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Integrative Medicine and the Role of Modified Citrus Pectin/Alginates in Heavy Metal Chelation and Detoxification – Five Case Reports

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Key Words
Modified citrus pectin · Chelation · Heavy metal · PectaSol® · Alginate

Summary
Heavy metal body burden can contribute to chronic disease, as well as interfere with the body's capacity to recover from illness. The five case studies presented here show that reduction in toxic heavy metals (74% average decrease) was achieved without side effects, with the use of PectaSol® modified citrus pectin (MCP) (EcoNugenics; Santa Rosa, CA, USA) alone or with an MCP/alginates combination. The gradual decrease of total body heavy metal burden is believed to have played an important role in each patient's recovery and health maintenance. This is the first known documentation of evidence of such results in a clinical report of case studies with possible correlation between clinical outcome and a reduction in toxic heavy metal load in patients using MCP and/or an MCP/alginate complex.

Schlüsselwörter
Modifiziertes Zitruspektin · Chelatbildung · Schwermetall · PectaSol® · Alginate

Zusammenfassung
Eine Schwermetallbelastung des Körpers kann zu chronischen Erkrankungen führen und die Fähigkeit, sich von Krankheiten zu erholen, beeinträchtigen. Die hier präsentierten fünf Fallstudien zeigen, dass durch den Einsatz von PectaSol®– modifiziertem Zitruspektin (MCP) (EcoNugenics; Santa Rosa, CA, USA) alleine oder in einer MCP-Alginat-Kombination eine Reduzierung toxischer Schwermetalle (um durchschnittlich 74%) ohne Nebenwirkungen erreicht wurde. Es wird angenommen, dass die graduelle Reduzierung der Schwermetallbelastung des Körpers eine große Rolle bei der Gesundung und Gesunderhaltung der Patienten spielt. Der vorliegende klinische Bericht der Ergebnisse mehrerer Fallstudien dokumentiert erstmals Hinweise auf eine mögliche Korrelation zwischen klinischem Outcome und einer Reduzierung der Belastung durch toxische Schwermetalle durch den Einsatz von MCP und/oder einen MCP-Alginat-Komplex.

Introduction

Heavy or toxic metals are stable trace elements which cannot be metabolized by the body and bio-accumulate in soft tissues (and bone), passing up the food chain to humans. These toxins are an integral by-product of industrial society and are unavoidable in our modern-day life. These include: mercury, lead, nickel, arsenic, cadmium, aluminum, platinum, the metallic form of copper, and others. These heavy metals have no function in the body and can be highly toxic, negatively influencing the body's metabolic processes, and impairing multiple physiological systems throughout the body. Toxic metal burden can induce impairment and dysfunction in the cardiovascular, gastrointestinal, immune, reproductive, urinary, endocrine, central and peripheral nervous systems, detoxification (colon, liver, kidneys, skin), energy production and enzy-

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matic pathways. Toxic heavy metals can negatively affect energy levels, memory, circulation, blood pressure, and cholesterol and triglyceride levels [1–4]. If unrecognized or inappropriately treated, toxicity can result in significant illness, reduced quality of life, and possibly death.

Symptoms of chronic exposure are very similar to symptoms of other medical conditions, and often develop slowly over months or even years, so their cause can be easily missed. Proper chelation and removal of heavy metals and toxins can allow the body to self-repair and to respond more favorably to traditional therapies when fighting the progression of chronic disease.

Traditional chelation methods using intravenous compounds such as ethylene diamine tetra-acetic acid (EDTA) for lead and dimercapto-propane sulfonate (DMPS) for mercury can cause side effects and deplete the body of essential minerals. In addition, successful intravenous therapy requires multiple treatments, is costly, and requires access to specialty clinics.

