To pursue scientific research into food forensics, I oversaw the construction of an atomic spectroscopy laboratory in central Texas. The lab's central feature was an Inductively Coupled Plasma Mass Spectrometry instrument, called ICP-MS for short. It has the unique ability to measure the concentration of almost any element -- such as nickel, lead, mercury or magnesium -- in almost any sample you might want tested. I call it "Star Trek technology" because it seems to function almost as if by magic. But it isn't magic... It's just "sufficiently advanced technology" as Author C. Clarke once explained.

In the months after its installation and calibration by expert chemists and instrumentation engineers, the ICP-MS instrument began to lift the veil on what was really present in all sorts of foods: junk foods, fast foods, superfoods, herbal supplements, vitamins and more.

That's when things began to get weird.

When the instrument identified very high levels of lead and cadmium in popular vegan protein products, I contacted the manufacturers of these products to suggest they pursue a voluntary recall of their products. A recall wasn't an option, I was informed, and I was urged to be careful about releasing anything publicly which would "impact sales revenues" of these companies.

When I discovered that popular ginkgo herbs grown in China contained a whopping 5 ppm of toxic lead -- an element proven to cause cancer and brain damage -- I was told that the lead contamination was "naturally occurring" and therefore didn't matter. Yet when I tested ginkgo herbs grown on U.S. soil, they tested remarkably clean, showing near-zero levels of heavy metals. It turns out that when ginkgo is grown in contaminated soils, it accumulates heavy metals contaminants in the herb.

When I found very high levels of tungsten (greater than 10,000 ppb) in superfoods imported from China and Southeast Asia, I was told that tungsten was of no concern because "the FDA has no limits on tungsten," and therefore everybody should ignore the presence of the heavy metal in popular superfood products.

When I discovered an astonishing 11 ppm of lead in mangosteen superfood powder imported from Thailand, I went public with the finding and warned people not to eat mangosteen powder unless it had been tested. In response, I was blacklisted from several importers and not allowed to purchase their raw materials any more.

Over and over again, as I began to find alarming levels of lead, aluminum, tungsten, mercury, arsenic and other toxic elements in everyday foods, superfoods and even certified organic foods, the response I got from manufacturers of these products was, "DON'T TELL ANYONE!"

In just the first few months of ICP-MS research on samples of foods, vitamins and consumer products,
I discovered:

* Over 500 ppb Mercury in cat treats
* Over 10 ppm Tungsten in rice protein products
* Over 5 ppm Lead in ginkgo herb products
* Over 11 ppm Lead in mangosteen powder
* Over 400 ppb Lead in cacao powders
* Over 500 ppb Lead and over 2000 ppb Cadmium in rice proteins
* Over 6 ppm Arsenic and over 1 ppm Lead in some spirulina products
* Over 500 ppb Mercury in dog treats
* Over 200 ppb Lead in brand-name mascara products

(Note: 1,000 ppb = 1 ppm)

In nearly every case, when I contacted the manufacturer of the product to warn them about the high levels of heavy metals found in their products, they insisted their products were perfectly safe while urging me to remain silent and keep their secret from the public.

**A real-life conspiracy of silence**

Conspiracies really do exist, of course. The New York Attorney General says that pharmaceutical companies conspired to set artificially high drug prices in that state. U.S. federal trade authorities say the Chinese government conspires to dump cheap solar panels on the U.S. market in order to drive U.S. solar manufacturers out of business. And food companies, I've discovered, actively conspire to keep their own customers ignorant of the toxic substances routinely found in their products.

The point of this book is to break that conspiracy of silence and reveal what's lurking in your favorite foods, superfoods, organic foods, dietary supplements, vitamins and even pet foods. The information in this book is precisely the information these companies desperately hope you never see.

Recent experience has taught me some valuable lessons in how these companies operate:

Step 1) DENY the existence of heavy metals or other harmful substances in their products.

Step 2) ATTACK the source of the information. Try to create doubt about the motives of the researcher (me) or the accuracy of the findings.

Step 3) Once denials and attacks fail, TWIST scientific facts to claim that all heavy metals are "naturally occurring" and therefore don't count, even if they are found in high levels due to heavy industrial contamination of the farms where the food is grown.

