Please do accept this as my comments to the Sunday, October 28, 2018, oral proceeding of the MEA ISR hearing record. Docket No. 40-8943-MLA-2, ASLBP No. 13-926-01-MLA-BD01

1. There are over 2600 private wells downstream of the proposed mine site that could be affected by inevitable lack of containment and breeches of confinement, as evidenced in every mine in history.

2. No toxicology of the potential and inevitable leaks is or was being considered, was not in the NEPA or possible environmental impact studies.

3. No testing is currently being required for uranium specifically. Uranium is known to concentrate in the wastewater, and new research has shown that organified forms of uranium are not able to be extracted by conventional means

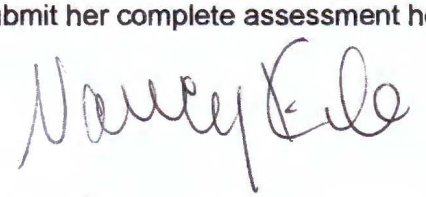
4. No heavy toxic metals are required for testing, and no specific chemical forms of such are tested for, so that true toxicity can be establish in wastewater and leaks.

5. No studies have been done to asses the biologicals and biota in the area as a baseline, something that EPA feels is important to assess true toxicity, since we cannot test for every chemical known to man. However, Mother Nature keeps score on such, and will show environmental damage even when our traditional chemistry testing is lacking.

6.Wastewater contamination and migration from lack of containment, will cause the crops grown with contaminated water from these affected wells to contaminate the resulting crops that go into the human food market.

7. Lack of containment is inevitable with every mine of this kind. Breeches of containment will toxify the Niobrara River and surrounding area that is one of the last pristine areas on the US, never to be reclaimed. Toxic metals and radiation cannot be successfully cleaned up after this.

8. These points of environmental concern are supported by the testimony of Linsey McLean, environmental biochemist, who is a federally approved expert witness in the Crow Butte case. I submit her complete assessment here.



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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)

CROW BUTTE RESOURCES, INC. ,)

(License Renewal for the ===)

Crow Butte Resources, Inc. - Marsland Expansion Area)

Docket ID NRC–2012– 0281

February 14, 2018

EXPERT OPINION TESTIMONY OF LINSEY MCLEAN

I, Linsey McLean, do hereby swear that the following written testimony is true to the best of my knowledge:

I. Basis for Testimony as Expert in Field.

As an environmental biochemist working with toxic exposures in both animals and humans for the last 40 years, I have collected the largest databank for hair analysis of metals and minerals of anyone in the world since 1977. This databank follows the continuing increase in environmental toxins in air, water and food residues over the last 50 years, and correlates with disease and health compromise symptoms and syndromes. To date, I have one Canadian and 7 U.S Patents for products

and protocols addressing health compromises from environmentally driven diseases in both humans and animals, including one for the only diet protocol that has ever earned a U.S Patent. This diet program resulted from my research from the 1970's, 1980's and 1990's, and underlies all the popular and effective diets of today featuring low carbohydrate, high protein, and high monounsaturated healthy vegetable oils, including the Atkins Diet, the South Beach Diet, the Zone Diet, the American Diabetes Association Diet, the Mediterranean Diet, etc. The foundation of this revolutionary approach is designed to fuel biochemical energy pathways while supporting compromised biochemical pathways compromised by exposure to common environmental toxins (not present before WW2), including hormone pathways, and also addressing detox of the interfering environmental chemicals, so that normalization of biochemistry is achieved.

I also have a US patent pending on a "Method to Accurately Calculate the True Toxicity of Metals in Soils and Water". When this is issued, it will be turned over to Public Domain, for EPA and other regulatory agencies to upgrade their assessments for superfund sites, dumpsites, mining sites and brownfield sites of all kinds.

I have a 40 year old manufacturing business that formulates and manufactures nutritional supplements for humans as well as commercial specialty feeds and nutritional supplements for horses, cattle and other food animals. My company has earned numerous honors and accolades including "Official Supplier to the United States Equestrian Team".

In addition, I have served in Michigan as an expert witness in state courts in environmental pollution and dumping cases and as expert witness in South Dakota in state and federal (NRC) hearings in the Dewey Burdock case for ISL uranium mining, and the Crow Butte license renewal case.

My complete CV is attached.

Expert Opinion and Testimony Concerning:

Failure to Require or Provide Necessary Baseline Data

Throughout the EA, NRC proposes to allow Crow Butte to defer collection of critical data that is admittedly necessary to conduct a review of the project and the resulting impacts.

According to the EA, substantial information related to baseline conditions at the site, and needed to assess the impacts of the proposed operations, is not proposed to even be collected or reviewed until long after the NEPA process has concluded. This scheme is not allowable under NEPA.

Under NEPA, an agency is required to "describe the environment of the areas to be affected or created by the alternatives under consideration." 40 C.F.R. § 1502.15. The establishment of the baseline conditions of the affected environment is a fundamental requirement of the NEPA process:

NEPA clearly requires that consideration of environmental impacts of proposed projects
take place before [a final decision] is made." *LaFlamme v. FERC*, 842 F. 2d 1063, 1071
(9th Cir.1988) (emphasis in original). Once a project begins, the "pre-project environment" becomes a thing of the past, thereby making evaluation of the project's effect on pre-project resources impossible. Id. Without establishing the baseline conditions which exist in the vicinity ... before [the project] begins, there is simply no way to determine what effect the proposed [project] will have on the environment and, consequently, no way to comply with NEPA.

Half Moon Bay Fisherman's Mark't Ass'n v. Carlucci, 857 F.2d 505, 510 (9th Cir. 1988).
"In analyzing the affected environment, NEPA requires the agency to set forth the baseline conditions." *Western Watersheds Project v. BLM*, 552 F.Supp.2d 1113, 1126 (D. Nev. 2008) (emphasis added). "The concept of a baseline against which to compare predictions of the effects of the

proposed action and reasonable alternatives is critical to the NEPA process." *Council of Environmental Quality, Considering Cumulative Effects under the National Environmental Policy Act* (May 11, 1999).

In this case, the EA has not demonstrated that a baseline has been adequately established.

Opinion:

There are 2600 private wells downstream from the site of this project that will be affected over time, with toxic metals and radioactivity from expected leaks, excursions and migrations and washouts of lixivients and other wastes. These wells are known to suck water from the Chamberlain Pass. This amounts to a quantity of 14 million gals per yr, per well, times 2600 wells, for total amounts of 36,400,000 gals of potentially toxic water laden with heavy metals and radioactivity entering the human food chain, per growing season and per crop harvest. Soybeans and sugar beets are extensively grown in the area and irrigated with these wells, as well as used for drinking water for livestock and humans who live there. This is a huge agricultural area where virtually all the products produced there go into the human food supply, one way or another. Every part of the soybean is used for human or animal feed for human food animals, including the hulls. Every part of the sugar beet is used for human or animal feed. Sugar is extracted via water extraction, so that water soluble ions and toxic metal salts will be

extracted with it. There is no process currently in commercial production of sugar now that targets the extraction of toxic metals, as such is not the usual contaminant in sugar beets. The beet pulp left is then dried and concentrated into animal feed for cattle, sheep, goats and other ruminants, that then enter the human food supply. The beet pulp will contain the toxic organified forms of the uranium and other metals that have built up in concentration in the reuse of the injected lixivient waters, as well as the waste waters, because of their lower solubility and inability to be efficiently extracted by the ion exchange methods used for recovery today. Organified metals of all kinds are highly bioavailable and easily taken up by plants and animals, and easily bioaccumulated up the food chain to humans.

Reference:

Arabian Journal of Chemistry
Volume 4, Issue 4, October 2011, Pages 361–377

The organified toxic metals, including uranium, are more able to be taken up and incorporated into the plants, and thus end up in the agricultural products and the food chain. The bioavailability of organified metals is huge, often by orders of magnitude over the inorganic salts, so bioaccumulation becomes a problem for humans at the top of the food chain.

Because organified uranium is not able to be recovered, it should be a required monitor of the wastewater.

Reference:

See Slide 8 and

Chelated Minerals in Animal Nutrition

Rajendran, C.Kathirvelan and V.Balakrishnan, Madras Veterinary College, Chennai, INDIA

Opinion:

In order to do a proper EA, considering the direct effects on human health, because of the irrigation contaminates used on human food sources and animals in the human food chain, and the probable/possible contamination of the the wells, the following factors need to be assessed and were not:

Human Health Ambient Water Quality Criteria (HH-AWQC) as specified by EPA and the Antidegradation Poilicy

-The bioaccumulation factor of the different chemical forms of the toxic metals in waters that would or could likely contaminate these wells and the WOTUS affecting the White River and Niobrara River by expected and predicted spills and excursions that occur with any ISL facility.

-The bioconcentration factor of the toxic metals, will include the biotic ligand model for metal toxicity

-Calculation of the Benchmark Dose by analysis and monitoring of total and individual metals in wastewater and monitor wells, including organified and inorganic forms to properly determine toxicity.

-Cancer Slope Factor of Exposure

-Drinking Water Intake for animals in human food chain plus humans

-Estimated Dose of Individual Metals, animals and humans through drinking water - time of exposure is important and necessary because it includes the entire growing season for plant application and animal feeding. No dose is safe for cancer causing metals, and the dose is linear,

however, some tumors do not start until there is an adverse effect which equals the threshold.

Reference: EPA.gov/ecotox databank, constantly updated

-Food Chain Multiplier - expected effects on humans who eat these food products

-Non Cancer Effects Expected

-Risk Level for Ag Products Produced Here to the Public

-Non radiological Health Effects of Exposure

The aquifer under MEA feeds the White River, the Niobrara River, Box Butte Creek which feeds the Box Butte Reservoir for recreation. Expected contamination of the aquifer under MEA will then contaminate the above that are designated WOTUS, subject to the Clean Water Act and EPA regs.