Modified citrus pectin (MCP) is a dietary supplement derived from the inner peel white pulp of citrus fruit. Citrus pectin is a complex polysaccharide obtained from the inner peel and is a soluble fiber. D-galacturonic acid is the principal monosaccharide compound that composes pectin. Some neutral sugars are also present in pectin. The D-galacturonic acid residues are linked together by alpha-1, 4 glycosidic linkages. Unmodified pectin is a non-digestible polysaccharide in long polymers of cross-linked chains. MCP is composed of citrus pectin that has been broken down into shorter chain molecules and reduced side chain structure using enzymatic and pH modification. The lower molecular weight is required in order for the pectin to be absorbed into the bloodstream during digestion, and the reduced esterification facilitates the ability of the pectin molecule to bind to its targets. MCP has been shown in animal models to inhibit tumor cell emboli and metastasis [5, 6], reduce tumor growth [7] and in human clinical study to slow progression of prostate cancer [8], and may stimulate the immune system as suggested in human cell culture [9]. Its ability to bind toxic heavy metals and excrete them while not disturbing the essential minerals in healthy humans has been recently demonstrated [10]. The specific MCP utilized in this study was demonstrated to have optimal structure for chelation of heavy metals. It consists of approximately 10% rhamnoglacturonan II as demonstrated in molecular analysis performed by the USDA [10]. It was also shown to decrease total body burden of mercury after prolonged use [11].

There is over 35 years of research on the benefits of alginates as a bio-absorbent for detoxification and heavy metal removal. Alginates are able to passively bind to heavy metals and sequester them in an alginate biomass in the aqueous portions of the body. The body is then able to excrete these toxins in normal excretory processes. Alginates have been used for radiation poisoning [12], polluted water and toxic site clean-up as a biological absorbent [13], and de-metallization of hydrogenated oils [14]. There have been extensive studies at McGill University [15], demonstrating the effect of seaweed inhibiting the absorption of lead, cadmium, and the cancer-causing radioactive strontium. Alginates have demonstrated superior ability to bind heavy metals, such as mercury, lead, copper, cadmium, and zinc [16–20]. The soluble fibers, pectin and alginate, are part of a class of complex polysaccharide compounds known as polyuronides.

Mercury, cadmium, and other heavy metals have a high affinity for sulfhydryl (-SH) groups, inactivating numerous enzymatic reactions, amino acids, and sulfur-containing antioxidants (N-acetyl cystein [NAC], alpha lipoic acid [ALA], glutathione [GSH]), with subsequent decreased oxidant defense and increased oxidative stress. Both bind to metallothionein and substitute for zinc, copper, and other trace metals reducing the effectiveness of metalloenzymes. Mercury induces mitochondrial dysfunction with reduction in adenosine triphosphate (ATP), depletion of GSH, and increased lipid peroxidation. The overall vascular effects of mercury include oxidative stress, inflammation, thrombosis, vascular smooth muscle dysfunction, endothelial dysfunction, dyslipidemia, immune dysfunction, and mitochondrial dysfunction [21]. Metal-mediated formation of free radicals causes various modifications to DNA bases, enhanced lipid peroxidation, and altered calcium and sulfhydryl homeostasis. Lipid peroxides, formed by the attack of radicals on polyunsaturated fatty acid residues of phospholipids, can further react with redox metals finally producing mutagenic and carcinogenic malondialdehyde, 4-hydroxynonenal and other exocyclic DNA adducts [22]. The recent findings in the metal-induced formation of free radicals and the role of oxidative stress in the carcinogenicity and toxicity of metals are shedding more light on the etiology of many chronic diseases. Clear exposure-response relationships and high risks have been observed and associated with exposure to lead, cadmium, mercury and arsenic [23].