Step 4) If all else fails, tell customers that heavy metals are GOOD for you! This strategy has already been invoked by one company whose products tested at high levels of lead and cadmium. Instead of announcing they would reduce the level of these metals in their products, they posted an article that claimed heavy metals were good for you and people shouldn't be concerned about eating them.

**Sheer deception and consumer fraud**
The process of denial and obfuscation I'm describing here is routinely pursued by companies of all sizes, including companies catering to organic consumers, raw foodies, vegans, vegetarians, detox patients and health-conscious buyers.

The deceptions are quite incredible. One company that imports nearly 100% of the rice protein used by all the vegan protein manufacturers in the United States is full aware that their product contains high concentrations of toxic lead, cadmium tungsten and mercury. On their website, however, they claim their material is "Prop 65 compliant," referring to Proposition 65 in California.

Prop 65 says that if your product exceeds 0.5 micrograms of lead per serving, then you must put a cancer warning on your product label. The rice protein material being imported by this company delivers over 16 micrograms of lead per serving, which is 34 times higher than the Prop 65 lead limit. So how is that "compliant?" Because companies using the material place a small cancer warning on their product labels in order to "comply" with Prop 65. So even though this material contains 34 times more lead than is allowed under Prop 65, the importer claims the material is "compliant" with Prop 65, thereby grossly misleading buyers into thinking the material has low lead composition.

This sort of deception and consumer fraud, I've found, is routinely carried out across organic foods, natural products, superfoods and dietary supplements companies. Many companies that sell products emblazoned with phrases like "better than organic" or "high raw" are actually poisoning their own customers with toxic heavy metals. And they almost never test their own products for heavy metals, which is why they are so surprised when I confront them with the truth about what's found in their products. Even then, when made aware of the heavy metals concentrations found in their products, they invoke denial and obfuscation rather than transparency. Just like drug companies, or weapons manufacturers, or Wall Street investment houses, many natural products companies are run by people who automatically place profits over consumer safety.

That's why this book is such an important public record of scientific truth. This book documents what's really found in these products, mapping out the actual metals composition of products which were acquired in the years 2013 and 2014, then analyzed via atomic spectroscopy for their elemental composition.

This book will spur widespread denials and possibly even a few lawsuits. It will enrage unethical product manufacturers but empower consumers with a new source of information that should appear on Nutrition Facts labels but doesn't. This book will indict dishonest companies selling contaminated products, but it will also celebrate those few companies whose products are remarkably clean of toxic heavy metals (and yes, they do exist).

**Substantial efforts were made to silence this work**

I have been offered money not to publish this book. I've been offered large advertising contracts to leave certain products out of this book. I've been threatened with lawsuits for publishing laboratory results on the web. One of the largest natural products retailers in the United States, a $12 billion company, deliberately trained its employees to lie about me in very specific terms by telling customers that "Mike Adams doesn't have a lab" and that all the laboratory results I've been publishing are fictional.

Substantial efforts have been made to discredit me and silence this work, and yet the fact that you hold this book in your hands is proof that all those efforts failed. No matter how much I am threatened, I refuse to remain silent on this crucial issue for humanity.
We live in a world that's heavily contaminated with industrial waste. Much of our organic food now comes from China, where the term "organic" is a cruel joke. Air quality in Beijing was recently recorded as being 1100% higher than the maximum air pollution limits set by the World Health Organization, reaching the astonishing pollution concentration of 268 micrograms per cubic meter.¹

Much of our food is now grown on lands where that industrial waste is intentionally dumped and used as "fertilizer." As a result, many foods are heavily contaminated with toxic substances. The environmental science cannot be denied, and the scientific findings of this book can be replicated by any competent laboratory running ICP-MS instrumentation.

Please value what you now hold in your hands, and understand how incredibly rare it is for this information to have finally been made public, despite all the threats and intimidation attempts that were unleashed in a desperate effort to keep this information hidden. To stay up to date on the latest findings in this realm, visit the website where I am the editor, www.NaturalNews.com

**Laboratory methodologies and accuracy**

Can you trust the data presented in this book? To answer this question, it's important to understand the nature of ICP-MS testing.