Biological (Biota) and Chemical Baselines have not been established for the Niobrara River, White River, Box Butte Creek or the reservoir, and any creeks that might contribute contaminated water from floods, berm failures, tornadoes, spills or other unexpected or expected events.

Since the levels of chemistry testing are limited to the known metals, with limited data on toxicity, including chemical forms, in addition to chemistry monitoring of the known metals in the contaminated wastes and lixivients, biological baseline assessment is necessary to properly assess the toxic effects should a contamination occur. Mother Nature keeps track of all the toxic effects and synergistic toxic effects of contaminants that we, as humans, either cannot test for or are not yet aware of. To do a proper Biological Baseline Criteria Study, the following are criteria set by EPA: fishes, caddisfly, crayfish, fishfly, mayfly, dragonfly, blackfly, stonefly, caddisfly in case, and amphibians

known to the area. These organisms, with the exception of fish and crayfish, go through a complete metamorphosis, and so are known to be the 'canaries in the coal mine' for genetic mutations from contamination that we might not be aware of, and that can affect humans if the dose or exposure time increases. Establishing baseline studies of these organisms in varying seasons of the year are important in future monitoring of contamination, and can only be done before any impacts are done. These studies need to be completed.

Further, a continuous monitoring program of baseline data is important in these times of climates changes that will affect the drought status of the entire West, for: rainfall, temperature, drought, flooding and water temperatures in both the rivers and mixing zones of creeks and ponds. Incorporation of weather extremes and conditions needs to be included as the rivers and reservoir impacted and affected fall under WOTUS/ Waters of the United States and the Clean Water Act governed by the EPA and Water Quality Standards.

Since the Niobrara River is a multi use and pristine wild river, it must be protected from impairments, and is subject to the Clean Water Act. The criteria of study for the River and the reservoir need to be specified for multi use that protect the designated uses, health, welfare and serve the purposes of the Clean Water Act. This river and reservoir would classify as 'Navigable Waters of the US'. The criteria listed above are set by the EPA.

Migratory birds need to be included as criteria of study for baseline and EA, as well as endangered species of the area that fall under the Endangered Species Act and use the surface waters impacted as their source of life drinking, reproduction and nesting waters.

The EA also did not do a proper study on the groundwater quantity reserves in the West impacting the local area to properly evaluate how the loss of so much groundwater and the permanent contamination of more groundwater, as well as the rivers and reservoir fed from the

aquifer under MEA would impact an already severe drought area, forecasted to be heading into an even more severe drought all over the western states. As the drought increases its forecasted impact for the area, there will be even more reliance on the depleting groundwater and river sources for irrigation and livestock drinking water. Expected spills and excursions that accompany any ISL mining operation can contaminate the White River and Niobrara River, Box Creek and reservoir, polluting yet another valuable water resource that will be even more needed for the future in a severe drought predicted for the West. And with the increased uranium mining already in existence in the West, we are seeing increasing uranium contamination in the drinking water we have left. We don't need any more, especially lacking the economically efficient ability to remove it and other toxic metals from commercial and private drinking water sources.

Reference:

https://www.inquisitr.com/2620420/increasing-amount-of-uranium-seeping-into-western-american-states-drinking-water-is-the-drought-responsible/

http://www.wcnc.com/article/weather/severe-weather/drought-is-causing-earths-crust-to-rise-in-the-west/275-292887902

http://www.wakeweekly.com/drought-risk-should-be-considered-at-all-times/

http://www.omaha.com/news/of-nebraska-now-in-considerable-drought/article_06cf6b63-0b5b-52ad-bc65-d9206a167aab.html

https://insideclimatenews.org/news/12022015/droughts-will-hammer-us-west-21st-century-unfolds

https://psmag.com/environment/why-are-we-allowing-uranium-miners-to-pollute-groundwater-in-drought-zones

https://www.usatoday.com/story/nletter/climatepoint/2018/02/01/climate-change-global-warming-drought-state-union-solar-wind-infrastructure-bears-ears-grand-stairca/1089047001/

https://news.nationalgeographic.com/news/2014/02/140214-drought-california-prehistory-science-climate-san-francisco-2/

The Case for Required Testing for Uranium in Waste Waters

Opinion: [contaminants associated with the current mining operations may produce non- radiological health effects]

Basis: Inorganic forms of minerals, especially selenium and uranium, as well as other heavy metals, which consistently test high in aquifers post mining, have shown to be toxic to living systems of plants, animals and humans in very low levels. Uranium toxicity at low levels has shown in population statistics of exposed population such as Native Americans on contaminated and exposed reservations downwind and downriver from old exposed uranium mines to be more predisposed to chronic conditions such as: metabolic syndromes, diabetes, behavior and sleep problems, obesity and heart disease, fertility, and morbidity and mortality compromises. These are non-radiological effects of uranium discussed, in that uranium as a metal actively incorporates itself into the biochemistry of the body. The radiological effects are another subject, not involving the actual chemical reactions such are described here.

Reference

Heavy metal uranium affects the brain cholinergic system in rat following sub-chronic and chronic exposure

"Previous studies have shown that uranium is present in the brain and alters behavior, notably locomotor activity, sensorimotor ability, sleep/ wake cycle and the memory process, but also metabolism of neurotransmitters. The cholinergic system mediates many cognitive systems, including those disturbed after chronic exposure to uranium i.e., spatial memory, sleep/wake cycle and locomotor activity."

Helene Bensoussan[a], Line Grancolas[a], Bernadette Dhieux-Lestaevel[b], Olivia Delissen[b],Claire-Marie Vacher[c], Isabelle Dublineau[a], Philippe Voisin[a], Patrick Gourmelon[a], Mohammed Taouis[c], Philippe Lestaevel[a]

Basis:

Uranium is known to travel through the blood to virtually every tissue and organ system in the living body through active transport by blood. It will reduce and for solid precipitates in the hard tissues of the body like bone and also cause kidney stones and kidney disease and the precipitates enlarge with time and chronic exposure. Binding with bicarbonate in the body will also compromise the body's ability to neutralize acids, pre- disposing to gastric ulcers as well as various muscle pains, cramps and spasms. Highly acidic bodies with compromised acid neutralization abilities, such as contamination with compromising uranium ions, will have higher agitation levels and volatility of behavior. Uranium ions in the liver will compromise blood sugar regulation, causing increased cravings for sugars in the diet, leading to diabetes, metabolic syndromes and obesity, as carbohydrate metabolism is compromised. Further, as blood sugar lacks internal regulation, alcohol and drug use is elevated in statistics, as the body struggles to "just feel good for a little while". Increased cancer rates are observed with uranium exposure as well as reproductive toxic effects with DNA breakage observed. Compromise to the connective tissues of the body, that cover virtually every surface in the entire body, produce autoimmune diseases such as crippling Lupus. This is exactly what we are seeing in population health statistics on the reservations affected. Further, the toxic effects of uranium are greatly enhanced in the presence of calcium ions, which are known to be generated in ISL mining as well as in runoff waters of the Rocky Mountains over old uranium open pit mines. The Rocky Mountains are high reservoir of calcium carbonate, so ISL mining waters containing uranium as they are known to do, will have even more toxic effects in synergy than what would be expected and predicted of each separately.

Reference:

Medical Effects of Internal Contamination with Uranium
Croatian Medical Journal v.40, n.1, Mar99 Asaf Durakoviæ
Department of Nuclear Medicine, Georgetown University School of Medicine, Washington D.C., USA

"Uranium as a heavy metal is of particular importance as a complex of uranium

and bicarbonate ions, which increases the solubility of uranium in serum. This compound is rather insoluble in water due to the complex ion formation between uranium and bicarbonates. This mechanism determines the transport of ultrafilterable uranium from the sites of contamination to the tissues and target organs (8). In blood, the uranium-bicarbonate complex establishes an equilibrium with non-filterable protein-bound uranyl ions, with 60% of uranium bicarbonate-formed and 40% protein- formed (9). In other studies, 74% of uranium in blood was present in the inorganic compartment of plasma, 32% was protein-formed, whereas 20% was associated with red blood cells (10). Uranyl salt complexes with bicarbonates are less stable than uranous salt complexes. Reduction of uranium in plasma is not probable, while the uranous salts can be reduced in the intracellular environment (11). Uranous (IV) retention sites are the bone and kidney, whereas uranyl (VI) ions accumulate in the liver and spleen prior to their redistribution in the renal and skeletal system."

"Each of the uranyl ions are complexed by two phosphate ions on the surface of bone crystals, with simultaneous release of two calcium ions. The uranous ion produces a toxic effect on the living cells by inhibiting the processes of metabolism of carbohydrates by the inhibition enzyme systems. A uranyl ion replacing a magnesium ion binds the ATP molecule to hexokinase. ATP-uranyl-hexo- kinase complex blocks the release of phosphate to glucose, inhibiting its first step of metabolic utilization with non-metabolized glucose in the extracellular environment (12). The toxic effects of uranium were shown to be

enhanced by the administration of calcium (33). The effects of uranium on the nervous system have been described as paralysis of the hind legs, blindness, and loss of coordination in rabbits in the terminal phase of intoxication (52). Most recent studies indicate significantly higher prevalence of malignant diseases in uranium workers (59), with increased mutations in underground miners (60) and connective tissue disease, including lupus erythematosus (61). Reproductive toxicity of uranium in a recent Chinese study includes chromosome aberrations in spermatogonia, causing DNA alterations in the spermatocytes and strand breakage in sperm (62)."

