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TOXIC HEAVY METALS

Another in the Life Sources' Client Education Series

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TOXIC HEAVY METALS

Living in a toxic world

Life Sources® Inc. amino acids; Forever Young and our Flagship product, Immuzyme® developed exclusively by for our company, are a combination that promotes the detoxification of heavy metals from the body. To understand why we have developed both of these blends, it is important to understand what and why the metal toxicity we face in this world can create such grave illnesses.

It is with deep respect that we present the following information by first acknowledging the research by two great researchers; Rachel Carson and Adele Davis to name a couple, but two giants in the field of toxic research.

The industrialization of the world has dramatically increased the overall environmental 'load' of heavy metal toxins to the point that our societies are dependent upon them for proper functioning. Industry and commercial processes have actively mined, refined, manufactured, burned and manipulated heavy metal compounds for a number of reasons. Today heavy metals are abundant in our drinking water, air and soil due to our increased use of these compounds. They are present in virtually every area of modern consumerism from construction materials to cosmetics medicines to processed foods fuel sources to agents of destruction, appliances to personal care products. It is very difficult for anyone to avoid exposure to any of the many harmful heavy metals that are so prevalent in our environment. While it does not appear that we are going to neutralize the threat of heavy metal toxicity in our communities nor decrease our Utilization of the many commercial goods that they help produce, we can take steps to understand this threat and put into action policies of prevention and treatment that may help to lessen the negative impact that these agents have on human health. Furthermore, we strongly recommend that individuals take measures to detoxify their systems as a matter of course to eradicate and allow the immune system to function properly.

Heavy metal toxins contribute to a variety of adverse health effects. There exist over 20 different heavy metal toxins that can impact human health and each toxin will produce different behavioral physiological and cognitive changes in an exposed individual. The degree to which a system organ tissue or cell is affected by a heavy metal toxin depends on the toxin itself and the individual's degree of exposure to the toxin. Here are presented just 5 of the many hazardous

metal toxins that are commonly encountered by humans. Each of these metals affects an individual in such a way that its respective accumulation within the body leads to a decline in the mental cognitive and physical health of the individual. The specific sources of exposure where the metals tend to be deposited and the adverse health effects of each metal are identified below.

Aluminum

Sources of exposure: Aluminum is a naturally occurring metal that has been utilized by humans for decades. It is the third most abundant element in the earth's crust (approximately 8% of the crust is composed of aluminum compounds) and is apparent is small quantities (from 3-2400 ppb) in seawater.

Incidences of acid rain on the planet have increased the availability of aluminum to various biological systems. Acid rain is able to dissolve aluminum compounds that are naturally found in soil and rock thus increasing their prevalence in soils and fresh and saltwater sources. Because of this aluminum concentrations can be seen in various fresh and saltwater marine life, and in plants that have been grown in aluminum laden soil.

Humans have processed aluminum compounds for years and its use is apparent in many different forms of industry. Because of its many industrial and commercial uses aluminum is consumed and/or handled by many individuals on a daily basis. Today aluminum can be found in cookware, aluminum foil, dental cements, dentures, leather tanning preparations, antacids, antiperspirants, appliances, baking powder, buffered aspirin, building materials, canned acidic foods, food additives, lipsticks, construction materials (the automotive aviation and electrical industries all use aluminum compounds for various uses), prescription and over-the-counter drugs (ant diarrhea agents, hemorrhoid medications, vaginal douches) dialysates, vaccines, processed cheese, paints, toothpaste, fireworks and "softened" and normal tap water.[2]. Aluminum has been found in at least 489 of the 1416 (34%).

Target tissues:

Aluminum accumulates in the brain, muscles, liver, lungs, bones, kidneys, skin, reproductive organs and stomach. Depending on the source of exposure aluminum can be absorbed through the gastrointestinal (GI) tract or the lungs. Absorption through the GI tract is slow due primarily to pH factors but once absorbed it is distributed to the bones, liver, testes, brain and soft tissues.

Following aluminum inhalation deposition occurs primarily within the lungs.