ICP-MS results across competent laboratories can and do vary by as much as 25% due to differences in methodologies and instrument sensitivities. Within the same lab, variation in results from different samples of the same product may vary as much as 10% due to a lack of homogeneity in the product sample. What this means is that the small sample size -- typically only 0.25 grams -- isn't precisely the same in composition from sample to sample. If you are sampling an herb, for example, one sample may have a little more of the herb root while another sample might contain a little more of the herb flower or seed.

But running the exact same sample over and over again in the same lab will usually yield data variations well under 5%.

From lab to lab, this number may vary + / - 10%. So if two different labs test the exact same protein powder, for example it is perfectly reasonable that one lab might report Lead at 450 ppb while a second lab reports Lead at 500 ppb.

However, you won't get orders of magnitude differences. No competent lab would report Lead at just 45 ppb for the same sample, in other words.

In summary, it's important to understand that ICP-MS laboratory results do have some natural variability within a narrow range. Metals composition will also vary from gram to gram and lot to lot. Every production lot of a commercial product has a different metals composition from previous lots. Because of these simple truths, all the numbers in this book should only be used as a general guide to help you decide what to eat and what to avoid. They do not describe absolute concentrations which are consistent across all products of the same name.

It's also true that because of the efforts already made by myself and the launch of the Natural News Forensic Food Lab, some companies are making tremendous efforts to clean up their raw materials and produce cleaner products. That's why products sold on the market at the time you read this may be
substantially cleaner than the products tested in this book. A book takes about a year to go from manuscript to store shelves, so what you are seeing in this book is actually a snapshot of products which were available in late 2013 and early 2014. If you'd like to see more up-to-date results, you'll find them at Labs.NaturalNews.com

Keep in mind, too, that the Natural News Forensic Food Lab is already in the process of receiving ISO 17025 accreditation -- the "gold standard" of laboratory certification for heavy metals testing.

Many commercial labs deliberately produce artificially low results
Another important thing to keep in mind here is that many commercial labs which cater to food companies are in the business of producing artificial low metals test results because that's precisely what their customers want to see. Producing artificially-low results is very easy to accomplish by using open-cell digestion without a watch glass (a kind of vapor lid) placed on top of the digestion vial, thereby causing some metals to be lost during digestion. Digesting samples too quickly at too high a temperature can also cause substantial off-gassing, even during closed-cell digestion.

Proper digestion of a sample to retain all heavy metals is a slow process, and that's why many commercial labs don't use it. Some prefer to use a faster process that loses some heavy metals, thereby making lab testing more rapid while also giving their clients more favorable results.

At the Natural News Forensic Food Lab, we use a slow digestion method that prevents the nitric acid from boiling. This retains nearly all heavy metals found in the original food sample. As a result, our metals results are typically slightly higher than what most commercial labs produce, but they are also more accurate. Our digestion cycle typically takes two hours, not the 45 minutes often used by other labs.

Any competent university lab, however, can easily reproduce our results within + / - 10% by using a slow, low-temperature digestion process.

How we assure scientific accuracy at our lab
In the interests of full disclosure, here are the methods and safeguards we've used in the Natural News Forensic Food Lab (http://Labs.NaturalNews.com) to ensure the best accuracy possible:

* All instrumentation is calibrated and certified accurate by its original manufacturer.

* All external standard solutions are traceable to NIST. Custom standards are formulated and validated by highly competent, experienced custom formulations companies.

* All methodologies used in the lab are based on EPA-approved methodologies such as method 200.8

* The autosampler for the ICP-MS is kept inside a near-air-tight enclosure to avoid contamination of samples from the laboratory environment.

* We do not re-use sample digestion vessels or autosampler vessels. Our laboratory process relies on disposable polypropylene vessels which virtually eliminate vessel contamination concerns.

* After every 10th sample is run via ICP-MS, a blank vial and a calibration vial are run in order to
ensure the ICP-MS instrumentation remains well-calibrated. If significant drift is detected, the run is halted, the instrument is cleaned (or consumable parts are changed out), and the run is repeated from the start.