Basis:

All metals/minerals have a relationship to each other in Nature. They balance each other. Too much of one will have a negative effect on the other. For good health, they all need to be in proper balance. Heavy metals generated from mining are many, and will compromise many essential minerals for health. When one mineral or metal is too high, it will exert a repressive effect upon its counterpart metal or mineral, causing a deficiency or imbalance. Since minerals are known to fuel enzyme systems in the body, and the living body is dependent upon enzymes for life itself, compromise of any enzyme system can cause severe health consequences and even death. The toxic heavy metals generated in ISL mining are shown in an overlay to accurately depict the interference of those toxins on the natural system and their impact to all living things, even plants. See slides 1-6

Inorganic salts of metals most prominent in aquifers, also have different toxicities, and any monitoring of aquifers should include speciations of these different forms so that proper toxicity evaluation can be done. Simply giving the absolute levels of a metal does not tell the whole story. All metallic "salts" are not equal. They can have different solubilities, different melting points, different Ph, different conductivity affecting the central nervous system that relies on electrical signals, and totally different chemistry within the living body. Further, any discussion to the general lay public needs to distinguish between a chemical

metallic salt and ordinary table salt, that the public is led to believe will be created as "salt" in a mined aquifer. Slide 7 shows the many species/ chemical forms that a metal can take upon exposure to oxidation/ reduction reactions typical within an ISL mining aquifer. Typically, speciation testing, even if monitored by the mining company, is not made available to the public.

The difference between inorganic and organic compounds:

Organic compounds always contain carbon, while most inorganic compounds do not contain carbon. Also, almost all organic compounds contain carbon-hydrogen or C-H bonds. Organic chemistry is "The Chemistry of Life". Metals in an inorganic form have significantly different chemistry in the living body from organically bound minerals Organic forms of uranium as well as other toxic metals have also been shown to exist in mining areas and they are not known to be recoverable by the ion exchange method of ISL recovery, since it is already bound organically and will not bind to the organic synthetic resins. Organic forms of any heavy metal are known to be much more toxic and much more bioavailable, so that they are able to penetrate the lining of the digestive tract much easier than ionic and inorganic salts that are blocked by their electrical charges. Organic metals have their electrical charges spread over the organic ligand they are bound to, so that they act as a "chelate", something that the health industry does to minerals to significantly improve absorption of essential minerals, and also make them much more able to enter into direct biochemical reactions in the living body. Organically bound metals under this circumstance, and there is plenty of organic carbon naturally existing with ISL mining sites to make this a complication, will continue to increase in the waste water of the ISL mine as they are **not recoverable, adding to the metal burden of the wastewater and also the toxicity of such beyond what would be it the metals remained in an in- organic and ionic form.**

Reference:

Problems with Ion Exchange in Water Purification

"Ion exchange is another method used successfully in the industry for the removal of heavy metals from effluent. An ion exchanger is a solid capable of exchanging either cations or anions from the surrounding materials. **Commonly used matrices for ion exchange are synthetic organic ion exchange resins. The disadvantage of this method is that it cannot handle concentrated metal solution as the matrix gets easily fouled by organics and other solids in the wastewater.** Moreover ion exchange is nonselective and is highly sensitive to the pH of the

solution." (Kurniawan et al., 2006).

Basis:

On the other hand, binding natural essential minerals to organic molecules will make them more bioavailable as well, and so much better able to enter the living body. We use that chelation process to enhance nutrition for essential minerals.

25 controlled studies by different authors in five different countries adverse array of data is presented. These data validate the effectiveness of mineral nutrients presented as amino acid chelates when compared with the ionic forms derived from the inorganic salts. These studies further support the results of numerous laboratory experiments showing increased absorption, assimilation and reduced toxicity of the forms of minerals chelated to amino acids. With little cost and effort animals can be supplemented with amino acid chelates which will promote, with little risk of overdose, a fuller genetic potential achievement as far as mineral requirements are concerned. Results of this supplementation are reflected in increased growth, immunological integrity and more consistent reproduction increased ovulation and conception after first service as a result of increased bioavailability of these

Reference:

Arabian Journal of Chemistry

Volume 4, Issue 4, October 2011, Pages 361–377

Chelated forms. See Slide 8
Reference:

Chelated Minerals in Animal Nutrition

Rajendran, C.Kathirvelan and V.Balakrishnan, Madras Veterinary College, Chennai, INDIA

Basis: The Jeckyll and Hyde personalities of minerals
Even the minerals that we consider necessary for the living body will have different biochemical actions and tissue and organ destinations in the living system. Common case in point: selenium. Selenium is known to have wonderful health effects, preventing cancer, converting the storage form of the storage thyroid hormone T4, to the active form T3 by virtue of fueling an enzyme glutathione peroxidase. This biochemical reactions is absolutely essential to life. Glutathione also doubles as the most powerful antioxidant in the body. Inorganic selenium, as is the form generated in ISL mining, is known to cause birth defects of the highest severity. However, in the inorganic state, selenium as a consequence of mining, is severely toxic, producing severe deformities. The higher evolved animals above micro organisms are not able to convert quantities of the inorganic forms of minerals, even essential ones like selenium, into the bio compatible organic forms. See slides 9-17

Basis: Bioaccumulation of organified heavy metals rises quickly in the living systems and the environment, rising up the food chain.
Elemental inorganic forms of metals and minerals are "organified",

bonded with carbon compounds to become organic forms by micro organisms, which are then eaten by simple life forms, which are then eaten by higher animals, and so on, all the way up to man and other top predators at the top of the food chain. As these metals and minerals pass from one body to the next, they are known to concentrate as they move up, with humans and other top predators then suffering the worst consequences from the highest concentration in their tissues and organs. There can be formed many different kinds of organic metal compounds, however, all are not equally bio essential, some are even more toxic as the living body cannot convert them. This will depend on which micro organisms are organifying the metals into which compounds. See slides 18-21

Basis: Selenium is a poorly regulated heavy metal, and difficult to regulate as far as toxicity and allowable levels are concerned, because of the myriad chemical forms that it can exist in, each with different toxicity. The same can also be said for every other toxic metal as well as nutritional metal. The Jeckyll and Hyde personalities of these elements is a very real thing in the natural world. Slide 22 shows the incongruencies between actual toxicities of some chemical forms of selenium and the regulatory levels. Most toxicity level charts fail to take into consideration the chemical forms of metals and minerals, which is absolutely critical in assessing any toxicity status. Care for patients suffering from selenium poisoning is usually aimed at treating symptoms. There is no specific antidote or treatments for selenium poisoning.

Reference:Upper Human Limits for All Minerals and Metals http://iom.edu/Activities/Nutrition/SummaryDRIs/~/media/Files/Activity%20Files/Nutrition/DRIs/ULs%20for%20Vitamins%20and%20Elements.pdf

Basis: Arsenic is another major pollutant. Unlike selenium, which has a value in certain chemical forms as a health and life biochemistry promoter, arsenic has not been found to have any health value outside of

its use as a parasiticide, and even that use can have toxic consequences. Slide 23 shows the major health effects of arsenic exposure.

Arsenic opposes iodine on the mineral wheel of life, and will cause a physiological iodine deficiency by its opposing actions even if there is enough iodine in the diet to counteract general deficiency. Such is the case with all opposing metals and minerals of nutritional minerals. This is how things work in Nature and the living body. Metals like arsenic have their own set of compromising chemistries, but the opposition and interference chemistries of opposing metals and minerals presents a whole new set of pathways for health compromise, independent of the individual roles of the individual metals in actual biochemical reactions. So, but its opposing action on iodine, arsenic can precipitate a whole hypothyroid overlay on the living body, complete with all the health compromises that a hypothyroid body will manifest. Slide 24 shows the different LD 50 doses for different chemical forms of arsenic. LD 50 represents the level at which 50% of the animals are killed from the toxin presented. So this again shows the importance of different toxicities of different chemical forms. Slide 25 shows the comparison of the toxicity of arsenic relative to other common toxins. Slides 26-30 show arsenic effects in humans.

There is no specific treatment for chronic arsenic poisoning. Once it has been identified further exposure should be avoided. Recovery from the signs and symptoms may take weeks to months from when exposure is stopped. In particular, effects on the nervous system may take months to resolve and in some cases a complete recovery is never achieved.

Basis: Epigenetics, a newly recognized toxic compromise of DNA by heavy metals. Epigenetics is a new study looking at how heavy metals and other environmental toxins can and do affect the gene expression of DNA to cause potentially serious ill health compromises, even death. DNA is actually a set of switches which are found to be con- trolled by chemical signals from the cell membrane of each cell, which are generated in response to the cell membrane's sensing of the environmental characteristics in the flu- id surrounding it. Every living

cell is actually floating in a body fluid called lymph. If the cell membrane senses that something is wrong, it sends a chemical signal to the cell nucleus and DNA there to adjust by turning on or off certain genetic switches. This is the living body's way of adapting to its surroundings for survival. This is evolution in progress.

Heavy metals have been found to both up regulate and down regulate DNA switches, and these switches tripped by epigenetic toxins can remain tripped into up to 5 generations hence, even if the original cause or toxin has been removed in the first generation. The implications for health and humanity for future generations considering epigenetics is mind blowing. Slides 31 -35 tell the story of epigenetics and the impact on DNA expression, all the way to cancer.

Basis:

Heavy metals also act as xenohormones and hormone disruptors in the living body.

Our hormones are all stereoisomers, meaning atoms are arranged differently in 3 dimensional space, and are subject to the toxic effects of xenohormone environmental toxins. Heavy metals have been shown to act as xenohormones, entering into the cellular receptor sites and skewing the hormone biochemical pathways for Estrogen, Testosterone, Progesterone, Cortisol, Pregnenolone, Thyroid, DHEA, Insulin and more. Since hormones are key initiators, regulators and intermediary metabolites of virtually every biochemical reaction in the living body, the protection of their integrity is crucial for their actions. Heavy metals, environmental chemicals and industrial chemical wastes can act as "xenohormones", and interfere with natural hormones, enzymes, etc., and cause cancer and other severe ill health compromises.