We present five case studies of patients with different medical conditions who also have heavy metal toxicity. Using an integrative therapy approach, gentle toxic metal removal was accomplished over time using MCP as a single agent or in conjunction with modified alginates. The chelation therapy with MCP and/or MCP/alginate complex was the focus of the care in all these presented case studies. In 3 out of 5 patients, an additional adjuvant preparation consisting of a blend of amino acids, thiol compounds, botanicals and minerals was added later in the treatment to support the detoxification process. In all five cases significant reduction in toxic heavy metals, without any side effects, was achieved. The gradual decrease of total body heavy metal burden is believed to have played an important role in their recovery and health maintenance. These 5 patients presented in this study represent a variety of conditions and chelation therapy regimes using MCP and/or MCP/alginate complex to reduce measurable lead and or mercury, and suspected mold toxicity with resulting improvements in their clinical symptoms and presenting conditions.

Materials and Methods

All 5 patients have provided signed informed consent for anonymous participation and the use of their medical history, treatment, and results. They were recruited for the study because of documented toxic heavy metal levels, dental amalgam free prior to heavy metal testing, ongoing unresolved clinical issues, and where toxin exposure was suspected from their history.

MCP: 2 patients received MCP. The MCP utilized in this study was PectaSol® MCP (EcoNugenics, Inc., Santa Rosa, CA), dosage used: 5 or 15 g of MCP daily. 1 person received MCP alone since PectaSol Chelation Complex (PCC) and PectaSol Detox Complete (PDC) were not available at that time. A dose of 15 g of MCP was used based on dosage used in clinical trails for prostate cancer [8] and heavy metal chelation [10, 11]. Another received MCP at 5 g a day along with PCC (see below) 3 capsules twice a day, due to his prostate cancer.

MCP/modified alginate complex: 4 patients received a blend of MCP with low molecular weight alginates from the brown algae, kelp (*Laminaria sp.*) cell wall. The complex utilized was PectaSol Chelation Complex (PCC) (EcoNugenics, Inc., Santa Rosa, CA). Each capsule of PCC contains 450 mg modified alginate complex (Algimate®) and 300 mg MCP. Dosage used: Patients received 3–8 capsules per day. PCC dosage range was determined based on the knowledge that the modified alginates component has the ability to absorb heavy metals in the gastrointestinal (GI) tract, therefore preventing re-absorption. With this added intestinal support, a significantly lower dose of the MCP component in PCC was expected to be as effective for heavy metal chelation with this added intestinal support; thus adjusted doses were used.

3 patients received an additional adjuvant preparation called PectaSol Detox Complete (PDC) (EcoNugenics, Inc.; Santa Rosa, CA), after 2 months into their treatment with MCP and/or PCC. PDC was introduced to complement and support the cleansing process. PDC contains nutrients, natural chelators and herbs that are believed to replenish exhausted detoxification systems and prevent re-absorption and re-distribution of the toxins in the body. The compounds in PDC are believed to enhance both discharge of heavy metals from the tissue as well as excretion through the digestive and urinary tract. The formula in PDC contains the following ingredients in 3 capsules: Vitamin C (250 mg), zinc (15 mg), selenium (100 µg), a blend of extracts of Chinese smilax stem, astragalus root, Chinese salvia root, Oregon grape root, European goldenrod flower and leaf, dandelion leaf, grass-leaf sweetflag stem (350 mg), garlic bulb (300 mg), cysteine (250 mg), MSM (250 mg), NAC (250 mg), cilantro leaf (200 mg), ALA (120 mg), L-carnitine (100 mg), milk thistle seed (60 mg), gingko leaf extract (20 mg), and L-glutathione (15 mg). Dosage used: 3 out of the 5 patients received 4 capsules per day, after a 2-month initial period on MCP and/or PCC only. PDC was added later in the treatment course of 3 of the patients to enhance the detoxification without causing aggravation due to the shift in chelation from the blood to the tissue. The dose was increased in 1 patient to increase effectiveness and was well tolerated.