* ICP-MS instrumentation is routinely maintained in accordance with manufacturer recommendations. For example, sample cones and skimmer clones are routinely cleaned. Sample uptake tubing in the peri pump is routinely changed. Argon air is in-line filtered as is our helium source.

* For each food sample tested, three separate samples are run. Results are then averaged across the three to help eliminate variability and improve reliability.

* All sample test vials are archived for a period of two years so that any challenged result can be re-validated if needed.

* The validity of digestion methods and ICP-MS analysis methods are further validated through the frequent use of CRMs - Certified Reference Materials with known concentrations of elements verified by over a dozen other laboratories.

* Outside labs are used to further validate and spot-check in-house laboratory results. We use both a third party commercial laboratory as well as a university laboratory, both of which have confirmed our findings on multiple occasions.

* All food samples tested are also archived in a massive "food museum" consisting of large metal racks with large plastic bins full of retail food products. This allows any product to be re-tested for metals composition even years later.

* The dilution water used in sample preparation is laboratory-grade DI water produced by a high-end Thermo Scientific water filtration system specifically designed for laboratories.

* Oxidation acids used for sample digestion are trace-grade acids and are routinely tested for their purity. The very small concentrations of elements (parts per trillion) found in these acids is measured at the beginning of each sample run, then subtracted from the results of all subsequent samples.

* Samples that show curiously high results are re-analyzed a fourth or fifth time to make sure the results are accurate.

* All raw sample data for each run is archived on multiple backup servers residing at two different physical locations.

**FDA and USDA have no heavy metals limits**

Neither the FDA nor USDA has any official limit on heavy metals in foods, beverages and dietary supplements sold to U.S. consumers.

This fact is, of course, astonishing. Most consumers of USDA-certified organic foods automatically assume those foods are substantially free of heavy metals. But in our lab, we've found USDA-certified organic foods to consistently contain far higher levels of heavy metals than conventional foods!

So why don't the USDA or FDA set any heavy metals limits for the U.S. food supply? Surely they have
their own explanations, but my view as a food researcher and investigative journalist is that both the USDA and FDA are far too intertwined with the interests of the industries they claim to regulate. Most of the top people at the USDA, for example, have a revolving door history with the cattle industry or herbicide companies like Monsanto and DuPont. Top FDA people, similarly, are far too cozy with drug companies and processed food manufacturers to reliably make decisions in the public interest.

Rather than regulating these industries for the benefit of the public, both the FDA and USDA seem far more interested in protecting these industries from public scrutiny. As a result, there is no real incentive to disclose the heavy metals contamination of agricultural products, or canned soup or beef jerky for that matter. Because the truth of all this might "cause alarm" among consumers, government regulators essentially play along with the "conspiracy of silence" preferred by food manufacturers.

This is why I have launched an online petition that asks the USDA to set heavy metals limits for certified organic foods. You can find that petition at:


Moving toward a Low Heavy Metals industry standard

Until the USDA and FDA come around to establishing heavy metal limits for foods, superfoods and dietary supplements, we've created our own limits which have been published online and embraced by several companies.

The website LowHeavyMetalsVerified.org provides a voluntary heavy metals guide for manufacturers of foods, superfoods and dietary supplements. The site describes a letter-grade self-certification system ranging from A+++ on the super clean side down to F for foods which are more heavily contaminated with heavy metals.

Here are the metals concentration levels which were originally proposed during the site's beta launch:

Low Heavy Metals Verified A+++
Lead < 0.025 ppm
Cadmium < 0.1 ppm
Arsenic < 0.62 ppm
Mercury < 0.006 ppm
Copper < 2.5 ppm

Low Heavy Metals Verified A++
Lead < 0.05 ppm
Cadmium < 0.25 ppm
Arsenic < 1.25 ppm
Mercury < 0.012 ppm
Copper < 5 ppm

Low Heavy Metals Verified A+
Lead < 0.12 ppm
Cadmium < 0.5 ppm
Arsenic < 2.5 ppm
Mercury < 0.025 ppm
Copper < 10 ppm

