cr+, Cu+, Mn+, Cs+, Cd+, Ni+, Li+
Zn-, Mg+, Al+, Ag+	Mg+, Cs+, Cd+, Ni+	Ca+, Mg+, Cr+, Cu+, Mn+, Mo+, Al+, Sb+, Ba+, Cs+, Cd+, Ni+, Hg+, Tl+, W+, Li+, Sr+,
Se-, Zn+,	Zn-, Ni+,	Ca+, Mg+, Mn+, Mo+, Cd+, Ni+,
Ni+, Sn+	Se-, Cr+, Mn+, Ni+, W+	Se-, Cu+, Zn+, Cd+, Ni+,
Co-, Mn-, Zn-, Al+,	Ca+, Cd+, Ni+,	Ca+, Cd+, Ni+,
Co-, Mo-, Sr-, Sb+	Se-,	Cu-, Se-,
Mg-, Co-, Sr-, Al+, Sb+,	Ca+, Ba+, Cd+, Ni+,	Ca+, Cu+, Mo+, Cs+, Cd+, Ni+, Ag+,
Co-, Mn-, Zn-,	Se-, Cd+,	Cd+, Ni+,
Co-, Mn-, Zn-, Sn+	Se-, Cs+, Cd+, Ni+,	Ba+, Cs+, Cd+, Ni+,
Co-, Zn-, Cu+	Cs+, Ni+,	Ca+, Cs+, Ni+,
Mg-, Fe-, Co-, Zn- Sr-,	Mo-, Ca+, Mg+, Cr+, Al+, Ba+, Cs+, Cd+, Ni+,	Ca+, Mg+, Cr+, Mn-, Zn+, Ba+, Cs+, Cd+, Ni+,
Co-, Mn-, Zn-, Sb+, Pb+, Sn+	Se-, Cd+, Ni+,	Cr+, Cu+, Mn+, Se-, Cd+, Ni+, Hg+,
Co-, Cu-,	Cd+,	Fe+, Cu+, Mn+, Al+, Cd+, Ni+, Zn+
Co-, Mg+, Sn+	Se-, Ca+, Mo+, Cs+, Cd+, Ni+ W+,	Ca+, Cr+, Ba+, Cs+, Cd+, Ni+, W+,
Se-, Sr+, Al+, Sn+,	Se-, Mg+, Cd+, Ni+,	Se-, Cr+, Mn+, Cd+, Ni+, Hg+
Mo-, Se-, Zn-, Ca+, Mg+	Se-, Cd+, Ni+,	Se-, Ca+, Cr+, Mn+, Ba+, Cd+, Ni+,
Hg+	Fe-, Se-, Ca+, Cd+, Ni+,	Fe-, Se-, Cd+, Ni+,
-	Fe-, Se-, Ni+	Fe-, Se-, Cs+, Cd+, Ni+
Mg-, Co-, Zn-, Al+, Sn+	Se-, Ni+,	Se-, Ca+, Ni+,
Co-, Cu-, Mn-, Mo-, Ba+ Sb+	Se-, Li+	Cu+, Ba+, Cs+, Cd+, Ni+, Li+
Mo-, Zn-,	Co+, Cs+, Cd+, Ni+	Co+, Mn+, Cs+, Cd+, Ni+

Toxic metal ions in urine and hair after provocation with a single dose of 15 drops energized cilantro tincture



Essential mineral ions in hair and urine after cilantro provocation



Oral administration, cont.

- D-Penicillamine (Russell Jaffe protocol)
- D-Alpha Lipoic: 100 mg q 3-4 hours (600 mg/day)- helps glutathione bound toxins to make it through the cell wall
- Organic freeze dried garlic (energetically enhanced from BioPure) : 2-3 caps after each meal 3-4 times/day
- **Phospholipid Exchange** (from BioPure: energized phospholipids, alpha-Lipoic acid, magnesium and Na-EDTA)- enhances acetylcholine in the brain
- cold processed whey (branched chain amino acids)

Freeze dried Garlic

(BioPure: with 26-28000 conversion units of allicin/capsule)

One of the most widely studied natural compounds

- ↑ Glutathione
- ↑ Metal chelation abilities
- Protects Brain from oxidative stress
- Anti-viral properties –(some metals harbored within underlying viral and bacterial infections)
- ↑ antioxidant/anti-inflammatory actions
- ↓ homocysteine, cholesterol, LDL ox-LDL
- Anti-cancer properties
- Modulates Epinephrine & Norepinephrine
- Dosage – 600-2000mg twice daily
- ↓ Fibrinogen
- No known interactions with Coumadin

Literature: Li, G. et al. 1995. *Oncol. Rep.* 2: 787-791.