Further, heavy metals are known to be "xenoestrogens", a hormone mimic of estrogen, the female and growth hormone. Estrogenic toxicity causes cancer, skin lesions, obesity, fertility problems, accelerated aging, liver problems, learning problems, mood disorders, metabolic syndrome, blood sugar irregularities, blood fat irregularities, increase in breast

tissue and size in both males and females, smaller or even undeveloped male genitalia and higher anger and anxiety responses to daily life situations. Mineral imbalances caused by high levels of toxic heavy metals themselves, also are known to cause hormone imbalances of insulin, thyroid, testosterone, progesterone, estrogen and cortisol.

We see those very problems exemplified in the most toxic areas of the world, and in increasing statistics overall in the world, as environmental pollution moves around the world. All of the heavy metals studied so far, that are common exposures to man, have shown to be "xenoestrogens", including those that are generated from the rock strata at Crowe Butte. The increase in obesity of animals and humans over the last several decades is directly correlated to the increase of environmental toxins that are known to be fat soluble and deposited in body fat, including heavy metals.

Reference: J Toxicol Environ Health B Crit Rev. 2009 Mar;12(3): 206-23. doi: 10.1080/10937400902902062.

The effects of metals as endocrine disruptors.

Iavicoli I1, Fontana L, Bergamaschi A.

Abstract

"This review reports current knowledge regarding the roles that cadmium (Cd), mercury (Hg), arsenic (As), lead (PB), manganese (Mn), and zinc (Zn) play as endocrine-disrupting chemicals (EDCs). The influence of these metals on the endocrine system, possible mechanisms of action, and consequent health effects were correlated between experimental animals and humans. Analysis of the studies prompted us to identify some critical issues related to this area and showed the need for more rigorous and innovative studies. Consequently, it was recommended that future studies need to: (1) identify the mechanisms of action, because at the present time only a few have been elucidated in this context, the

possible presence of hormesis need to be determined, as currently this was reported only for exposure Cd and As; (2) study the possible additive, synergistic, or antagonistic effects on the endocrine system following exposure to a mixture of metals since there is a lack of these studies available, and in general or occupational environments, humans are simultaneously exposed to different classes of xenobiotics, including metals, but also to organic compounds that might also be EDCs; (3) assess the potential adverse effects on the endocrine system of low level exposures to metals, as most of the information currently available on EDCs originates from studies in which exposure levels were particularly high; and (4) assess the effects on the endocrine and reproductive systems of other metals that are present in the general and occupational environment that have not yet been evaluated."

Our hormones are all stereoisomers, meaning atoms are arranged differently in 3 dimensional space, and are subject to the toxic effects of xenohormone environmental toxins. Heavy metals have been shown to act as xenohormones, entering into the receptor sites of hormones and having an unhealthy action.

PMID: 19466673 [PubMed - indexed for MEDLINE]

Basis: Heavy metals are also known to denature protein and negate the bio- chemical activities of protein based enzymes and hormones, as well as cause effects in skeletal muscles. Protein makes up a full 90% of the dry weight of the living body. Any living body, any species. Protein is an organic compound com- posed of long chains of amino acids. Each protein has its own distinct combination of amino acids and also its unique three dimensional shape, and it is the shape that gives it its unique biochemical activity, not simply the chemical formula of its amino

acid composition. **This is the most important concept in protein, hormone and enzyme biochemistry.**

Denaturation is a process in which proteins lose their three dimensional structure/shape which is present in their native state, causing them to unwind and deform, by application of some external stress or compound such as a strong acid or base, a concentrated inorganic salt, an organic solvent (e.g., alcohol or chloroform), radiation or heat. If proteins in a living cell are denatured, this results in disruption of cell activity and possibly cell death. Denatured proteins can exhibit a wide range of characteristics, from conformational change and loss of solubility to communal aggregation to form a solid.

Heavy Metal Salts:

Heavy metal inorganic salts act to denature proteins in much the same manner as acids and bases. Heavy metal salts usually contain Hg^{+2}, Pb^{+2}, Ag^{+1} Tl^{+1}, Cd^{+2}
and other metals with high atomic weights. Since salts are ionic they disrupt salt bridges in proteins. The reaction of a heavy metal salt with a protein usually leads to an insoluble metal protein salt, meaning that it forms a solid and becomes inactive biochemically.

A common example that we all understand and that is epidemic in the human and pet animal population today, is that of insulin. Insulin is a three dimensional folded protein that acts also as a hormone, regulating blood sugar but escorting glucose in the blood into the tissues for storage. If the insulin cannot accomplish this process, then the blood sugar rises to dangerous levels and the patient is diagnosed with Diabetes.

Non-Insulin Dependent Diabetes, or Diabetes Type 2, is the result of such a compromise in the body, with the insulin not able to

perform its designated function. It is also called Insulin Resistant Diabetes, because simply giving the affected patient more insulin does not cure the problem. Typical blood testing of insulin reveals the presence of adequate insulin or even higher than normal levels, but conventional blood testing is not capable of viewing the actual three dimensional shape of the molecules to properly asses their actions or lack of. So we typically see the Type 2 diabetic having both high blood glucose along with high insulin levels that are not working effectively. The insulin has been denatured in the blood, and any new insulin that would be still functional when administered to the type 2 diabetic with toxic blood sporting effective levels of some denaturing toxin, will just further deform any new and functional insulin given. Such is the naming of "Insulin Resistance".

The same scenario is commonly born out with thyroid testing and other natural hormones such as estrogen, testosterone, progesterone, DHEA, cortisol, pregnenolone, etc. We call this scenario in medicine "euthyroid hypothyroid" for thyroid, and appropriately such for the other hormones, where the blood levels show normal levels but the patient manifests hypo hormone symptoms, because the hormones present have been denatured and rendered ineffective. This is a serious problem for medicine today. This is a serious problem in assessing the real toxicity of any environmental toxin that has been shown to denature protein, such as heavy metals. Conventional blood testing does not accurately reflect the true health compromise of the sick individual. Slides 36 - 37 show how proteins are formed and then folded into their three dimensional shapes and then subsequently unravelled and deformed by denaturing agents. Slide 38 shows the hormone insulin with its characteristic folded nature, that is unfolded in Type 2 diabetes by denaturing agent exposure.

Opinion: [impacts of selenium on humans and wildlife if Crow Butte uses land application of mining wastes]

Basis: Heavy metals, most notably: Selenium, Molybdenum and Arsenic will be generated in soluble forms that are highly toxic to all living things, and are able to be concentrated even further by bioaccumulation up the food chain.

Reclamation of the affected land is not physically or economically feasible.The land application for wastewater is destined for environmental contamination that will never be able to be remediated. Heavy metals never degrade into harmless substances. Those lixiviant solubilized toxic heavy metals, will eventually migrate into groundwater aquifers or surface water via streams, floods, melting snow runoff and storms.

No ISL mines have ever have proven to be safe and free of excursions, or been able to be properly decommissioned with the mined aquifer restored to baseline chemistry levels, so that the water is drinkable in quality.

Humanity has continuously failed to clean up our mining messes throughout history, as evident from all the superfund sites of total and complete loss of any use all over the country and the world, not to mention the over 10,000 other old uranium mines that should be super funds and are not, due to lack of funding for remediation/burial. It is likely that this mine will join the current open pit mines that should be superfund right next door at Dewey Burdock in Edgemont, SD.

The more dangerous the mined materials, the more toxic the residual mess left. In this case, mining of uranium, a toxic heavy metal in itself, also brings an additional risk of radiation from radon gas and lixiviant solubilized radioactive heavy metals of vanadium, thorium, strontium and radionuclides.

Reference: Large amounts of contaminated wastewater are generated, according to a report on ISL mining prepared for the Larimer County Commissioners by **The Larimer County Environmental Advisory Board,** in WY, they say:

"Due to the nature of ISL mining, quite large volumes of wastewater are created, which are often highly saline and contain toxic levels of heavy metals, process chemicals, and radionuclides. Excess ISL process water that is not re-injected is typically either directed to an evaporation pond, or injected into a deep disposal well to an aquifer below the uranium deposit and domestic aquifers."

Slides 5 and 6 show the Mineral Wheel - a graphic of how minerals and metals interact with each other. You can see that, following the arrows from one to another, that an excess of one will create a deficiency of another. This is important in the health of all life, as minerals both fuel and direct enzymatic biochemical reactions in the living body. When high levels of heavy metals offset and upset the biochemistry of the living body, severe compromises to health are set in motion, including hormone imbalances. Heavy metals will not only create deficiencies of essential minerals but also exhibit toxicity by their very presence in the living body. Thus they are doubly toxic.

Looking at just one of those toxic heavy metals, selenium, well known as a common mining pollutant in Crowe Butte and elsewhere, we find that according to studies done at the Smith Ranch and the Highlands Uranium Mine in Converse County, Wy, selenium was found to bioaccumulate in the environment and wildlife of the area where in situ wastewater was used to irrigate grasslands. In this case, the in situ wastewater was applied to grasslands as irrigation water. http://link.springer.com/article/10.1007/s00244-001-0037-y#page-2

In this study, mean selenium concentrations in grasses, grasshoppers, red-winged blackbirds eggs and livers were 5.8 to 30 times higher at the study area than at the reference site. Elevated selenium collected from soil, water, and wildlife demonstrate that selenium is being mobilized and is bioaccumulating in the food chain. This can eventually affect livestock grazing in the area and can then enter the human food chain.