Signs and Symptoms

Aluminum toxicity can produce a number of clinical signs and symptoms. Common are excessive headaches, abnormal heart rhythm, depression, numbness of the hands and feet and blurred vision.[6] Aluminum toxicity has been shown to produce impairment in choice reaction time, long-term memory psychomotor speed and recall in affected individuals as compared to controls.[7]

Animal studies have shown similar impairment in locomotor activity/response and spatial learning in rats receiving dietary aluminum for a period of 12 weeks. in a study conducted with patients receiving dialysis for renal failure aluminum was believed to be a causal agent in the development of dialysis encephalopathy (or "dialysis dementia") a special form of bone disease known as osteomalacic dialysis osteodystrophy and anemia. In this study individuals had been receiving concentrations of aluminum directly from their dialysate. Similarly long-term hemo-dialysis patients have exhibited a progressive neurological syndrome that includes speech disorders dementia myoclonus and encephalopathy.[10]

Evidence suggests that inhaled aluminum may contribute to the development of pulmonary fibrosis and to a lesser degree pulmonary granulomatosis.[11]

Aluminum may be involved in a myriad of neurodegenerative diseases. Dr. McLaughlin MD F.R.C.P. a professor of physiology and medicine and the director of the Centre for Research in Neurodegenerative Diseases at the University of Toronto states: "Concentrations of aluminum that are toxic to many biochemical processes are found in at least ten human neurological conditions."[12]

Recent studies suggest that aluminum may be involved in the progression of Alzheimer's Disease, Parkinson's disease, Guam ALS-PD complex "Dialysis dementia," Amyotrophic Lateral Sclerosis (ALS), senile and presenile dementia, neurofibrillary tangles, clumsiness of movements, staggering when walking and an inability to pronounce words properly.

To date however we do not completely understand the role that aluminum plays in the progression of such human degenerative syndromes.

Chronic aluminum exposure has contributed directly to hepatic failure, renal failure and dementia. Other symptoms that have been observed in individuals with high internal concentrations of aluminum are colic, convulsions, esophagitis,

gastroenteritis, kidney damage, liver dysfunction, loss of appetite, loss of balance, muscle pain, psychosis, shortness of breath, weakness and fatigue.[15]

Behavioral difficulties among schoolchildren have also been correlated with elevated levels of aluminum and other neuro-toxic heavy metals. And aluminum toxicity may also cause birth defects in new-borns.[17]
Medical tests for aluminum screening: Blood, urine, feces, hair and fingernails.

Arsenic

Sources of exposure: The use of this toxic element in numerous industrial processes has resulted
in its presence in many biological and ecological systems. Ground surface and drinking water are susceptible to arsenic poisoning from the use of arsenic in smelting refining galvanizing and power plants; environmental contaminants like pesticides herbicides insecticides fungicides desiccants wood preservatives and animal feed additives; and human made hazardous waste sites chemical wastes and antibiotics. Arsenic concentrations are apparent in the air as a result of the burning of arsenic containing materials such as wood, coal, metal alloys and arsenic waste.[18]

Arsenic concentrations can also be found in specialty glass, defoliants, marine life (primarily fish and shellfish) and riot-control gas.[19] Arsenic is present in at least 781 of the 1300 (60%) NPL sites as identified by the EPA.[20]

Target tissues: Many arsenic compounds are readily absorbed through the GI tract when delivered orally in humans. Absorption within the lungs is dependent upon the size of the arsenic compound and it is believed that much of the inhaled arsenic is later absorbed through the stomach after (respiratory) mucocillary clearance. After the absorption of arsenic compounds the primary areas of distribution are the liver, kidneys, lung, spleen, aorta and skin. Arsenic compounds are also readily deposited in the hair and nails.[22]

Signs and Symptoms: Arsenic is a highly toxic element that has been used historically for purposes of suicide and homicide. Its health effects are well known and multiform. Acute exposure to arsenic compounds can cause nausea, anorexia, vomiting, abdominal pain, muscle cramps, diarrhea and burning of the mouth and throat.[23] Garlic-like breath, malaise and fatigue have also been seen in individuals exposed to an acute dose of arsenic while contact dermatitis

skin lesions and skin irritation are seen in individuals whom come into direct tactile contact with arsenic compounds. A large acute oral dose has caused tachycardia acute encephalopathy congestive heart failure stupor convulsions paralysis coma and even death.

Animal studies have shown similar acute effects when arsenic compounds were delivered orally to Rhesus monkeys.[26] Repeat exposure to arsenic compounds have been shown to lead to the development of peripheral neuropathy, encephalopathy, cardiovascular distress, peripheral vascular disease, EEG abnormalities, Raynaud's phenomenon, gangrene of the lower legs ("Black foot disease"), acrocyanosis, increased vasopastic reactivity in the fingers, kidney and liver damage, hypertension, myocardial infarction, anemia and leucopenia.[27] Other chronic effects of arsenic intoxication are skin abnormalities (darkening of the skin and the appearance of small "corns" or "warts" on the palms soles and torso), neurotoxic effects, chronic respiratory diseases, (pharyngitits, laryngitis, pulmonary insufficiency), neurological disorders, dementia, cognitive impairment, hearing loss and cardiovascular disease.[28] A significantly higher percentage of spontaneous abortions has been shown in a population living near a copper smelting plant; lower birth weights of babies born to this same population are seen and an abnormal percentage of male to female births is also apparent suggesting that arsenic affects babies in utero.