Low Heavy Metals Verified A
Lead < 0.25 ppm
Cadmium < 1 ppm
Arsenic < 5 ppm
Mercury < 0.050 ppm
Copper < 20 ppm

Low Heavy Metals Verified B
Lead < 0.5 ppm
Cadmium < 2 ppm
Arsenic < 10.0 ppm
Mercury < 0.1 ppm
Aluminum < 800 ppm
Copper < 40 ppm

Low Heavy Metals Verified C
Lead < 1 ppm
Cadmium < 4 ppm
Arsenic < 20.0 ppm
Mercury < 0.2 ppm
Copper < 80 ppm

Low Heavy Metals Verified D
Lead < 2 ppm
Cadmium < 8 ppm
Arsenic < 40.0 ppm
Mercury < 0.4 ppm
Copper < 160 ppm

Low Heavy Metals Verified F
is anything worse than "D"

See revisions to these standards at LowHeavyMetalsVerified.org

Most food products available in the marketplace today fall between A and D. This scale sets a voluntary standard by which food products can be easily compared on their heavy metals composition. It also allows consumers to more easily shop for products which are cleaner than others. For example, almost every health-conscious consumer would prefer to eat grade "A" chocolate rather than grade "B" chocolate, assuming all other properties of the chocolate are identical.

The downside of this system is that it is purely voluntary and, as you might have already guessed, many companies will flat-out lie to their customers and claim cleaner heavy metals concentrations than really exist in their products.

For this reason, Natural News will be policing the industry by randomly purchasing products from companies who claim these heavy metals limits and testing those products for compliance. Products which do not comply with the claims levels will be publicly published on NaturalNews.com.
Our hope is that both the USDA and FDA will eventually take over this function and establish their own procedures for heavy metals limits and industry spot-checking. Until that day comes, Natural News is the only organization on the planet which will be fulfilling this important role in the interests of public safety.

Some observers find it quite curious -- perhaps even bizarre -- that a private sector company is doing a better job of policing the U.S. food supply for heavy metals than the entire federal government.

I find it bizarre, too.
Everything You Need to Know About Toxic Elements

The next section of this book is more "scientific" in structure. If you're really only interested in the heavy metals test results for your favorite foods and superfoods, you can skip ahead to the charts section of this book.

But for those who want more in-depth research and explanations about how heavy metals harm biology and why they are so difficult to get rid of, this section documents the harm of heavy metals with a considerably amount of scientific explanation and research citations.

For this reason, I'll be covering this section in my "scientific voice" and will refrain from the kind of opinion statements that normally characterize my writing.

Just a warning, though: This section can get a bit technical. (Doctors, scientists and biologists, however, will find it right in line with their scientific papers.)

Where do heavy metals come from?

Life on Earth in its rawest natural form is fraught with countless dangers and immediate threats to your existence. Numerous toxic metals and compounds are found almost everywhere on this planet in some concentration. Raw and potentially poisonous forms of mercury, lead, cadmium, arsenic, aluminum, copper, tin, tungsten, chromium, beryllium and other elements are increasingly found in our post-industrial environment.

As elements, they are never destroyed and will continue to exist in one form or another. Once encountered in the environment, they may be inhaled, ingested or absorbed into humans, animals, plants and fungi, or they may be transformed and combined with other substances to create new compounds... but they cannot simply be eliminated.

It is the industrial concentration of these elements – which are generally sparse and spread out at relatively low levels – that has turned vague primordial threats into everyday dangers. As byproducts of smelting, ore extraction, energy production and commercial goods, heavy metals and refined chemical compounds have poured into our air, water, soils, foods, ecosystems and bodies.

In September 2013, the U.S. Center for Disease Control (CDC) issued its fourth National Report on Human Exposure to Environmental Chemicals detailing more than 201 chemical substances which have been identified in blood serum and urine levels throughout the U.S. population. These can be ingested, absorbed, stored, excreted, metabolized or bound to other compounds – potentially interacting, blocking or amplifying reactions within the body.