Fish and aquatic organisms are especially sensitive to selenium levels and grasshoppers and other insects, salamanders and crayfish are key parts of the food chain at risk.

Slides 9 and 10 show fish affected by selenium toxicity.

A low concentration of selenium in water has the potential to increase by several orders of magnitude by the time it reaches fish and wildlife. For example, a water concentration of 10 ug/L (micrograms per liter or parts-per-billion) can increase to over 5,000 times that amount in fish tissues. Bioaccumulation causes otherwise harmless concentrations of selenium to reach toxic levels. This same principle applies to other heavy metals as well.

Slides 18-21 show a graphic of how bioaccumulation works. The substance that exists in a low level amount in the environment, that was formerly thought to be so low as to be safe, is taken up by small and simple organisms such as algae, then eaten by animals, which in turn are eaten by other animals up the food chain, and the substance is further concentrated as it travels up the food chain, increasing its toxicity. Man, as the top predator, will suffer the most from bioaccumulation as we eat the animals in the food chain below us.

Although fish do take up some selenium directly from water, most of it comes from their diet. Therefore, in order to protect fish from selenium poisoning it is essential to keep waterborne selenium below levels that cause bioaccumulation in the food chain (Lemly and Smith 1987).

Selenium can exist in many chemical forms, and some forms are more toxic for the amount of selenium exposure than others. Symptoms of selenosis, selenium toxicity, include a garlic odor on the breath, gastrointestinal disorders, hair loss, slough- ing of nails, (hooves and claws in animals), fatigue, irritability, thyroid compromise, thyroid chemistry compromise, and neurological damage. Selenium in certain chemical forms, is not only non-toxic but absolutely essential to life. It fuels the enzyme that converts T4, the storage form of thyroid hormone to T3, to the active form, that regulates the speed of all biochemical reactions in the body at the cell level. Extreme cases of selenosis can also result in cirrhosis of the liver, pulmonary edema, and death.

Slide 11 shows horse hooves affected by selenium toxicity

Slide 12 is a picture of sheep with selenium poisoning and cattle hooves

Slide 13 shows the mutagenic birth defects effects of selenium on ducks that had access to evaporation and holding ponds in mining.

The same result of toxic bioaccumulation occurs for other known pollutants and products of ISL mining, such as arsenic. So that everything stated above for selenium can also be said for arsenic, manganese, chromium, copper, vanadium, and other heavy metals.

Slides 26 - 29 shows cancer and lesions from chronic arsenic poisoning in humans

Slide 30 shows blood abnormalities from selenium toxicity
Metals cannot be broken down to other elements in Nature or the living body, and in fact, toxin exposure in continuous low levels, formerly thought to be safe, have now been shown to have additive or synergistic effects, where the end effects of a combination of toxin exposure produces more severe health compromises than those that would be expected from each toxin. The common example is that 2 +2 now equals 8. Since different chemical forms of minerals and metals can and do exist, and some are more toxic than others, and travel up the food chain at different rates. Different chemical forms of minerals and metals target different organs and tissues of the body.
Additionally, each individual toxin is shown to enter the body at levels under the body's detoxification radar of liver detoxification, thus allowing toxic levels of the pollutant to build up over time, until the body becomes so sickened that it cannot help itself anymore in a detox and elimination protective method.

Arsenic, in particular, is extremely dangerous in the world today, and especially North America, because arsenic opposes iodine on the mineral causes iodine deficiency. Current research has shown that we need far more iodine than we thought we did for health, and we are not getting it in food or water, even as we used to decades past, when iodine was used in food processing and water purification.

Arsenic has been rising in our environment and food supply because of the legal dumping of it into commercial fertilizers from mining and ore smelting waste since 1976 when it became legal to do so. In the 1980's President Reagan increased to legal limit of arsenic in public drinking water because the levels were rising so high, and arsenic is both difficult and expensive to remove from water, as mining reclamation efforts have shown.

Mother Nature, of course, does not necessarily agree that so much arsenic is safe! Arsenic compromises thyroid. Thyroid disease has escalated epidemically in the last 50 yrs since iodine was reduced in our food and water supplies. And today, as relevant for accelerated aging, each generation is not expected to live as long as its parents, and higher and higher statistics of formerly "old age" ailments are evident in younger and younger segments of the population, severely compromising our health care.

Reference: Combined Toxic Exposures and Human Health: Biomarkers of Exposure and Effects
Int. J. Environ. Res. Public Health 2011, 8, 629-647; doi:10.3390/ijerph8030629

These toxic metals will be concentrated in the area of waste water discharge for time immemorial and due to the large volume of wastewater generated and also the large surface area contaminated, no effective and safe economical method of remediation and reclamation of the land's original purpose is possible. Application of wastewater to grasslands from this uranium mine is not a good idea, and not a safe and efficacious solution for disposal of this highly contaminated waste water. The subsequent plants grown, if they are able to grow at all from the toxicity, would be far too contaminated to be used for any feeding.

Substantial disposition of sediment in stream or lake beds, landslides, or water pollution cannot feasibly be prevented;
Containment of toxic wastewater load is not feasible in a leach pond designed to be large enough to be a lake bed, contrary to a plan to fence out Nature. No fence will last the lifetime of the toxins being contained

here: ie; the lifetime of radiation left behind and accumulation of heavy metals that never die or degrade, in sediments of a pond. It is not possible to adequately fence off Nature. Fencing plans are to fence off mammals, however, there is no fence for the rest of Nature, insects and other small crawly things, small mice, salamanders, snails, etc., at the bottom if the food chain, that would leave the pond and be eaten by their predators, to have their toxins then bioaccumulate up the food chain.

Seasonal weather changes bringing heavy rains, winds, blizzards and floods will cause the borders of the pond to be overrun, taking toxins away from the pond, toward streams and rivers, and giving access to Nature, the environment and wildlife. Further, seasonal drying in summer and drought conditions will allow exposure to the winds of dried sediments on the pond's edge, adding to air pollution which can be carried for miles. Migrating birds and other animals will carry toxins to far away places, while it damages their bodies for survival, and contaminates game birds that are hunted and eaten by man.

Further, with the high drainage capabilities of areas of Crowe Butte, such that domestic leach beds for septic systems often drain too fast, this water with its toxins will permeate the Earth and eventually contaminate the waters below. This is how Nature works to recharge its aquifers, after all. And gasses produced like radon, will be taken by the wind with other by toxic byproducts yet to be seen.

The problem with ponds

1. Ponds are shallow design, not more than a few feet deep. This allows for more contact between the highly chemically active waste water and the plastics in the liners, facilitating faster degradation. And all plastics do degrade over time, even without this chemical exposure. The high levels of oxidizing chemicals will speed degradation dramatically. This is what these chemicals do and why they are used in the ISL process to degrade rocks.

2.The plastics used in the liners are polypropylene and polyethylene, common plastics we use every day. These plastics are so easily degraded

that they are the principle plastics used in the food and bottled water industry and easily recycled by adding chemicals to degrade and disintegrate, and hence the ones we recycle.

The warranty by the manufacturer is only 1 yr for the polypropylene and 2 yr for the polyethylene, and the project is supposed to last 20 yrs. And the strips of plastics will be bonded together by seams of heat and or glue, and these have been shown in other EPA tests to leak.

Although it is recognized that the warranty period for all plastics can be less than their period of use, that period of use will depend highly on how they are used and to what degrading exposure they are exposed. In this case, the exposure to UV light from the sun continuously, and the highly oxidative chemicals in the ponds will shorten the life of the effective life of those plastics over what would be another normal use without such exposures.

3.The plasticizers that are integral in all plastics to give them their softness and pliability, are well known endocrine disruptors and hormone mimics, and also are well known to leach into foods. Hence the warnings of plastic bottled juices, foods and waters.

When these plasticizers are leached from the plastics, the plastics become brittle and will break and then leak. I would expect leaks fairly quickly in the these ponds because of the contact with these highly active oxidative chemical waste waters facilitating that leaching of plasticizers and degradation. Given that service life can be different from the warranty period for any product, the service life is directly proportional to the abuse and/or use of the product. In this case, nothing that I have proposed or submitted in testimony concerning these plastics, indicates any likelihood that the common plastics used in these liners will outlast their warranty, which does not take into adequate consideration the abuse of use in exposure to these highly destructive chemicals in the wastewater, along with the exposure to UV rays of the sun, which is also known to cause degradation of these common plastics. Warranties for use of products is limited to the "common" use of the products, not excessive use or different use/abuse from intent of

production. The numerous leaks of documented history are support for my conclusion that the service life of these plastics should be expected shorter than the warranty, due to degradation by the extremely harsh chemicals in the waste water, far shorter than the life of the project. Further, the manufacturer's warranty does not include the manually joined seams where fusion welds between strips are done under field, not factory, conditions. These joining seams are significantly less resistant to wear than the rest of the lining.

http://cdn2.hubspot.net/hub/32796/file-2204650797-pdf/docs/chemical-resistance-xr-5-8130.pdf?t=1438130708147 shows 28 day exposures to the best pond liner of different chemicals

The clay liner underneath will not be impervious to the leakage, as we have found with clay pits of old that are now deemed superfund sites. Clay leaks too.