Studies have shown close associations between both inhaled and ingested arsenic and cancer rates. Cancers of the skin liver respiratory tract and gastrointestinal tract are well documented in regards to arsenic exposure.[30]

Several arsenic compounds have been classified by the US Environmental Protection Agency as a Class A- Human Carcinogen.

[1] Venugopal and Luckey 1978
[2] ATSDR 1990 Wills and Savory 1985
[3] National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA) (ATSDR 1995
[4] ATSDR 1990 Wills and Savory 1985
[5] Venugopal and Luckey 1978
[6] Kilburn and Warshaw 1993
[7] Wills and Savory 1985
[8] Commissaris et al. 1982
[9] Wills and Savory 1985
[10] Perl and Brody 1980
[11] ATSDR 1990
[12] Crapper-McLachlan 1980

[13] Berkum 1986; Goyer 1991; Shore and Wyatt 1983
[14] Arieff et al. 1979
[15] ATSDR 1990
[16] Goyer 1991
[17] ATSDR 1990
[18] ATSDR 1989; Morton and Caron 1989
[19] Hine et al. 1977
[20] RAIS 1992
[21] ATSDR 1989
[22] U.S. EPA 1984
[23] ATSDR 1989
[24] Feldman et al. 1979
[25] Morton and Caron 1989
[26] Heywood and Sortwell 1979
[27] ATSDR 1989; Blom et al. 1985; Feldman et al. 1979; Heyman et al. 1956; Hine et al. 1977; Langerkvist et al.
1986; Morton and Caron 1989
[28] Blom et al. 1985; Kyle and Pease 1965; Morton and Caron 1989

Medical testing for arsenic screening: Urine, (best) hair and fingernails.

Copper

Sources of exposure: Copper occurs naturally in elemental form and as a component of many different compounds. The most toxic form of copper is thought to be that in the divalent state cupric (Cu2+). Because of its high electrical conductivity copper is used extensively in the manufacturing of electrical equipment and different metallic alloys. Copper is released into the environment primarily through mining, sewage treatment plants, solid waste disposal, welding and electroplating processes, electrical wiring materials, plumbing supplies (pipes faucets braces and various forms of tubing) and agricultural processes.[32] It is present in the air and water due to natural discharges like volcanic eruptions and windblown dust. Drinking water sources become contaminated with copper primarily because of its use in many different types of plumbing supplies. It is a common component of fungicides and algaecides and agricultural use of copper for these purposes can result in its presence in soil, ground water, farm animals (grazing animals like cows horses etc.) and many forms of produce.

Copper is also present in ceramics, jewelry, monies (coins) and pyrotechnics. Though copper is an essential trace element required by the body for normal physiological processes increased exposure to copper containing substances can result in copper toxicity and a wide variety of complications.

Target tissues: Absorption of copper occurs through the lungs, gastrointestinal tract and skin. The degree to which copper is absorbed in the gastrointestinal tract largely depends upon its chemical state and the presence of other compounds like zinc.[36] Once absorbed, copper is distributed primarily to the liver, kidneys, spleen, heart, lungs, stomach, intestines, nails and hair. Individuals with copper toxicity show an abnormally high level of copper in the liver, kidneys, brain, eyes and bones.[37]

Signs and symptoms: Acute toxicity of ingested copper is characterized by abdominal pain, diarrhea, vomiting, tachycardia and a metallic taste in the mouth. Continued ingestion of copper compounds can cause cirrhosis and other debilitating liver conditions.[38] Inhaled copper dust or fumes can produce eye and respiratory tract irritation, headaches, vertigo, drowsiness, chills, fever, aching muscles and discoloration of the skin and hair in humans.[39] Vineyard workers exposed to copper fumes for a long period of time developed pulmonary fibrosis and granulomas of the lungs, liver impairment and liver disease (cirrhosis, fibrosis and various morphological changes).

Similar results were obtained in animals chronically exposed to copper containing dust and fumes.[40] Further animal studies on copper toxicity have shown varying degrees of liver and kidney damage (necrosis of the kidney, sclerosis, necrosis and cirrhosis of the liver), decreased total weight, brain weight and red blood cell count, increased platelet counts and the presence of gastric ulcers.

Copper also appears to affect reproduction and development in humans and animals. Offspring of hamsters that received copper sulfate injections while pregnant exhibited increased incidences of hernias, encephalopathy, abnormal spinal curvature and spina bifida.

Sperm motility also appears to be compromised by the presence of copper in human spermatozoa. Chronic exposure to copper can produce numerous physiological and behavioral disturbances.