The methods for evaluation and monitoring of heavy metal burden were through the administration of a known chelating agent, followed by a standardized period of urine collection. Doctor's Data Laboratory (St. Charles, IL, USA) used Inductively Coupled Plasma Mass Spectrometry (ICP-MS) for analysis of results. Collection periods for provocation agents are dictated by the active half life of the specific agent. Intravenous (IV) EDTA used in this study has a half life of approximately 1 h; collection period of 4 h was used. 2,3-DMPS IV has a half life of approximately 1 h; collection periods of 4 or 6 h were used. PCC was used as a challenge agent in 1 of the cases with a collection time of 6 h. Results were reported in µg/g creatinine, the international standard which takes into account urine dilution variations. Reference ranges are representative of a healthy population under non-challenge or non-provoked conditions.

DMPS dosage is calculated based on patient weight with a maximum dose of 250 mg. In all case studies which used DMPS challenge, the patients received the maximum dose of 250 mg based on their weight. Creatinine results for all patients in the study were >25 mg/dl, and results within the range of accuracy. Great care was taken to ensure bladder was completely empty prior to all challenges for accurate collection. Each challenge can lower the body burden, so multiple challenges would function as a therapy and no longer serve as an accurate monitoring tool for the effectiveness of the oral chelating agents, so only two challenges per case was performed. The DMPS-mercury challenge test is an accepted method used for assessing and monitoring mercury exposure [24, 25].

Patients were evaluated during the course of treatment for subjective symptoms including a worsening or improvement of presenting symptoms, development of any new symptoms including potential adverse effects of the detoxification regime, including headache, diarrhea, reflux or other GI disturbance, palpitations, or fluid retention.

Case Studies

Case 1

59-year-old male patient with diagnosis of prostate cancer, Gleason Score 7, PSA of 62 at time of diagnosis. Patient decided to pursue 'active waiting' with dietary approaches, resulting in a temporary decrease of PSA to 38. Subsequently, PSA values increased with levels as high as 114, motivating the patient to seek treatment. At the time of patient's first visit to our clinic, 43 months since diagnosis, the PSA was 102. Patient presented with bone metastases in the lower pelvis, and involvement of retroperitoneal lymph nodes. Advised that cancer was inoperable, and radiation not advised, combined androgen suppression therapy with Lupron/Cassodex was recommended. Patient's history was of potential significance with work as a fire fighter, police officer, and a helicopter pilot in the United States/Vietnam War. His helicopter was shot down eight times in one year. In addition, patient has a hobby involving repair of cars and motorcycles. Heavy metal exposure was suspected from this history, which could be a significant factor in the unexpectedly aggressive behavior of the prostate cancer relative to the Gleason score. A confirmatory IV Calcium EDTA (1.0 g) provocative urine challenge 4-h collection, revealed a very elevated lead level of 92 µg/g creatinine (reference range <5.0), creatinine 68 mg/dl (reference range 25–225). Treatment was begun with PCC at 3 capsules twice per day, MCP at 5 g per day. PDC at 2 capsules twice per day was added after 2 months, and used for a 3-week period prior to repeat challenge. The repeat Calcium EDTA (1.0 g) provocative urine challenge after 3 months of treatment with PCC and 3 weeks of treatment with PDC, showed a 49% decrease in lead level to 47 µg/g creatinine, creatinine 37 mg/dl. His PSA dropped to <0.1 and has been stable for over 18 months. He has discontinued hormonal therapy for 2 months with the PSA stable at <0.1. The patient reported no adverse effects when evaluated in clinic visits. Bone metastasis in the pelvic area have resolved as demonstrated by recent PET/CT.