Non containment of toxic wastes at the processing site

> **Basis: N**o mention was made as to the issue of the non-approved, non-permitted current practice of aerial and subsequent land applications, of the toxic pond waters, through the use of central pivot sprayers. Higher levels of unrecoverable organified uranium have been documented in ISL mining waste waters. Spraying these wastes into the air to be carried for miles in the wind and is an effective land application, for which a permit has been denied. The soluble precipitates and salts dry in the air and become "Fugitive Dust", to be inhaled by living bodies, animals and humans, and then transported to all areas of the body via lungs and then blood, as presented in prior testimony. Aerial application is, in effect a form of land application of not only uranium, but all of the toxic metals associated with ISL mining in the pond waters, including selenium. Photos submitted in prior testimony

showed illegal pivot sprayers active in the ponds, both from Google Earth and current ground based cameras. In fact, Google Earth has recorded these pivot sprayers active in all 3 of the large ponds from 1993 to the present. You can see the effects of the wind blowing the spray and mist away from the center pivots in the 3 most recent photos.

Basis: In the second partial decision of Dec 6, 2016, no mention was made of the violation of Crow Butte in allowing the ponds to go completely dry, well beyond the freeboard, as submitted in prior testimony. This is a clear violation of the permit. Significant sediments of heavy and toxic metal salts are seen from satellite photos that are able to be carried by the wind as "Fugitive Dust". Fugitive Dust is a regulated entity by the State of Nebraska as it is a well recognized land application of toxic material.

http://www.deq.state.ne.us/Publica.nsf/0/48b60f1d4f66c38e05256c55007724ce?OpenDocument

> "Title 129, Chapter 32, Section 001 requires sources to handle, transport, and store material in such a way to prevent particulate matter (commonly referred to as dust) from visibly crossing property boundaries."

The dry pond conditions are apparently not restricted to temporary short term means for sealing leaks in the pond barrier, as no leaks were reported to NRC near the dates of the arial photos showing empty ponds. The photo from 1993 shows an empty pond, yet the first leak was reported in 1997. The photo taken in 2013 was submitted in prior testimony, showing

a dry pond, but no leaks were reported near that calendar date either.

Additionally, significant sediments are also seen on the outside of pond 1 in every single picture since 1993, indicating an unreclaimed spill.

Basis: The active contamination of the environment and humans can be shown by testing hair samples of people living directly downwind from the pivot sprayers, as compared to people living in proximity to the mine but not directly downwind from the prevailing winds at the mine. Hair analysis has been shown to be a reliable tool for studying exposures of animals and humans to metals. It has been in use for approximately 60 years.

Following are laboratory reports of hair samples from 4 individuals, 2 of which lived directly downwind of the pivots, in the town of Crawford, Nebraska. The other 2 individuals lived in the town of Crawford and also on a ranch next door to the mine, but not in the prevailing winds of the pivots. The two people with the highest uranium levels were directly downwind.

This first person lived directly downwind in the town of Crawford. This individual suffered uterine cysts and hormone dysfunction from the time she lived in that locale, that directly correlates with the known expected xenoestrogenic effects of uranium in the living body, as described in prior testimony. She has relocated away from the exposure and the hormonal dysfunction has ceased within several months. The uterine cysts resolved and did not recur. Following is a health case history from this person:

Updated 12/29/16
Health History of Iris Paris

I, Iris Paris, formerly Iris Ann Rogers, born in Fort Morgan Colorado on October 21, 1951 weighed 6 lbs and was healthy in

every way. Breast fed for the first year of my life, I moved to Pasadena California with my mother and father when I was one year old. I moved back to Denver Colorado after my brother was born. I was 3 years old. I lived in Denver until I was 9 years old then moved to San Diego, CA and lived there until I was 38 years old. I moved to Oregon with my two daughters in 1989 and lived in various parts of Oregon, mostly Albany, until 2006. I moved to Crawford Nebraska in 2006 and lived there until April 2016, except for 14 months in Salem Oregon when I broke my leg and needed help from my family to recover.

DOCTOR'S DATA

LAB #: H151116-2282-1
PATIENT: Iris Paris
ID:
SEX: Female
AGE: 64

CLIENT #: 13859
Linsey McLean, AFF
840 Husker Place
Rapid City, SD 57701 U.S.A.

Toxic Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL	PERCENTILE 68th 95th
Aluminum	(Al)	8.4	< 7.0	
Antimony	(Sb)	< 0.01	< 0.050	
Arsenic	(As)	< 0.01	< 0.060	
Barium	(Ba)	9.3	< 2.0	
Beryllium	(Be)	< 0.01	< 0.020	
Bismuth	(Bi)	0.011	< 2.0	
Cadmium	(Cd)	0.047	< 0.050	
Lead	(Pb)	0.33	< 0.60	
Mercury	(Hg)	0.21	< 0.80	
Platinum	(Pt)	< 0.003	< 0.005	
Thallium	(Tl)	< 0.001	< 0.002	
Thorium	(Th)	< 0.001	< 0.002	
Uranium	(U)	0.20	< 0.060	
Nickel	(Ni)	0.20	< 0.30	
Silver	(Ag)	0.01	< 0.15	
Tin	(Sn)	1.1	< 0.30	
Titanium	(Ti)	0.39	< 0.70	
Total Toxic Representation				

SPECIMEN DATA	
COMMENTS:	
Date Collected: 11/10/2015	Sample Size: 0.205 g
Date Received: 11/16/2015	Sample Type: Head
Date Completed: 11/18/2015	Hair Color:
Methodology: ICP/MS	Treatment:
	Shampoo:

RATIOS		
ELEMENTS	RATIOS	RANGE
Ca/Mg	26.5	4- 30
Ca/P	13.9	1- 12
Na/K	1.84	0.5- 10
Zn/Cu	11.5	4- 20
Zn/Cd	> 999	> 800

I, Iris, had no health issues as a child except at age 13 had tonsils removed after several years of tonsillitis problems. My parents were also very healthy. My brother had asthma as a child but out grew it. My father smoked a pipe in the house all the time they were growing up.

Before moving to Crawford I had no health issues except hemorrhoid surgery at age 25 as well as environmental allergies starting at age 25 when I became allergic to cats. I had 2 caesarean

births because daughters were so big but both girls perfectly healthy.

After moving to Crawford I began to feel less and less well but did not know why. At first I just thought it was old age. I lived less than five miles from the uranium wells at Crow Butte Resources and evaporation ponds and lived on crest of hill from 2006 to April of 2016 where wind could blow toxic dust directly to me from the uranium mine. I was told by the city and by the mines that there was not danger from the the uranium mines to human health.

In April of 2010 I went to a naturopathic Doctor in Hot Springs and was diagnosed with heavy metal toxicity and hormonal imbalance and metabolic problems, high blood pressure, etc. I felt better within 6 weeks of being treated and stayed on the vitamin/ mineral regimen after detoxing for 1 year. Not aware of specific uranium toxicity, I thought I was cured and stopped taking detox regimen.

By May of 2015 the same and more symptoms were back and new ones as well. It presented with not digesting well, always tired etc. There were new symptoms of concern: dark urine, kidney pain, blood in urine. Dr Turnquist treated me again for heavy metal toxicity and told me not to drink the Crawford water. Most symptoms where still presenting so in November of 2015 I had a hair strand test to look for uranium and other metal poisons.

Results of hair test done by Doctors Data Lab showed that I was in 96th percentile for uranium toxicity. Immediately I went of a regimen to specifically treat uranium toxicity and I was told by three health professionals that I needed to move from the area of toxicity. In April of 2016 my husband, (who was diagnosed even higher than me) and I relocated to Salem Oregon. We left behind our home which we own and relatives and friends. In June I was diagnosed with mild heart failure, though they could not tell why I

had it. I continued to detox from uranium toxicity and now, as of December, 2016 am working full time at a very physical job and all symptoms of toxicity, even heart failure are gone. I lived 3.6 miles NW of the mine, up on top of a hill, where the wind blew constantly and there was much dust.

The above is all true to the best of my knowledge.

Iris Paris
3660 Liberty
Rd S #27
Salem, OR
97302
cell: 503
983-5073

DOCTOR'S DATA

LAB #: H160311-2474-1
PATIENT: Crawford, NE Resident
ID:
SEX: Male
AGE:

CLIENT #: 13859
Linsey McLean, AFF
840 Husker Place
Rapid City, SD 57701 U.S.A.

Toxic Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL
Aluminum	(Al)	1.8	< 7.0
Antimony	(Sb)	0.021	< 0.066
Arsenic	(As)	0.046	< 0.080
Barium	(Ba)	2.1	< 1.0
Beryllium	(Be)	< 0.01	< 0.020
Bismuth	(Bi)	0.027	< 2.0
Cadmium	(Cd)	< 0.009	< 0.065
Lead	(Pb)	0.10	< 0.80
Mercury	(Hg)	0.10	< 0.80
Platinum	(Pt)	< 0.003	< 0.005
Thallium	(Tl)	< 0.001	< 0.002
Thorium	(Th)	< 0.001	< 0.002
Uranium	(U)	0.27	< 0.060
Nickel	(Ni)	0.05	< 0.20
Silver	(Ag)	0.01	< 0.08
Tin	(Sn)	0.08	< 0.30
Titanium	(Ti)	0.24	< 0.60
Total Toxic Representation			

PERCENTILE 68th 95th

SPECIMEN DATA

COMMENTS:

Date Collected: 02/15/2016
Date Received: 03/11/2016
Date Completed: 03/16/2016
Methodology: ICP/MS

Sample Size: 0.197 g
Sample Type: Head
Hair Color: Brown
Treatment:
Shampoo:

RATIOS

ELEMENTS	RATIOS	RANGE
Ca/Mg	17.5	4- 30
Ca/P	5.82	0.8- 8
Na/K	22.9	0.5- 10
Zn/Cu	16.9	4- 20
Zn/Cd	> 999	> 800

DOCTOR'S DATA INC. ADDRESS: 3755 Illinois Avenue St. Charles, IL 60174-2420 CLIA ID NO: 14D0648470 LAB DIR: Eric Roth, MD

*This 60 yrs old man reported typical male health problems consistent with xenoestrogenic exposure that is known to compromise and interfere with the male hormone testosterone. Uranium is a xenoestrogen. He has since relocated out of the area and has reported that he does not have those same problems anymore. He also lived 3.6 miles NW from the mine, on top of the windy hill with constant dust.