Copper toxicity has been characterized in patients with Wilson's disease a genetic disorder that causes an abnormal accumulation of copper in body tissue. Wilson's disease is fatal unless treated in time. Manifestations of Wilson's disease include brain damage and progressive demyelization, psychiatric disturbances, depression, suicidal tendencies and aggressive behavior;

hemolytic anemia, cirrhosis of the liver, motor dysfunction and corneal opacities.[44] Some patients may also experience poor coordination, tremors, disturbed gait, muscle rigidity and myocardial infarction.[45]

Medical tests for copper screening: Blood, urine and hair.

Lead

Sources of exposure: Lead is the 5th most utilized metal in the U.S. It is mined extensively in Missouri, Colorado, Idaho and Utah and is used for the production of ammunition bearing metals, brass materials, solder, ballast tubes, containers, gasoline products, ceramics and weights.[46] Human exposure to lead occurs primarily through drinking water, airborne lead containing particulates and lead-based paints. Several industrial processes create lead dust/fumes resulting in its presence in the air. Mining, smelting and manufacturing processes, the burning of fossil fuels (especially lead-based gasoline) and municipal waste and incorrect removal of lead based paint results in airborne lead concentrations. After lead is airborne for a period of ten days it falls to the ground and becomes distributed in soils and water sources (fresh and salt water surface and well water and drinking water). However the primary source of lead in drinking water is from lead-based plumbing materials. The corrosion of such materials will lead to increased concentrations of lead in municipal drinking water. Lead from water and airborne sources have been shown to accumulate in agricultural areas leading to increased concentrations in agricultural produce and farm animals.[48] Cigarette smoke is also a significant source of lead exposure; people who smoke tobacco or breathe in tobacco smoke may be exposed to higher levels of lead than people who are not exposed to cigarette smoke.

Target tissues: Lead is absorbed into the body following inhalation or ingestion. Children absorb lead much more efficiently than adults do after exposure and ingested lead is more readily absorbed in a fasting individual.[50] Over 90% of inhaled lead is absorbed directly into the blood.

After lead is absorbed into the body it circulates in the blood stream and distributes primarily in the soft tissues (kidneys brain and muscle) and bone. Adults distribute about 95% of their total body lead to their bones while children distribute about 73% of their total body lead to their bones.[51]

Signs and Symptoms: Lead is one of the most toxic elements naturally occurring on Earth. High concentrations of lead can cause irreversible brain damage (encephalopathy), seizure, coma and death if not treated immediately.[52] The Central Nervous System (CNS) becomes severely damaged at blood lead concentrations starting at 40mcg/dL causing a reduction in nerve conduction velocities and neuritis.[53] Neuropsychological impairment has been shown to occur in individuals exposed to moderate levels of lead. Evidence suggests that lead may cause fatigue irritability information processing difficulties memory problems a reduction in sensory and motor reaction times decision making impairment and lapses in concentration. At blood concentrations above 70 mcg/dL lead has been shown to cause anemia characterized by a reduction in hemoglobin levels and erythropoiesis-- a shortened life span of red blood cells.[55]

In adults lead is very detrimental to the cardiovascular system. Occupationally exposed individuals tend to have higher blood pressure than normal controls[56] and are at an increased risk for cardiovascular disease myocardial infarction and stroke.[57]

The kidneys are targets of lead toxicity and prone to impairment at moderate to high levels of lead concentrations. Kidney disease both acute and chronic nephropathy is a characteristic of lead toxicity.[58] Kidney impairment can be seen in morphological changes in the kidney epithelium increases in the excretion rates of many different compounds reductions in glomerular filtration rate progressive glomerular arterial and arteriolar sclerosis and an altered plasma albumin ratio.[59] Chronic nephropathy has lead to increased death rates among occupationally exposed individuals as compared to controls in studies by Selevan et al. (1975) and Cooper et al. (1985). Other signs/symptoms of lead toxicity include gastrointestinal disturbances, abdominal pain, cramps, constipation, anorexia and weight loss, immunosuppression and slight liver impairment.