While many elements, including trace levels of certain minerals, are essential nutrients for catalytic conversions and bodily functions, alarming concentrations of toxic forms of these elements have found their way into our lives at a pace that's wildly out of balance with nature and hazardous to our health and longevity.
A few dozen key contaminants may be posing a crucial but yet-uncalculated toll on the well-being of everyone around the world – with increased levels of toxins in everyday foods contributing to a general rise in inflammation, immunological and digestive disorders, neurological damage, organ failure, heart and lung ailments, cancer, and other serious diseases and conditions.

When most people think of being poisoned, they typically imagine ingesting a large, concentrated dose that quickly induces acute toxicity, often followed by a swift and horrible death. In reality, however, the real danger to health comes from long-term exposure to low-level doses of toxins over time, including heavy metals.

Science now recognizes that these detrimental health effects are triggered by gradually accumulating minuscule concentrations of toxins over time, through repeated dietary or environmental exposure.

The tidal wash of pesticides, herbicides, insecticides, fungicides, rodenticides, fertilizers, preservatives, emulsifiers and additives across the agricultural practices of the entire Western world -- and increasingly the developing world -- has contributed to the introduction of known toxins into the environment at apocalyptic levels. They interact with and are absorbed by soils, bodies of water, vegetation, fish and wildlife. They are absorbed and integrated into plant and animal tissues. As humans, we breathe these compounds, eat them, drink them and bioaccumulate them in our bodies. We also excrete them, or their metabolized byproducts, back into the environment, furthering the cycle of death and destruction brought about by these toxins. While further research is needed to expand our understanding of exactly how these toxins interact to produce disease and death, there is little debate about the importance of limiting environmental and dietary exposure to these toxins in the first place.

Dietary exposure to toxic heavy metals through foods is a far greater problem than most people supposed. Even U.S. Department of Agriculture (USDA) certified organic foods are not tested for heavy metals like cadmium, lead, arsenic or mercury. Thus, there are no limits on heavy metal levels in these foods, including those sold in upscale healthy food retailers such as Whole Foods. The organic label simply describes the process through which the food was grown and that a farmer hasn't used additional pesticides, herbicides, or other petrochemicals during that process. "Certified organic" in no way requires any heavy metals testing of soils, irrigation water or even the final food product.

The reality is that one farmer's “organic” food can differ widely from another farmer's food simply because the air, water and soil in which the food is grown is heavily contaminated with heavy metals.

Toxic heavy metals and other elemental poisons -- whether they circulate around us or are absorbed into our bodies -- definitively remain in the biosphere in one form or another in perpetuity. They literally comprise a vicious and deadly cycle that modern life has exponentially accelerated through the industrial mining, concentration and dispersing of toxic elements which would have been far better left alone, buried in the Earth's crust.

Some of the worst offenders, including lead, mercury, cadmium and arsenic, have long-since thoroughly infiltrated our lifestyles, and each pose their own significant hazards. Because the functions of the body are complex, many of the harmful effects are still being discovered and documented to this day. The scientific work on understanding the effects of toxic elements on biological systems, in fact, has only just begun.

Already, there is ample evidence of heavy metals disrupting chemical reactions throughout the body and blocking important nutrient absorptions. Toxic metals often compete with nutritional elements for
metabolic processes; poisonous metals can imitate essential, or “good” trace metals, rendering elements the body needs unavailable as chemical catalysts. Even when heavy metals don’t prevent important conversions, they still cling to cell walls, interfering with normal cellular functions such as waste excretion, immune defense, healing and adaptation.

Scientists have spent a considerable amount of time and effort researching the processes by which heavy metals undermine and destroy the body over time. Oxidation is one such process, whereby cells are disrupted and damaged, often leading to disease or weakened organ vitality. This is one reason why antioxidants are essential for good health: they protect cells from dangerous and deadly exposure to free radicals.