Case 2

64-year-old female patient with a significant history of potential toxic metal exposure secondary to living in an old house in New York City for 25 years, with potential exposure from paint, plumbing, gasoline and other fume inhalation. Her primary symptoms at the time of initial clinic visit were over 10 years of depression and anxiety. She was advised to continue her regimen of PCC. Mercury amalgams were removed 8 years prior to first visit without any improvement in her condition. She was referred to the clinic following a urine challenge which utilized PCC (at 4 capsules), as the provoking agent, with a 6-h collection. Elevated lead levels at 75 µg/g creatinine (reference range <5.0) were detected, and mercury level was 4.6 µg/g creatinine (reference range <4.0), creatinine 38 mg/dl (reference range 25–225). The patient was started on PCC, 2 capsules twice per day. After 2 months, a follow-up urine challenge was performed utilizing PCC (4 capsules) as provoking agent, with 6-h collection. The resulting lead level was below detectable limits, essentially a reduction of

100%, and the mercury level dropped to 0.8 µg/g creatinine, creatinine 40 mg/dl, a mercury level reduction of 83%. The patient reported no adverse effects when evaluated in clinic visits. Her symptoms of depression and anxiety improved during this time and remain resolved by her own evaluation in interviews at the clinic.

Case 3

67-year-old male patient with a 25-year history of prostatitis and benign prostatic hyperplasia, with episodes of frequency, nocturia, interrupted sleep, slowed urinary stream, and discomfort. Other symptoms included chronic loose stool, fatigue, recurrent upper respiratory infections, asthma, and inhalant allergies. The patient also presented with abnormal hormonal levels in multiple endocrine systems. His PSA at the time of presentation was 5.5. Mercury amalgam fillings were removed 1 year prior to his first visit. The removal of dental amalgams did not improve any of the patient's symptoms. Environmental mold and heavy metal exposure were suspected, based on his presenting symptoms and history. The patient was taking multiple supplements for a period of several years with little improvement in his symptoms. Patient had a provocative urine challenge with DMPS 250 mg IV followed by 4-h collection. Mercury level was extremely elevated 200 µg/g creatinine (reference range < 3 µ), creatinine 28 mg/dl (reference range 25–225). Treatment was initiated with PCC, 4 capsules twice per day, followed in 2 months by the addition of PDC, 2 capsules twice per day. After 6 months the treatment was changed to PCC, 3 capsules twice per day, and PDC, 2 capsules twice per day. Repeat DMPS provocative urine challenge after 9 months showed a mercury level of 39 µg/g creatinine, creatinine 86 mg/dl, a mercury level reduction of 80%. During this time, the patient experienced a dramatic improvement in his symptoms. His digestive tract stabilized for the first time in years with normal, regular bowl movements, allergies and asthma improved markedly and his hormonal profile improved though not as yet normalized. His PSA dropped to 3.84. The patient reported no adverse effects when evaluated in clinic visits.

Case 4

45-year-old male patient with presenting symptoms of adrenal fatigue, low cortisol levels, significant fatigue, non-restorative sleep, and a long-standing inability to gain weight. Symptoms started over 15 years prior to presentation at the clinic. A post-provocative DMPS challenge with 6-h collection revealed an elevated mercury level of 52 µg/g creatinine (reference range <3.0), creatinine 33 mg/dl (reference range 25–225). Treatment was initiated with PCC, 3 capsules twice per day. After 2 months, PDC was added at 2 capsules twice per day, with PCC increased to 4 capsules twice per day. Other nutritionally supportive supplements were included in this patient's program. DMPS challenge was repeated after 7 months showing mercury level dropping to 22 µg/g creatinine, creatinine 35 mg/dl, a reduction in mercury level of 58%. The patient reported no adverse effects when evaluated in clinic visits. The patient has experienced a needed 10-lbs (4.5 kg) weight gain, and improvements in energy and sleeping pattern.