Children are susceptible to the most damaging effects of lead toxicity. Ample literature exists that shows just how damaging lead is to children. Prenatal and postnatal development are compromised significantly by the presence of lead in the body. At blood lead concentrations of 80-100 mcg/dL severe encephalopathy occurs. Those children who survive lead-induced encephalopathy typically suffer permanent brain damage marked by mental retardation and numerous behavioral impairments. These children also suffer slower neural conduction

velocities, peripheral neuropathy, cognitive impairment and personality disorders.[61] Tuthill (1996) has found that hair lead levels in children were positively correlated with attention-deficit and hyperactive behavior. Numerous studies have implicated lead as a causal agent in the deterioration of cognitive functioning in children. Studies by Schroeder and Hawk (1986) Burchfield et al. (1980) Otto et al. (1981 1982) and Munoz et al. (1993) have shown IQ deficits in children with blood lead concentrations from 6-70 mcg/dL. Longitudinal studies have given further evidence that lead affects intelligence in exposed children. Studies by Vimpani et al. (1989) McMichael et al. (1988) and Wigg et al. (1988) have shown decreased performance on intelligence tests in lead exposed school children. One study has correlated lower socioeconomic status with childhood lead poisoning 50 years after lead exposure. Maternal blood lead concentrations and prenatal lead exposure appear to be strong predictors of cognitive performance in offspring. Prenatal exposure may also cause birth defects miscarriage spontaneous abortion and underdeveloped babies.[63] Lead not only appears to affect cognitive development of young children but also other areas of neuropsychological function.

Young children exposed to lead may exhibit mental retardation, learning difficulties, shortened attention spans (ADHD), increased behavioral problems (aggressive behaviors) and reduced physical growth.[64] Lead has been determined by many health experts to be the #1 threat to developing children in our industrial societies.

Medical test for lead screening: Blood, urine and hair.

[39] U.S.A.F. 1990
[40] Johansson et al. 1984; Stockinger 1981
[41] Kline et al. 1977; Rana and Kumar 1978
[42] Ferm and Hanlon 1974
[43] Battersby and Morton 1982
[44] ATSDR 1990a; Goyer 1991a; U.S. EPA 1987
[45] ATSDR 1990a
[46] ATSDR 1993
[47] U.S. EPA 1989
[48] ATSDR 1993
[49] RAIS 1994
[50] U.S.EPA 1986
[51] U.S. EPA 1986a
[52] U.S. EPA 1986
[53] ATSDR 1993

[54] Ehle and McKee 1990
[55] Goyer 1988; US EPA 1986a
[56] Pocock et al. 1984; Harlan et al. 1985; Landis and Flegal 1988
[57] US EPA 1990
[58] Goyer 1988
[59] Goyer 1985 1988; Landigran 1989

Mercury

Sources of exposure: Mercury occurs primarily in two forms: organic mercury and inorganic mercury. Inorganic mercury occurs when elemental mercury is combined with chlorine sulfur or oxygen. Inorganic mercury and elemental mercury are both toxins that can produce a wide range of adverse health affects. Inorganic mercury is used in thermometers, barometers, dental fillings, batteries, electrical wiring and switches, fluorescent light bulbs, pesticides, fungicides, vaccines, paint, skin-tightening creams, vapors from spills, antiseptic creams, pharmaceutical drugs and ointments.[65] Inorganic mercury vapor is at high concentrations near chlorine-alkali plants, smelters, municipal incinerators and sewage treatment plants. The organic form occurs when mercury is combined with carbon. The most common form of organic mercury is methyl mercury which is produced primarily by small organisms in water and soil when they are exposed to inorganic mercury. Humans also have the ability to convert inorganic mercury to an organic form once it has become absorbed into the bloodstream.

Organic mercury is known to bioaccumulate -- or passes up the food chain due an organism's inability to process and eliminate it. It is found primarily in marine life (fish) and can often be found in produce and farm animals processed grains and dairy products and surface salt- and fresh water sources. Occupational exposure to mercury containing compounds presents a significant health risk to individuals.
Dentists, painters, fishermen, electricians, pharmaceutical/laboratories workers, farmers, factory workers, miners, chemists, and beauticians are just some of the professions chronically exposed to mercury compounds.

Target tissues: The absorption and distribution of mercury compounds depends largely upon its chemical state. Organic mercury compounds are absorbed from the gastrointestinal tract more readily than inorganic mercury compounds with the latter being very poorly absorbed. After absorption in the gastrointestinal tract organic mercury is readily distributed throughout the body but tends to

concentrate in the brain and kidneys.[67] Approximately 80% of mercury vapor is absorbed directly through the lungs and distributed primarily to the CNS and the kidneys. Inorganic and organic forms of mercury have also been seen in the red blood cells liver muscle tissue and gall bladder.

Signs and symptoms: Mercury exposure can result in a wide variety of human health conditions.

The degree of impairment and the clinical manifestations that accompany mercury exposure largely depend upon its chemical state and the route of exposure.

While inorganic mercury compounds are considered less toxic than organic mercury compounds (primarily due to difficulties in absorption) inorganic mercury that is absorbed is readily converted to an organic form by physiological processes in the liver.