Emerging science reveals that toxic elements ("heavy metals") have a greater propensity than previously thought for damaging DNA and disrupting cellular processes. Not only are these metals shown to cause cancer, but there is increasing information demonstrating their potential roles as co-carcinogens which increase mutations and disruptions when combined in the body with other types of toxins.iii

**Heavy metals poisoning is trans-generational**

An even more important -- and destructive -- role may be played by toxic heavy metals in interfering with the process of DNA methylation, which transforms cytosine and adenosine nucleotide bases in the DNA sequence. This creates inheritable changes in what is known as the epigenome, a genetic roadmap parallel to DNA that records changes to its code (as when gene expression is repressed) and passes them on to the next generation.

This process of DNA methylation plays a role in gene regulation and is a vital process during early fetal development when methylation during cell division directs specific tissue formation and other processes. While approximately 70% of human DNA is methylated naturally when the attachment of methyl groups switch on or off a gene, when toxic metals attach to these methyl bonds, it can distort vital bodily functions or even block them altogether.iv

Through the still-emerging understanding of epigenetics, science has uncovered the specific process by which environmental factors, diet, stress and exposure to toxins rewrite the intended gene expression and alter DNA. This, in turn, influences an individual's chances of getting disease -- or of passing along those risks to their children. Despite the fact that it is not pre-written in DNA, epigenetic effects create traits which are inherited by offspring.

A full understanding of this phenomenon should cause immediate alarm in the mind of anyone reading this. Epigenetic inheritance of toxic side effects from dietary exposure to heavy metals means that **toxicity is trans-generational.** This, in turns, means that the toxic environment in which we live today will negatively impact future generations for an unknown number of generations even if we eliminate all exposure starting tomorrow.

For example, studies have shown an inverse relationship between a mother's cumulative cord blood lead levels and the epigenome of her developing fetus, strongly suggesting that toxins interfere with "long-term epigenetic programming and disease susceptibility".vvi Arsenic exposure was likewise found to affect DNA methylation in fetal development, damaging DNA and disrupting gene regulation.vii
In many ways, we are already too late to save future generations from the toxic effects of exposure to toxic elements. And because exposure is only getting worse, not better, trans-generational negative effects are likely to significantly worsen with each subsequent generation. I happen to be one of many people who believe the entire human race now stands on the verge of destroying itself through this very process. Technically speaking, we may already have doomed ourselves to global infertility, devastating cancer rates and a planet-wide loss of cognitive function due to heavy metals exposure in modern-day foods.

In other words, we may have already set out a path by which the great grandchildren of today's young adults will be almost universally retarded, infertile and incapable of surviving at all. The destruction of sustainable human life on our planet may have already been set into motion, only to play out through several generations of suffering and bewilderment as government regulators and food companies continue to push their conspiracy of silence into the actual underlying causes.

**Natural chelation and the removal of heavy metals from the body**

Health-conscious consumer naturally want to find ways to remove heavy metals from their bodies. The most important method for accomplishing that is to eliminate dietary exposure to toxic heavy metals. Once sources of exposure are eliminated, the body's natural elimination processes will automatically and over time remove toxic heavy metal buildup in organs and tissues.

But even the process of removing heavy metals from your body can be toxic by itself. For example, when heavy metals are chelated out of the body's organs and tissues, they are dumped into the blood supply. If this process is too rapid, the levels of heavy metals in the blood supply can increased so rapidly that it becomes acute and toxic on its own. This is why any heavy metals detoxification program must be pursued under the guidance of a clinically qualified chelation expert, naturopathic physician, or other holistic practitioner with years of experience in removing heavy metals from the body.

If you are looking for a chelation expert, my recommendation is to visit the website ACAM.org which can help you locate a qualified heavy metals removal clinician in your area.

The topic of heavy metals removal from your body is covered in more detail later in this book. As you read, however, keep in mind that removing the sources of exposure is the single most important principle of detoxification. Failure to remove the sources of exposure – even while undergoing aggressive detoxification therapies – will net you very few overall gains.

There are many ways in which heavy metals interfere with and distort healthy biological function. As just one example, heavy metals may interfere with normal cellular methylation cycles. When lead builds up in bones, it can negatively distort DNA methylation processes in white blood cells, which of course originate in bone marrow.