Case 5

A 57-year-old male patient with a decade-long history of headaches, constipation, irritable bowel syndrome, elevated liver enzymes, and a strong family history of Alzheimer's disease. Mercury exposure was suspected from this patient's history of years of fish consumption as a resident of the state of Hawaii. A post-provocative DMPS 250 mg IV challenge with 6-h urine collection revealed an extremely high mercury level of 180 µg/g creatinine (reference range <3.0 µg/g creatinine), creatinine 28 mg/dl (reference range 25–225). Treatment was initiated with MCP at 5 g three times per day, along with a regimen of nutritionally supportive supplements. After 5 months, a repeat post-provocative DMPS challenge showed a mercury level of 49 µg/g creatinine (reference range <3.0 µg/g creatinine) creatinine 98 mg/dl (reference range 25–225). The patient continued on the regimen of 15 g of MCP daily for 7 more months at which time a repeat DMPS challenge, 12 months from initiation of therapy, resulted in a further decrease in mercury level to 30 µg/g creatinine, creatinine 180 mg/dl, a total mercury level decrease of 73%. The patient reported no adverse effects when evaluated in clinic visits. The patient's symptoms subsided during this time.

The patient discontinued treatment with MCP for a 9-month period. Subsequent post-provocative urine challenge with DMPS showed an increase in mercury levels to 90 µg/g creatinine, creatinine 41 mg/dl. Treatment was resumed, but no further challenge analysis has been performed to include in this report.

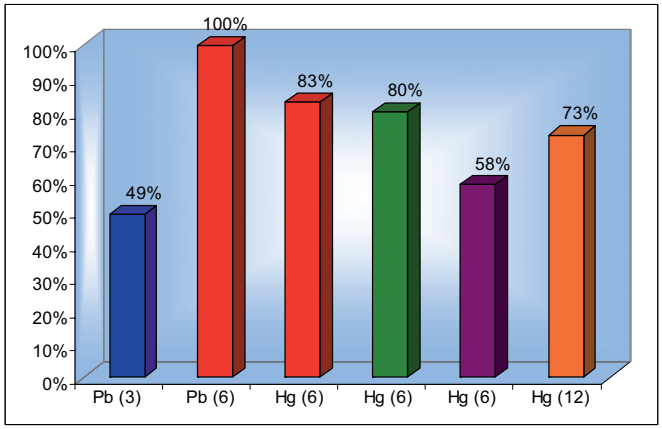

Fig. 1. Percent decrease in heavy metal tested. 74% average decrease. Pb = Lead, Hg = mercury, (#) = months, (blue) = case 1, (red) = case 2, (green) = case 3, (purple) = case 4, (orange) = case 5.

Results

In the 5 patients presented in this paper, 1 patient (no. 1) took PCC (3 capsules twice per day), MCP at 5 g per day, and after 2 months, PDC at 2 capsules twice per day was added; lead level decreased by 49% over 3 months; 1 patient (no. 2) took PCC alone (2 capsules twice a day) for 6 months; lead level decreased from highly toxic level to undetectable levels, mercury decreased by 83%; 2 patients (no. 3 and 4) took PCC (3 or 4 capsules twice a day) for 6 months, adding in PDC after 2 months (4 capsules a day in divided doses); mercury decreased by 80 and 58%, respectively. One patient (no. 5) took MCP alone (5 g three times a day) for 12 months; mercuy decreased by 73%.

All 5 patients had a very significant decrease in their toxic heavy metal load (fig. 1) and improvement in their clinical presentation and symptoms. None of the patients reported experiencing any side effects from the treatment protocols when evaluated. Average decrease for the six metal levels measured was 74%.

In one patient (no. 5) who was taking MCP only and had significant reduction of total body burden of mercury over 12 months, discontinuation of MCP for 9 months resulted in increased levels of mercury, suggesting ongoing exposure.

Discussion

Heavy metal toxicity is a significant global health issue that can cause health problems of varying degrees in multiple systems. The two most common heavy metals that cause adverse effects are mercury and lead. Addressing heavy metals as part of an integrative medical plan can aid in the prevention and treatment of multiple ailments.