The acute ingestion of inorganic mercury salts may cause gastrointestinal disorders such as abdominal pain, vomiting, diarrhea and hemorrhage.[70] Repeated and prolonged exposure has resulted in severe disturbances in the central nervous system, gastrointestinal tract, kidneys and liver. Davis et al. (1974) reported dementia colitis and renal failure in individuals chronically poisoned due to the ingestion of an inorganic mercury containing laxative.

Inhaled inorganic mercury can cause a wide range of clinical complications in individuals including corrosive bronchitis, interstitial pneumonitis, renal disorders, fatigue, insomnia, loss of memory, excitability, chest pains, impairment of pulmonary function and gingivitis.

Chronic inhalation of inorganic mercury compounds may result in a reduction of sensory and motor nerve function, depression, visual and/or auditory hallucinations, muscular tremors, sleep disorders, alterations in autonomic function (heart rate blood pressure reflexes), impaired visuomotor coordination, speech disorders, dementia, coma and death.[72] Ngim et al. (1992) have shown that a group of dentists exposed to mercury vapors occupationally perform significantly worse in neurobehavioral tests that measure motor speed, visual scanning, visuomotor coordination and concentration verbal memory and visual memory. Kishi et al. (1993) have found that smelter workers exposed to inorganic mercury compounds continue to experience neurological symptoms such as tremors, headaches, slurred speech, senile symptoms and diminished mental capacities eighteen years after the cessation of mercury exposure.

Our understanding of the effects of methyl mercury poisoning comes primarily from epidemic poisonings in Iraq and Japan. In Iraq more than 6000 individuals were hospitalized and 459 died as a result of methyl mercury poisoning. Adults experienced symptoms including parasthesia, visual disorders, ataxia, fatigue, tremor, hearing disorders (deafness) and coma.

Neuropathologic observations of exposed individuals have shown irreversible brain damage including neuronal necrosis, cerebral edema, gliosis and cerebral atrophy.[74] Iraqi children poisoned through the consumption of methyl mercury containing food products (grains treated with mercury containing fungicides) exhibited nervous system impairment, visual and auditory disorders, weakness, marked motor and cognitive impairment and emotional disturbances.

Individuals in Japan experienced many of these same symptoms after the ingestion of fish containing large amounts of methyl mercury. Similarly autopsies conducted on deceased Japanese in the Minamata Bay have shown pronounced brain lesions, cerebral atrophy, edema and gliosis in the deeper fissures (sulci) of the brain such as in the visual cortex. The Japan and Iraq epidemics have clearly established mercury as an agent that can disrupt developmental processes in the unborn and infantile individual. Methyl mercury can pass through the placental barrier and produce many deleterious effects on the unborn fetus.[78] Children born to mercury poisoned mothers were of smaller total weight, had decreased brain weights at birth, had fewer nerve cells in the cerebral cortex and experienced an abnormal pattern of neuronal migration.

Of those children that survived the epidemic many experienced severe developmental effects like impaired motor and mental function, hearing loss and blindness, throughout their childhood.

Researchers have also observed a heightened incidence of cerebral palsy in children born to mothers in the Minamata Bay.

Mercury has recently been implicated as being a contributing factor to the increasing prevalence of Autism in American children. The Autism Research Institute has focused on mercury containing vaccines (TMS) and their relationship to autism. Over 2 million individuals are affected with autism a neurodevelopment syndrome that typically produces impairment in sociality communication and sensory/perceptual processes and recent evidence has found a positive correlation between complications seen in autistics and complications seen in mercury poisoned individuals.[82] While it is difficult to ascribe causation in this case it should not be altogether dismissed. Mercury poisoning has been implicated in the development of many other human dysfunctional states for many years. Among these are cerebral palsy,

amyotrophic lateral sclerosis, Parkinson's disease, psychosis and chronic fatigue syndrome.

We are beginning to understand the threat that heavy metal toxins are to our health. However heavy metal toxicity is a condition that often goes overlooked in traditional medical diagnoses.

While it is rare for an individual to experience a disease or health condition solely from a heavy metal toxin it is reasonable to conclude that these toxins exert a dramatic effect on the health of an individual and contribute to the progression of many different debilitating conditions. We have seen how just 5 heavy metals and their respective compounds can adversely affect an individual's health.

These effects range from simple gastrointestinal disturbances to severe emotional and cognitive disturbances.

Metal toxins have the ability to impair not just a single cell or tissue but many of the body's systems that are responsible for our behavior mental health and proper physiological functioning that we depend on for sustained life. If undetected these agents can cause immeasurable pain and suffering for any afflicted individual. Fortunately there are avenues that an affected individual can pursue to detoxify heavy metals already in their system.

