

Heavy Metal Chelation and Testing

Background Information

Chelation is the use of a chemical substance to bind molecules, such as metals or minerals, and hold them tightly so they can be removed from the body. The main heavy metal found on testing in the general population is mercury. Fish consumption is directly associated with increased methylmercury levels¹, while mercury in dental amalgams is probably the major source of inorganic mercury exposure in humans and studies have shown a direct correlation between the number of amalgam fillings and mercury concentration in blood and urine².

The impact of chronic, low level mercury exposure is now known to adversely impact numerous cellular and organ system processes³. Ionic mercury is antigenic and may contribute significantly to autoimmune processes^{4,5}. Mercury is also immunotoxic and it may result in immune suppression and allergy^{6,7,8,9}. Research has also demonstrated that multiple strains of antibiotic resistant bacteria develop rapidly in the gut and oral cavity of both humans as well as non-human primates following the placement of amalgam fillings¹⁰. Liver glutathione production can be markedly inhibited when mercury accumulates within hepatocytes (liver cells), causing mercury and numerous other toxic substances to accumulate throughout the body¹¹. Mercury may also promote atherosclerosis and hence increase the risk of myocardial infarction¹².

Methylmercury is considered the most toxic form of mercury and targets the central nervous system whereas inorganic mercury favours accumulation in the kidneys. Research has demonstrated that DMPS¹³ (2,3-dimercapto-1-propane sulfonic acid) is a good chelating agent for inorganic mercury and DMSA (2,3-dimercaptosuccinic acid) is considered the most efficient chelator of methylmercury¹⁴ and lead^{15,16}. DMSA may also be able (as seen in animal studies) to cross over the blood brain barrier and thereby chelate organic mercury and lead from the nervous system¹⁷. Research also suggests that DMSA may be effective in detoxifying non-phosphorous pesticides and mushroom poisonings¹⁸.

DMSA is a sulfhydryl-containing, water-soluble, non-toxic, orally administered metal chelator¹⁹ that has been in use as an antidote to heavy metal toxicity since the 1950s. Experimental studies show DMSA to be of low toxicity²⁰ and it is considered to very safe when used correctly. It usually causes few side effects, although some patients may experience slight gastrointestinal bloating or discomfort, itching, nausea or fatigue when higher doses are used.

Animal studies on the acute and chronic toxicity of DMPS have been carried out and the results illustrate the safety of this agent and its wide therapeutic window²¹. Numerous human studies have failed to uncover any significant adverse impacts of DMPS upon human renal function, liver function, cardiovascular system, blood, immune system, G.I. tract or any other organs or systems. Minor or avoidable side effects such as local irritation at the site of parenteral infusion or hypotension with overly rapid infusion of the agent have been reported²¹. Very rare mucocutaneous reactions, ↑ liver enzymes, leucopenia, neutropenia, thrombocytopenia have been reported for DMSA and DMPS.

People with long standing body burdens of mercury may not show elevated levels of mercury in the urine, blood or stool when specimens are gathered in the absence of a challenge with an appropriate metal chelating agent. Because of this a provocation test measuring urinary mercury after the administration of a chelating agent such as DMPS, may be the only valid means to assess chronic mercury body burden^{22,23}.

EDTA (ethylene-diamine-tetraacetic acid) is another chelator which has been used as an antioxidant food preserver for many years and can be used with DMSA or DMPS. Only about 5% is absorbed when taken by

mouth, however it does help block absorption of heavy metals from the gut and prevent the possibility of mercury that has been excreted through the liver and bile into the intestine during chelation with DMSA or DMPS from being reabsorbed back into the blood stream. There are over 300 references to the use of oral EDTA²⁴ including its safety²⁵.

Chelators can remove various minerals from the body and it is important to take appropriate supplementation with minerals such as zinc (20-50mg elemental zinc daily) and selenium (100-300mcg daily) while undergoing chelation. Also vitamin C (1-2g daily), vitamin E (mixed tocopherols 250-500mg daily) and B vitamins (especially B6) can be useful.

Protocol for heavy metal test

1. The test for heavy metals is usually carried out on a Monday morning in order for the sample to reach the USA the same week
2. It is important that you have an empty bladder at the beginning of the test
3. A slow intravenous injection of DMPS 250mg is given through a small needle over several minutes (for patients living at a distance an alternative is the use of oral DMPS capsules, 250mg x 2, which can be taken on the Sunday night and the urine collected until morning)
4. A collection kit is given to you and you need to either avoid passing urine for a minimum of 3 hours and then pass a sample of urine into the test tube provided (to the arrow mark on the tube), or you can empty your bladder as often as you wish by collecting all the urine into a large collecting bag provided and then finally emptying your bladder into the same bag at the end of 3-4 hours, at which point you empty a small amount from the bag into the sample test tube provided in the test kit.
5. You need to make sure that the form is fully completed, including details of your Master/Visa card (if you do not have a card please let the receptionist know and we will arrange payment and charge your account)
6. The filled test tube with the lid screwed on tight is placed in the polythene bag, and this is put in the courier bag provided along with the completed form, and posted at the NZ Post in time for that day's collection.

Protocol for mercury removal

1. Take a DMSA capsule on 2 consecutive days each week on an empty stomach (e.g., Saturday and Sunday morning 1 hour before breakfast with a glass of water). The dose of the DMSA capsule will be given by the prescribing doctor. If you feel that you may be having some sort of reaction to DMSA (e.g., not feeling quite right, nausea, etc) then it may be appropriate to reduce the dose – please contact the health centre. However, patients often feel better while taking the DMSA rather than noticing any side-effects.
2. Take an EDTA capsule with breakfast and evening meal (you may wish to start with 1 capsule daily and increase after a week). This is normally well tolerated, but if you think you could be reacting in some way please let us know.
3. A multimineral/vitamin, e.g., BAM daily, but not on the morning of the DMSA capsule (can be taken later in the day as DMSA has a short duration in the body).
4. DMPS may sometimes be used in the place of DMSA. Different dosing and protocols are used for chelation in children.
5. Milder chelators can also be used instead of or alongside DMSA, DMPS and EDTA. These include cilantro (Chinese parsley/choriander), chlorella and garlic.

6. The chelation programmes can be modified with the use of intravenous (IV) vitamin C + glutathione, as well as IV DMPS or EDTA. Other agents can be added such as alpha lipoic acid, digestive enzymes, fish oil (DHA+EPA), various minerals and homeopathics. Saunas (especially FIR), massage, lymph drainage, exercise programmes and colon therapy can be helpful for detoxification.

If you have any questions or want to have more details on the different methods of chelation please ask Dr Ewer (email info@mapuahealth.com).

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