Heavy metal exposure is a continuous problem. When addressing this issue, we need to remove existing heavy metals in the body while preventing absorption of heavy metals due to on-going exposure. While there are intravenous chelating agents such as DMPS and EDTA that can detoxify and chelate heavy metals from the body, they commonly produce significant side effects, and can deplete the body of essential minerals. They can redistribute heavy metals with the possibility of increasing their concentration in vital organs such as the brain [26]. These agents are therefore not suitable for ongoing use, and prevention. There is a great need for gentle chelating agents that are safe and can be used on an ongoing basis.

As a systemic chelator, MCP has the ability to reduce total body burden of heavy metals. This was demonstrated in its ability to decrease the total body burden of mercury after long term use [11]. The preventative potential of these compounds was clearly illustrated in Case 5 of this study in which the patient using MCP exclusively, discontinued MCP for 9 months resulting in increased levels of total body mercury due to ongoing exposure, presumed mainly from consumption of fish and seafood. This case demonstrates the preventative value of the polyurinades and the need for ongoing use of such compounds on a daily basis.

One of the major issues with heavy metals, especially mercury, is the high percentage of reabsorption through the gut. While elemental mercury is poorly absorbed through the gut, its organic methylated form is highly absorbed (90–95% absorption). The non-organic elemental mercury excreted through the bile is often methylated by abnormal bacteria or yeast in the gut resulting in re-absorption of methylated mercury. Organic mercury (from fish and seafood) and elemental mercury absorbed from various pollutants can also be absorbed through the digestive tract. The methylated mercury can pass the blood-brain barrier, and exert its toxic effects in the brain either as methylated mercury, or after being demethylated in the brain, as elemental mercury. A similar mechanism and issue exists for other heavy metals that can get reabsorbed through the digestive tract. The reabsorption can be prevented and minimized by using modified, low molecular weight alginates. The low molecular weight alginates are crucial to selective binding of heavy metals, without binding to essential minerals. The relative binding affinity series of both alginates and pectin for their potential for metal sequestration consistently places lead as having the highest affinity [27–29]. The proposed mechanisms for the binding of polyurinades, both alginates as well as pectin, is the egg-box mechanism (fig. 2).

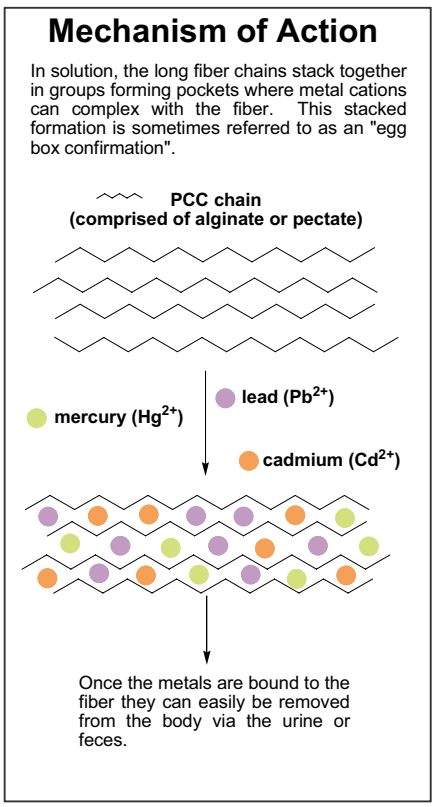

Fig. 2. Polyuronides form stacks in solution in what is known as an 'egg box' structure. Each pocket of the 'egg carton' contains a positively charged ion to balance the negatively charged chains. Normally, the positive ions are sodium and potassium. However, toxic metals especially lead, mercury, cadmium, and radioactive metals have a higher affinity for polyuronides than the essential ions like calcium, magnesium, and potassium. Toxic metal ions become trapped in the 'egg box' structure and are eliminated from the body.