Popular therapies (known as chelation) today rely on intravenous (IV) solutions to help eliminate heavy metal toxins. EDTA and DMSA are two compounds that are being used for the removal of heavy metals today. These therapies have been shown to be effective but also potentially harmful to many individuals. Alternative chelating therapies such Life Sources® Inc.'s formulas; Immuzyme®, Forever Young (amino acids includes;12 non-essential; 13 essential), plus adding the single amino acid N-Acetyl-Cysteine has been proven to be safer than the traditional IV therapies and may prove to be just as effective.

These therapies popularly known as oral chelation therapies rely on nutritional substances that have been shown to help detoxify heavy metals within the body and help support the body's overall health.

60 ATSDR 1993; US EPA 1986a).
61 US EPA 1986a
62 White et al. 1993
63 Goyer 1988; McMichael et al. 1988; US EPA 1986d
64 Bellinger D. et al. 1990 1992
65 ATSDR 1989a)
66 ATSDR 1989a; Brenner and Snyder 1980
67 Goyer 1991b
68 Friberg and Nordberg 1973
69 Peterson et al. 1991 Dutczak et al. 1991 ATSDR 1989a
70 ATSD 1989a
71 Goyer 1991b ATSDR 1989a

[72] Clarkson 1989; Goyer 1991b; Fawyer et al. 1983; Piikivi and Hanninen 1989; and Ngim et al. 1992
[73] Bakir et al. 1973; Mottet Shaw and Burbacher 1985
[74] Mottet Shaw and Burbacher 1985
[75] Bakir et al. 1973; Bakir et al. 1978
[76] I recall a Life Magazine photo essay by W. Eugene Smith. His monumental essay Minamata, exposed the problems with mercury exposure in a small fishing village in Japan. The one gripping photograph was of a woman bathing her adult child who was severely deformed by mercury poisoning.
[77] Takeuchi 1968)
[78] Mottet Shaw and Burbacher 1985
[79] Choi et al. 1978; Takeuchi 1968 Amin-Zake et al. 1974
[80] Amin-Zaki et al. 1974
[81] Matsumoto Koya and Takeuchi 1965
[82] Bernard et al. 2000
[83] Adams et al. 1983; Bernard et al. 2000; Dales 1972

Oral Chelation with ***Life Sources® Inc's Proprietary Blend of Immuzyme®, since 1999,*** has proven to support not only one of many healthy benefits to support Cardiovascular Conditions; plus so many other disorders that have been disrupted by our environment; has been naturally chelating Heavy Metal Toxicity, plus, supports all organs of the body as follows;

Cardiovascular Conditions

Heavy metal toxicity is frequently the result of long term low level exposure to pollutants common in our environment: air water food and numerous consumer products.

Exposure to toxic metals is associated with many chronic diseases. Recent research has found that even low levels of lead mercury cadmium aluminum and arsenic can cause a wide variety of health problems.

Symptoms Sources Solution
Decreased Intelligence in Children
Nervous System Disorders
Immune Dysfunction
Depression
Fatigue
Muscle Weakness and Aches
Anemia
Skin Rashes
High Blood Pressure
Memory Loss
Diarrhea
Nausea
Metallic Taste in Mouth
Irritability

Tremors
Cancer
Hyperactivity
Autism
Behavioral Disorders
Headaches
Aluminum
Cookware
Amalgam Fillings
Drinking Water
Air Pollution
Tobacco Smoke
Fish and Seafood
Pesticides
Medications
Cosmetics
Fertilizers
Heavy Traffic
Old Paint
Anti-Perspirants

Testing is very effective through oral chelation therapy.

Behavioral Structural Functional Abnormalities associated with various Heavy Metals

Toxins
Published in the August Issue of Alternative & Complementary Therapies (a magazine for doctors) and Published in the April, 2001, Issue of Townsend Letter for Doctor's & Patients).

Psychiatric Disturbances
Social Deficits Social withdrawal
Mercury

Repetitive perseveratives; stereotyped behaviors; OCD-typical behaviors
Mercury

Depression mood swings flat affect impaired facial recognition
Arsenic, Copper, Lead, Mercury

Schizoid tendencies, hallucinations. Delirium
Mercury

Irritability aggressive behaviors temper. tantrums
Lead, Mercury

Suicidal Behaviors
Copper, Mercury

Sleep difficulties/ disturbances
Lead, Mercury, Thallium

Chronic fatigue (CFS) weakness malaise
Aluminum, Arsenic, Cadmium, Copper, Lead, Mercury, Thallium

Anorexia; symptoms reflecting eating disorders loss of appetite/weight
Arsenic, Lead, Mercury

Anxiety; nervous tendencies
Thallium

Attention problems (ADHD) lacks eye contact impaired visual fixation
Lead, Mercury