- Tiwari, R. et al. 1993. *Breast Cancer Res. Treat.* 27(1-2):80.
- Liu, J. et al. 1992. *FASEB J.* 6(4): 3230.
- Tadi, P. et al. 1991. *Nutr. Cancer* 15: 87-95.
- Sumiyoshi, H. et al. 1990. *Cancer Res.* 50: 5084-5087.
- Sumiyoshi, H. et al. 1989. *Proc. Am. Assoc. Cancer Res.* 30: 181.
- Lau, B. 1989. *Int. Clin. Nutr. Rev.* 9(1): 27-31.

Oral administration, cont.

- Forceful electrolyte supplementation (Matrix Electrolyte from BioPure is the most balanced and best tolerated formula for metal detox)
- Forceful trace mineral supplementation (MicroMinerals from BioPure is best absorbed), including copper (rule out kryptopyrroluria and HPU)
- Carnosine: 1000 mg 3x daily (prevents collagen breakdown)
- Branched chain amino acids: valine, leucine and isoleucine (high in all whey products)
- Correct neurotransmitter imbalances (use Braverman test from “The Edge Effect”)
- Dopamine is most depleted when chronic infections are present. Use Mucuna powder (BioPure) as precursor

Glutathione

- Not thought to increase blood levels with oral administration though some studies have shown that it does
- Not cost effective
- New oral form recently available but no data to show effectiveness in metal elimination.

Witschi A, *et al*: The systemic availability of oral glutathione, *European Journal of Clinical Pharmacology* 1992;43(6):667-669.

Am J Physiol 1990; 259:G524-529.

Biochem Biophys Acta 1992;1113:13-23.

The role of thiols, dithiols, nutritional factors and interacting ligands in the toxicology of mercury

Abstract

Mercury has been known as a toxic substance for centuries. Whilst the clinical features of acute mercury poisoning have been well described, chronic low dose exposure to mercury remains poorly characterised and its potential role in various chronic disease states remains controversial. Low molecular weight thiols, i.e. sulfhydryl containing molecules such as cysteine, are emerging as important factors in the transport and distribution of mercury throughout the body due to the phenomenon of “Molecular Mimicry” and its role in the molecular transport of mercury. Chelation agents such as the dithiols sodium 2,3-dimercaptopropanesulfate (DMPS) and *meso*-2,3-dimercaptosuccinic acid (DMSA) are the treatments of choice for mercury toxicity. Alpha-lipoic acid (ALA), a disulfide, and its metabolite dihydrolipoic acid (DHLA), a dithiol, have also been shown to have chelation properties when used in an appropriate manner. Whilst **N-acetylcysteine (NAC) and glutathione (GSH)** have been recommended in the treatment of mercury toxicity in the past, an examination of available evidence suggests these agents **may in fact be counterproductive**. Zinc and selenium have also been shown to exert protective effects against mercury toxicity, most likely mediated by induction of the metal binding proteins metallothionein and selenoprotein-P. Evidence suggests however that the co-administration of selenium and dithiol chelation agents during treatment may also be counter-productive. Finally, the issue of diagnostic testing for chronic, historical or low dose mercury poisoning is considered including an analysis of the influence of ligand interactions and nutritional factors upon the accuracy of “chelation challenge” tests.

SAMe

(s-adenosylmethionine)

- SAMe has been called "the liver's super-nutrient." The liver contains the third highest amount of SAMe after the adrenals and the pineal glands.
- Reverses destructive effects of chemicals and alcohol as they occur.
- Performs methylation and trans-sulfuration reactions to increase glutathione.
- Plays a leading role in liver regeneration.
- SAMe protects against arsenic toxicity (Goering et al. 1999).
- Detoxifies Lead and Cadmium. Also effective in correcting zinc and glutathione concentrations. (Gubrelay et al. (2001) (Paredes et al. 1985).
- Dosage – 600 mg./day (methylation dose)

Vitamins/Minerals

Full range of vite's/min's to support pathways activated during detox, especially:

- Glycine, DMG, TMG
- B12 – hydroxy- and/or methylcobolamine
- B6 – P5P or pyridoxine HCL
- B2
- Folate – options folate, folinic acid, MTHF
- High dose zinc for short periods (up to 240 mg elemental zinc)
- HPU protocol (i.e.Core, from BioPure)
- Magnesium glycinate and malate
- DL-methionine