Chelation Treatments -Uses and Abuses

Don C. Fisher, MD, MS Occupational Medicine EFCOG Subgroup Meeting 20 April 2007 Albuquerque, NM

Chelation Agents

- DMSA dimercaptosuccinic acid (succimer, Chemet)
- DMPS dimercaptopropanesulfonic acid (unithiol, Dimaval)
- DTPA diethylenetriaminepentaacetate (pentetic acid)
- EDTA ethylenediaminetetraacetic acid (edetate, versenate, edathamil)
- Dimercaprol 2,3-dimercaptopropanol (British antilewisite BAL)
- Deferoximine (Desferal, Desferin)
- D-penicillamine 3-mercapto-D-valine
- Dithiocarb diethyldithiocarbamate (DDC, Imuthiol)

Chelation for Metal Poisoning

- DMSA Pb. Sb, As, Bi, Hg
- DMPS As, Hg. Cr, Co, Cu, Au, Pb, Hg, Po, Ag, SbH₃
- DTPA Pu, Am, Bk, Cm, Cf
- EDTA Cd, Co. Zn
- BAL As, Hg (inorganic), Au. Pb, Sb, Bi, Cr, Ni, W
- Deferoximine Fe. Al
- D-penicillamine Cu. Pb, As
- Dithiocarb Ni(CO)_{4.} Cu

Chelation Agents – pitfalls and contraindications

- DMSA sulfur odor, Pb rebound after D/C
- DMPS childhood Pb (use DMSA instead)
- DTPA Ur, Np poisoning. Use Zn-DTPA
- EDTA Na₂EDTA. Pb poisoning (renal redistribution). Atherosclerosis
- BAL Cd, Fe, Se, Te, organoHg poisoning (enhanced tissue uptake and redistribution)
- Deferoximine renal impairment
- D-penicillamine PCN allergy, SLE, renal failure
- Dithiocarb Ni, Tl, Cd poisoning (redistribution to brain), disulfram-like rxn

EDTA

- Chelate named from Greek *chele* for clawlike chemical structure
- Binds di- and tri- valent metallic ions
- Chelates only water soluble metal ions
- Strongest binding with iron, weakest with calcium
- Non-selective binding of Hg, Cd, Pb, Al. Fe, Cu, Ni, Co, Zn, Mg, Mn, Ca

EDTA Chemical Structure



Hypotheses of EDTA and Atherosclerosis

- "Roto-rooter" removing Ca in plaques would cause them to disintegrate
- Parathyroid hormone (PTH) induced change in Ca balance from bone triggered activation of PTH
- Blocks production of free radicals damage to arterial walls averted
- Prevents mutation atheromas are benign tumors prevented by chelation

Placebo Controlled Studies of EDTA and Atherosclerosis

- Guldager, et al, EDTA treatment of intermittent claudication: A double-blind, placebo-controlled study. Journal of Internal Medicine, 1992.
- Knudson, et al, Chelation therapy for ischemic heart disease: a randomized, controlled trial. JAMA, 2002.

Case presentation

- 39 y/o male, "corrosion specialist" for pipeline Co. Changed Hg out of pressure meters. Hg spills in meter housing shacks.
- 7 yr. hx of generalized joint pain, extremity paresthesias, fasciculations
- "Kinesiology" tests suggested Hg poisoning
- Urine tests indicated Hg poisoning
- DMPS and supplements started
- No change in symptoms after 2 mos of tx
- Toxicology exam stocking-glove hypesthesias, hyperreflexia, sustained ankle clonus. No tremor, mental status change, dermatitis/stomatitis or constitutional symptoms
- Had normal occupational exposure monitoring results.
- 24 hour Urine Hg and beta 2 microglobulins: WNL

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Chelation "Therapy" Case

- 5 y/o male with autism, brought from England to PA for treatment
- Treated by ENT specializing in environmental medicine
- IV Na₂EDTA
- Cardiac arrest in office
- Autopsy: hypocalcemia (<5 mg/dl, normal 8.8 to 10.1 mg/dl)
- CDC review results wrong drug used

Discussion Points

- Do no harm vs. Do no good
 - Newer agents relatively safe
 - Non-selective nature of chelation
 - "Supplements" used during chelation tx
 - Results of long duration use unstudied