Speech and Language Deficits

Speech disorders Aluminum, Mercury

Loss of speech developmental problems with language
Mercury

Speech comprehension deficits Mercury

Dysarthria; articulation problems; slurred speech unintelligible speech
Mercury

Cognitive Impairments; **Mental retardation borderline intelligence**
Arsenic, Lead, Mercury

Uneven performance on IQ scores low IQ scores
Copper, Lead

Poor concentration attention deficits (ADHD); response inhibition
Aluminum, Lead

Poor memory (short term verbal and auditory) Aluminum, Lead

Dementia; pre-senile and senile dementia
Aluminum

Stupor

Aluminum, Arsenic

Impaired reaction time; lower performance on timed tests
Lead

Sensory Abnormalities

Abnormal Sensations in the mouth and extremities
Arsenic

Hearing loss difficulty hearing
Arsenic, Lead, Mercury

Abnormal touch sensations; diminished touch sensations aversion to touch
Arsenic

Blurred vision; sensitivity to light
Arsenic, Mercury

Motor Disorders; **Choreiform movements myoclonal; jerks; unusual postures**
Copper, Mercury

Difficulty walking swallowing talking
Copper, Mercury

Flapping circling rocking toe walking
Mercury

Problems with intentional movements or imitation
Mercury

Abnormal gait/posture; un-coordination loss of balance; problems sitting lying crawling and walking
Mercury

Decreased locomotor activity
Aluminum, Arsenic

Convulsions; seizure
Aluminum, Arsenic, Copper, Lead, Mercury, Thallium

Structural and Functional Abnormalities associated with various heavy metal toxins

Physiological Impairment

Brain and Central Nervous System

Neurofibrillary tangles
Aluminum

Neuritis retrobulbar neuritis; neuropathy
Aluminum, Arsenic, Thallium

Encephalopathy
Aluminum, Arsenic, Lead, Thallium

Alterations in nerve conduction velocity
Lead

Alterations in the spinal chord
Thallium

Accumulates in CNS structures
Aluminum, Mercury

Abnormal EEGs
Arsenic, Lead

Autonomic disturbances
Copper, Lead, Mercury, Thallium

Peripheral Nervous System

Peripheral neuropathy
Arsenic, Mercury

Alterations in peripheral nerves
Arsenic

Loss of feeling/ numbness in the extremities parasthesia
Arsenic, Mercury, Thallium

Gastrointestinal Tract; **Nausea vomiting diarrhea loss of appetite**
Arsenic, Copper, Mercury, Thallium

Abdominal pain stomach cramps; burning of the throat and mouth
Arsenic, Copper, Lead, Mercury, Thallium

Esophagitis; gastroenteritis; colitis
Arsenic, Mercury, Thallium

Cancers (colon pancreatic stomach or rectal)
Arsenic

Renal and Hepatic Impairment; **Hepatotoxicity**

Liver dysfunction damage
Arsenic, Copper, Thallium

Cirrhosis of the liver; hepatitis
Copper

Kidney disease; kidney failure
Arsenic, Lead, Mercury

Renal toxicity; tubular proteinosis
Arsenic, Copper, Lead

Kidney Damage histological alterations
Arsenic, Lead

Cardiovascular System; **Blood vessel damage**
Arsenic

Anemia; decreased red blood cell count
Arsenic, Copper, Lead

Hypertension; increased heart rate (tachycardia)
Arsenic, Copper, Lead, Thallium

Electrocardiac disorders; Peripheral vascular disease; cardiovascular disease; vascular collapse
Arsenic, Lead

Respiratory System; **Pulmonary Fibrosis**
Aluminum, Arsenic

Pneumonia laryngitis pharyngitis bronchitis
Aluminum, Arsenic, Mercury

Restrictive airway disorders asthmatic conditions pneumoconisis
Arsenic, Aluminum

Respiratory tract cancers
Arsenic

Immune System; **Immunosuppression**

Lead

Decreased white blood cell count
Arsenic, Thallium

***Reproductive System;* Genital abnormalities**
Aluminum, Thallium

Disturbances in menstrual cycle; menstrual pains
Copper, Mercury

Birth defects; premature births; Spontaneous abortion
Arsenic, Lead, Mercury

Reproductive dysfunction
Arsenic, Aluminum, Cadmium, Lead

***Other Physical Disturbances;* Rashes contact dermatitis eczema itchy/irritating skin**
Aluminum, Arsenic, Copper, Mercury

Muscle pain; headache; acrodynia; colic
Arsenic, Copper, Lead, Thallium

Alopecia (hair loss)
Aluminum, Lead, Thallium