By combining the two compounds, a much lower dosage was effective in the cases presented for decreasing the total body burden of heavy metals as well as for prevention. Six capsules of MCP/modified alginates a day (a total of 4 g a day) were sufficient with significant results seen in 3–6 months. Based on our clinical experience, in severe toxicity, a higher dosage of up to 12 capsules a day can be used with no side effects. Maintenance and prevention dosage is as low as 2–4 capsules a day. Once the total body burden of heavy metals is reduced, the chelation and detoxification process can be supported by utilizing additional compounds that can enhance the detoxification process, help in excreting heavy metals from the organs and tissues into the blood stream, aid in liver detoxification, provide the necessary thiol groups for detoxification, help the elimination of toxic metals through the gut and urine, and support the body's detoxification and antioxidant pathways while providing stamina and support through the utilization of adaptogenic compounds. This was achieved with the formulation PDC, a specific preparation that addresses these mechanisms of action.

While all 5 patients experienced improvement in their clinical condition and symptoms, no adverse side effects were reported. This is of note even in such a small sample group since it is supported by previous studies which reported no adverse effects with the use of MCP at 15-g daily doses [9, 10]. Side effects of traditional chelating agents such as EDTA, DMSA and DMPS can include headaches, skin irritation, nausea or stomach upset, vomiting, diarrhea, extreme fatigue, cramps, joint pain, feeling faint, convulsions, shock, cardiac arrhyth-

mias, hypertension, bone marrow suppression, transient fever, kidney damage, and even death. Traditional chelating agents can also increase excretion of essential minerals, such as zinc and, in certain cases, calcium [30]. There are recent warnings from reports of three deaths associated with chelation-therapy related hypocalcemia that resulted in cardiac arrest, which included two children [31]. The trace metal most dramatically lost as a result of EDTA chelation is zinc. Researchers have found that 24 h after an infusion of EDTA, the urine of human subjects contained 15 times the normal amount of zinc [32]. In the study of urinary excretion using MCP there was virtually no change in urinary excretion of zinc after 24 h or after 6 days [10].

The hormonal therapy in the patient with aggressive metastasized prostate cancer played a role in his improvement and maintaining his low PSA level and a significant role in his condition improving and slowing his cancer progression. The nutritionally supportive supplements included in two of the of the other patient's programs, may also have played a role in their improved health. However, the measurable amount of decrease in lead and/or mercury in these case studies with their improved health does strongly suggest a possible connection in their recovery. Further studies need to be performed to confirm the effectiveness of this gentle non-toxic chelating system as an alternative to harsher chelators in the treatment of those with heavy metal body burden.

These five case studies demonstrate that the use of MCP alone and in combination with alginates, successfully reduced heavy metal burden over time. It has been previously demonstrated that MCP has the ability to increase the urinary excretion of toxic elements in subjects with 'normal' body loads of metals without increasing excretion of essential minerals [10]. Decrease in total body burden of mercury using MCP has also been previously demonstrated [11]. This is the first known documentation of evidence of such results in a report of case studies with possible correlation between clinical outcome and a reduction in toxic heavy metal load in patients with MCP and/or an MCP/alginate complex. No adverse side effects have been reported or documented. These compounds appear able to provide a measured, progressive detoxification, avoiding side effects and exacerbation of symptoms commonly reported with the use of synthetic chelating agents. The cancer patient responded to his treatment regimen much more favorably than expected once his heavy metal burden was decreased. In our other cases, longstanding recalcitrant issues were improved or resolved once the heavy metal burden was decreased. This is a promising finding and points to evaluation and treatment of heavy metal burden as a significant factor in a comprehensive integrative approach in the care of cancer patients and others with chronic illness. In addition, these supplements offer an affordable, safe, and readily accessible long-term prevention and treatment option for a broad spectrum of the population, including the pediatric population. Additional research and clinical experience can aid in optimizing such protocols.

Disclosure

Dr. Eliaz is the Medical Director of the Amitabha Medical Clinic and Healing Center in Sebastopol, CA. He developed and holds patents on MCP and MCP/Alginates use in the chelation of heavy metals.

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