*This is an individual that now lives in the town of Crawford, but not directly downwind of the pivots. Her uranium levels are elevated from living for several decades on ranch property next door to the

mine prior to moving to the town of Crawford. Her uranium levels are still elevated from prior long term exposure. On the ranch for 30 yrs, she lived directly East of the mine, across the street. For the last 5 yrs, she has lived west of town, in a protected valley.

DOCTOR'S DATA

LAB #: H151116-2266-1
PATIENT: Crawford, NE Resident
ID:
SEX: Female
AGE: 78

CLIENT #: 13859
Linsey McLean, AFF
840 Husker Place
Rapid City, SD 57701 U.S.A.

Toxic Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL
Aluminum	(Al)	2.8	< 7.0
Antimony	(Sb)	< 0.01	< 0.050
Arsenic	(As)	0.033	< 0.060
Barium	(Ba)	1.1	< 2.0
Beryllium	(Be)	< 0.01	< 0.020
Bismuth	(Bi)	0.025	< 2.0
Cadmium	(Cd)	< 0.009	< 0.050
Lead	(Pb)	0.14	< 0.60
Mercury	(Hg)	0.04	< 0.80
Platinum	(Pt)	< 0.003	< 0.005
Thallium	(Tl)	< 0.001	< 0.002
Thorium	(Th)	< 0.001	< 0.002
Uranium	(U)	0.15	< 0.060
Nickel	(Ni)	0.19	< 0.30
Silver	(Ag)	0.03	< 0.15
Tin	(Sn)	0.13	< 0.30
Titanium	(Ti)	0.23	< 0.70
Total Toxic Representation			

PERCENTILE 66th 95th

SPECIMEN DATA

COMMENTS:

Date Collected: 11/10/2015
Date Received: 11/16/2015
Date Completed: 11/18/2015
Methodology: ICP/MS

Sample Size: 0.2 g
Sample Type: Head
Hair Color: Gray
Treatment:
Shampoo:

RATIOS		
ELEMENTS	RATIOS	RANGE
Ca/Mg	26	4- 30
Ca/P	4.19	1- 12
Na/K	3.2	0.5- 10
Zn/Cu	16.4	4- 20
Zn/Cd	> 999	> 800

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*This person has lived in the town of Crawford all of her life, but not directly downwind from the pivot sprayers. Her uranium levels are significantly lower. She has lived all her life

DOCTOR'S DATA

LAB #: H160426-2348-1
PATIENT: Crawford, NE Resident
ID:
SEX: Female
AGE: 64

CLIENT #: 13859
Linsey McLean, AFF
840 Husker Place
Rapid City, SD 57701 U.S.A.

Toxic Elements; Hair

TOXIC METALS		RESULT µg/g	REFERENCE INTERVAL
Aluminum	(Al)	8.4	< 7.0
Antimony	(Sb)	< 0.01	< 0.050
Arsenic	(As)	0.037	< 0.060
Barium	(Ba)	2.6	< 2.0
Beryllium	(Be)	< 0.01	< 0.020
Bismuth	(Bi)	< 0.002	< 2.0
Cadmium	(Cd)	0.021	< 0.050
Lead	(Pb)	0.18	< 0.60
Mercury	(Hg)	0.09	< 0.80
Platinum	(Pt)	< 0.003	< 0.005
Thallium	(Tl)	< 0.001	< 0.002
Thorium	(Th)	0.001	< 0.002
Uranium	(U)	0.072	< 0.060
Nickel	(Ni)	0.15	< 0.30
Silver	(Ag)	0.02	< 0.15
Tin	(Sn)	0.14	< 0.30
Titanium	(Ti)	0.43	< 0.70
Total Toxic Representation			

PERCENTILE 66th 95th

SPECIMEN DATA

COMMENTS:

Date Collected: 04/21/2016
Date Received: 04/28/2016
Date Completed: 04/29/2016
Methodology: ICP/MS

Sample Size: 0.202 g
Sample Type: Head
Hair Color: Brown
Treatment:
Shampoo:

RATIOS		
ELEMENTS	RATIOS	RANGE
Ca/Mg	21.1	4- 30
Ca/P	6.45	1- 12
Na/K	4.38	0.5- 10
Zn/Cu	18.2	4- 20
Zn/Cd	> 999	> 800

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west of town 1/2 mile, in the same protected valley as the former person.

Comparing these four individuals' levels of uranium, it is clear that all have elevated uranium levels over the general population, likely due to background exposure from weathering of local outcrops; however, the two people in town and directly downwind of the pivot sprayers, and the one who lived next door to the mine and the sprayers have the highest levels of uranium. Though the numbers of individuals are low, the expectation of lab values shows exactly what we should expect. Both of the females of the worst case and least case are the same age, drinking the same source public water. Only their proximity to the pivots is different.

Further, the chemical form of uranium that would be most bioavailable and most able to be incorporated into the protein base of the growing hair shaft would be the organified form. In prior testimony, it was shown that the organified uranium of ISL mining is not able to be recovered by the resin beads through ion exchange units, and will subsequently build up to high levels in the wastewater. Exposure to organified uranium from the air to the lungs and then the blood, provides a viable path into the biochemistry of the body of this highly bioavailable form of uranium. The corresponding symptoms of xenoestrogen exposure in both of the younger people downwind of the pivots, with subsequent resolution of their problems when exposure was terminated, is further proof of the contention that **contaminants associated with the current mining operations may produce non-radiological health effects.** This study also makes the case for the importance of testing for different chemical forms of metals, as described in prior testimony. Currently, there is no such requirement for testing of different chemical forms of any of the toxic metals generated by ISL mining, especially uranium. Given that the LD 50 levels for the different chemical forms of metals can differ by orders of magnitude, it is impossible to make any conclusions as to what levels of each metal are actually safe and

what is not, based upon the screening testing for elemental levels only in a simple quantitative analysis. More complete testing is necessary.

Crow Butte's witnesses testified that uranium—unlike chlorides, conductivity, and total alkalinity—is a poor leading indicator of excursions. With the increasing levels of organified, non recoverable uranium building up in the wastewater and re injected mining water, over levels found in water of the surrounding aquifers, uranium testing "is" a very good indicator of excursions, and simple quantitative analysis will show that.

I have just given numerous reasons that conditions for land reclamation and prevention of contamination cannot be met with Crowe Butte's mining activities.

None of this data has been considered by NRC in its environmental assessment.

The moral of the story is that once you severely contaminate an environment with radiation and heavy metals, it cannot be taken back. The initial financial rewards enjoyed for a relatively short time become horribly costly in the end, much more so than the initial rewards.

And science now understands that exposure of just one generation of individuals, will have their genetics impacted in a negative way for the next 5 generations, even if that individual is removed from the contamination. This is HUGELY significant. This means that birth defects from environmental toxins can last up to 5 generations afterward, and some studies have tracked these mutations to 15 generations hence.

Contamination of our water, land and air with radiation and toxic chemicals released in uranium mining and processing cannot be taken back...not in our lifetime, nor the lifetimes of the next 5 generations. In fact, it cannot be taken back at all.

Civilization has been shaped over time by science and scientific discoveries. Indeed, this is how we grow and develop as humanity. New observations by man are incorporated into the standard paradigm which change our world views, and shape and direct our actions for the future. We learn from our mistakes, or are supposed to.

When new observations come into conflict with the standard paradigm, there is always outrage, resistance and denial, as the status quo is challenged. However, for man to progress forward, these new observations must be incorporated into our learning curve so that civilization can progress forward. We must keep learning about our environment, our surroundings and our place in it, to survive, maintain and improve our quality of life on Earth.

In decades past, we thought that butter was the best treatment for burns. In fact, even hospitals put butter on burns. It wasn't until an oil tanker burned and sank in the north Atlantic, leaving the crew with burns up to 80% of their bodies and floating in the cold ocean for 14 hours until help arrived, that we discovered that cold water was the superior treatment for burns. When the crew was plucked from the cold ocean water, they were in remarkable shape. This new discovery by tragedy, changed our paradigm of burn treatment forever. Yes, it caused the expected denial, resistance and outrage by the traditionalists, but further studies comparing different treatments of burns proved the new discovery correct, and a paradigm shift was accomplished.

Today, with ISL mining, we are now seeing the same traditionalist beliefs prevailing here, however history has shown us that ISL mining cannot be contained, aquifers cannot be restored to baseline, and the mining toxic wastes cannot be disposed of in a safe and economical way. So, we professionals here testifying for you today, from various fields of expertise, are giving you the latest research and in- formation for you to use, for the opportunity for you to right a grave wrong, to upgrade our paradigm for the good. Understanding that those who came before you, permitted ISL technology with the belief that mining in a totally reduced zone, a condition that other areas exhibit, would safely secure any excursions, that they would just go out and hit the reduced zone and turn back into rock and be contained for safety. However, history has shown us otherwise. Now, with the experience of history and the research we have given you, you have the opportunity to upgrade our mining scientific paradigm and uphold your agency's commitment to guarding the environment and safety of the American people with your oversight, that is regulating agency mandate, and deny this permit.

Further **References:**

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Report on In Situ Leach and Open-Pit Mining, Prepared for the Larimer County Commissioners

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Activation of estrogen receptor-alpha by the heavy metal cadmium.

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and Biotechnologies, 2011, 44 (2)
Heavy Metals Acting as Endocrine Disrupters

Cheryl A. Dyer, PHD eknygos.lsmuni.lt/springer/631/111-133.pdf **5**
Heavy Metals as Endocrine-Disrupting Chemicals

P. Ramirez, Jr., B. P. Rogers, **Selenium in a Wyoming Grassland Community Receiving Wastewater from an** *In Situ* **Uranium Mine**. Archives of Environmental Contamination and Toxicology,May 2002, Volume 42,

Issue 4, pp 431-436

William T. Frankenberger, Richard A. Engberg - 1998 - Technology & Engineering **Ecosystem recovery following selenium contamination in a freshwater reservoir.** Ecotoxicol. Environ. Saf. 36:275-281. **Lemly**, A. D., and G. J. **Smith**. **1987**.

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Sasadhar JanaMonojit A. Choudhuri. **Synergistic effects of heavy metal pollutants on senescence in submerged aquatic plants.** Water, Air, and Soil Pollution, January 1984, Volume 21, Issue 1-4, pp 351-357

Harvey H. Ashmead, H. Dewayne Ashmead, Darrell J. Graff

Amino acid chelated compositions for delivery to specific biological tissue sites

Patent number: 4863898 Filed: February 6, 1986Issued: September 5, 1989 Assignee: Albion International, Inc.

Inventors: Harvey H. Ashmead, H. Dewayne Ashmead, Darrell J. Graff

Theo Colborn, Dianne Dumanoski, and John Peterson Myers ***Our Stolen Future: Are***

We Threatening Our Fertility, Intelligence, and Survival? 1996

Int. J. Environ. Res. Public Health 2011, 8, 629-647; doi:10.3390/ ijerph8030629

Combined Toxic Exposures and Human Health: Biomarkers of Exposure and Effects

http://www.diabetesandenvironment.org/home/mech/genes **Epigenetics and gene expression**

Pursuant to 10 CFR 2.304(d) and 28 USC 1746, I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed in _____Rapid City, SD_____, _____, on _____Feb 14, 2018_____,

Linsey McLean_____

LINSEY MCLEAN

Expert Testimony of **LINSEY MCLEAN** **Curriculum Vitae**

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biochemist@vitaroyalproducts.com

EDUCATION

1967-1972 University of Michigan, full paid academic scholarship, AB in science with double major of biology and chemistry

1974-1975 Michigan State University and Eastern Michigan University to complete specialty in Clinical Microbiology and Clinical Mycobacteriology for ASCP (American Society of Clinical Pathology) on full paid scholarship from employer Hurley Medical Center, Flint, Michigan

1975 to present- Continuing education programs in medicine for physicians and medical providers as they become available.

2017 - Water Quality Standards Academy, USEPA Washington, DC.

WORK EXPERIENCE

1972 to 1973 Clinical Chemistry in private medical lab, routine blood samples and CDC (Center for Disease Control) licensing unknowns.

1972 to 1976 Class 5 CDC Reference Lab (Center for Disease Control) in Clinical Mycology and Mycobacteriology, routine samples with CDC un-

knowns for licensing in a hospital specialty and research laboratory, Hurley Medical Center, Flint, Michigan

1977 to present- As an active biochemist and CEO for Vita Royal Products, Inc., a company that I founded in 1977. Most of my work is in human and animal research with chronic debilitative diseases. I formulate new supplements for commercial use, blend custom supplements for special cases, consult individual clients, doctors and veterinarians, and do research and teaching. Research includes extensive and ongoing monitoring of environmental status and its effects on normal biochemistry, monitoring and observing environmental syndromes manifesting in population statistics and how they are changing over the last 50 years, and adjusting nutritional programs to more properly address these pollution interferences on biochemistry.

TEACHING EXPERIENCE

1977 to 1998 –Taught "Biochemistry of Nutrition" classes in nutrition for animals and humans for Mott College, Flint Mi.

1981 to Present- Wrote many feature articles for national magazines including Dressage and Eventing, Equisport,

Horse of Kings, Crabbett Arabian, and many others, and the Supplement section for the Whole Horse Catalogue

RESEARCH AND AWARDS

Research work includes neurochemistry, metabolic compromise syndromes, autoimmune syndromes with cases ranging from hyperactive children and violent behaviors, to Gulf War Syndrome, neurological affective disorders such as Equine Protozoal Myeloencephalitis, obesity, Type 11 Diabetes and Syndromes X, hormone imbalances, learning disabilities, autoimmune syndromes and diseases, blood sugar regulation, ulcers and leaky gut syndrome, allergy and asthma, clinical depression, chronic fatigue syndrome, chronic infections in both animals and humans as manifestations of environmental pollution. Sports medicine physiology includes high end competition performance horses that perform internationally.

1983 and 1984 Vita Royal Products was chosen as the official supplier of the United States Equestrian Team. Both custom and commercial supplements and feed protocols were formulated for the United States Olympic Team and they won a record number of gold and silver medals, a record yet to be equaled, and in a contaminated environment for athletes, Los Angeles.

1986 -Invited to represent the United States as a Citizen Ambassador in Scientific and Technical Exchange for the People to People Program to New Zealand and Australia.

1987- Invited to present two research papers to the 10th International **Equine Nutrition** and **Physiology** Symposium, Fort Collins, CO an international scientific professional organization. Both projects won top 10 spots of 1500 entries for oral presentation to veterinarians and university research professors.

"Plasma amino acids/intermediary metabolites in the racing horse".
McLean, LM, Hall, ME and Bederka, JP (1987)
This was a study to map the biochemistry of exercise and clinical depression for adaptation to humans.

"Evaluation of serum iron, total iron binding capacity, unbound iron binding capacity, percent saturation of serum ferritin in the equine."LM McLean, ME Hall and JP Bederka 1987 This was a study to map the biochemistry of anemia as a function of inflammation for adaptation to humans and animals.

1988 – Invited to represent the United States as a Citizen Ambassador in Scientific and Technical Exchange for Communist Bloc Countries.

1991 -Invited to represent the United States as a Citizen Ambassador in Scientific and Technical Exchange for China for Oriental Medicine (TCM) and acupuncture.

1996-After eight years of clinical trials, granted two U.S. Patents in 1996 for environmental biochemistry. One was for the first nutritional diet program for weight loss in morbid obesity, normalizing blood sugar in Type II diabetes and lowering cholesterol using supplements and diet, without drugs, based upon addressing the biochemical compromises in the body from high toxic body burdens and without counting calories. This is significant since there were at the time, over 28,000 diets registered in the U.S., none ever earning a U.S. Patent for efficacy. This research pioneered the low carb diets of today, of which there are many. The clinical trial subjects were all morbidly obese women living in SE Michigan, which at the time and still has, the reputation of the worst statistics for morbidity and mortality in the world. It also has record numbers of toxic landfills and industrial dumpsites as well as air pollution problems that cause the area to regularly fail air quality standards. These people, I felt, were the most environmentally challenged population, with the most severely affected basal metabolism and provided the perfect population to work with. They also had very good medical insurance programs to pay for constant medical lab monitoring testing.

1996- Another US Patent for a liquid composition with both nutritional and buffering abilities, without heavy metals or other potential toxins, to aid the increasing acidity in environmentally affected populations, both human and animal. The common antacids all contained aluminum as an active ingredient. Also included were ratios of cations to balance abnormal biochemistry from excess ratios of calcium to magnesium.

1999- Wrote an extensive information web site vitaroyalproducts.com for understanding and self help for Environmental Illness in humans and animals

1999- A continuation to the original diet program was awarded a U.S. Patent for treatment and control of all autoimmune diseases including Lupus, Fibromyalgia and Hashimoto's thyroiditis, as well as chronic fatigue and clinical depression.This patent addressed the hormonal interferences of environmental chemicals that mimic natural hormones, and supplementation of natural hormones to aid affected biochemistry.This patent was immediately picked up by ABC NEWS and featured on their web site.

1999- Three more U. S. Patents for additional biochemical formulations. One represents a dry formulation of the liquid Nutrient Buffer; the second addressed "leaky gut syndrome" with a special nutrient supplement blend, and

the last defines a soothing, therapeutic bath salt compound.

1999-Christopher Columbus Award finalist, an award given for the **'Best discovery of 1998 for the benefit of mankind'.**

2000- another patent was issued for "Leaky Gut Syndrome" protocol with application to horses affected by neurological syndromes including Equine Protozoal Myeloencephalitis

2000- present, research continues toward methods of normalizing affected biochemistry in Environmentally Driven Illnesses.

2010 - Canadian patent issued for "Leaky Gut Syndrome" protocol with ap-plication to horses affected by neurological syndromes including Equine Protozoal Myeloencephalitis

2016 - Writing a cutting edge web site for Thyroid diseases and compromise, "newiodine.com", bringing to market the first iodine amino acid chelate.

2017 -Creating a "Method to Accurately Calculate the True Toxicity of Metals in Soils and Waters." Submitted to US Patent office 2017. This method will be turned over to EPA and other regulatory agencies to upgrade their testing methods for superfund sites, dumpsites, mining sites etc. To date, the only evaluation available only shows the absolute

levels of metals, in a quantitative analysis, not the chemical forms they exist in, needed to be able to evaluate the true toxicity of their exposure. Different chemical forms have orders of magnitude difference in toxicity levels.

SUMMARY STATEMENT

I will be happy to bring to this table and share 50 yrs of data that I have collected on the degradation of the environment and how it has affected population statistics of morbidity, education problems, quality of life, and why our current nutritional and medical paradigms concerning exposure need to be reformed. If the current pollution problems of the world continue to escalate, as I believe they will, then the information that I have collected living and working for over 55 yrs in the infamous "I-75 Industrial Corridor" will become invaluable in setting upgraded nutritional standards, protocols for addressing the toxic body, and methods of remediation for the rest of the world.

lack

Linsey McLean