The classification of many metal toxins as electrophiles defines how these particles are driven to steal electrons and bind to chemical compounds in processes similar to methylation. Lead, mercury, arsenic and cadmium are biochemical vampires, latching onto and interfering with vital molecular groups, disrupting their immunological and metabolic contributions to healthy biology. Even after they are expelled from the body, these heavy metals can go on to cause damage in downstream biological systems such as fish, amphibians and ocean ecosystems.
Chelation strategies are based on a metal element's natural affinity for molecules with a certain chemical charge. Chemical binding properties provide a pathway for removing damaging heavy metal from the body. Even the best chelators, however, are limited in their abilities. No chelation strategy offers 100% removal of any heavy metal from the body.

Common chelating agents for lead, arsenic and other metals include meso-dimercaptosuccinic acid (DMSA), dimercaptopropanesulfonic acid (DMPS) and 2, 3-dimercaprol (BAL). These chelates -- termed after chela, or 'claw' in a Greek-derived Latin word -- are often used in combination with vitamins and other antioxidants structured to bind more effectively with the metal while enhancing metabolic pathways for metals removal. While DMSA and DMPS are the most widely used chelates for lead and arsenic, studies have found them incompatible with mercury removal, where more custom chelates are typically used.

There are many foods which naturally have some limited chelation properties. Cilantro, chlorella and lemons have all been identified as agents with some effectiveness for reducing heavy metal toxicity, while foods like garlic can reduce levels of oxidative stress. It has also been found that citrate, cysteine, glutamate, EDTA and yeast extract (particularly effective against copper toxicity) bind and remove metals. (Although it must be noted that yeast extract is a common form of MSG, an excitotoxin with its own health concerns.)

In research conducted in 2010, Taiwan researchers found that lemon and orange peel could aid in the removal of heavy metal ions, particularly copper and nickel. Activated carbon (charcoal) is also very effective at neutralizing and removing metal toxins.

In research conducted in 2010, Taiwan researchers found that lemon and orange peel could aid in the removal of heavy metal ions, particularly copper and nickel. Activated carbon (charcoal) is also very effective at neutralizing and removing metal toxins.

**Lack of exercise and sweating causes heavy metals to accumulate over time**

The body's mechanisms for excretion also play an important role in detoxification; in studies, sweating in particular has been shown to remove heavy metal particles in vastly higher quantities than through urination. Endurance exercises and use of infrared saunas have been successfully used to sweat out toxins, in many cases surpassing the level of toxins removed through urination. Some studies have shown that many metals are best removed through sweating them out.

The fact that more and more Americans pursue sedentary lifestyles lacking almost all vigorous exercise -- and therefore sweating -- helps explain why metals so rapidly accumulate in the bodies of the obese. A 2014 study published in the *Mayo Clinic Proceedings* and conducted at the University of South Carolina’s Arnold School of Public Health found that obese Americans spend less than one minute per day engaged in vigorous exercise.

Yes, that's one minute per day. The study found that obese women were far worse off than men, engaging in less than one hour of vigorous exercise per year.
The very mention of the element arsenic evokes thoughts of its notorious role as a poison in the commission of murder, often tempered by passions, jealousy or the quest for power. This use, long captured in literature and the infamous crimes of centuries past, continues today.

Yet in modern times, the broader impact of arsenic as a chronic, cumulative contaminant in water, food and the air eclipses the significance of acute, deliberate poisoning. Arsenic does not always kill so quickly. It is a known carcinogen that has been linked to tumors formed in the skin, lungs, bladder, kidneys, and digestive tract as well as the lymphatic and hematopoietic systems in both humans and animals. Arsenic's numerous detrimental health effects have been well documented to include diabetes, heart disease and cardiovascular issues, respiratory distress, impaired neurological development and even depression. Arsenic toxicity has also been linked to increased infant mortality and early developmental issues.

Notably, arsenic comes in two forms: organic and inorganic. Defined by their bond with carbon and hydrogen, the organic forms of arsenic are largely considered harmless. The inorganic forms of arsenic, typically bound to elements like oxygen, sulfur or chloride, are widely used in industrial applications. These are the varieties associated with arsenic's poisonous and carcinogenic effects. Common inorganic forms of arsenic include arsenic trioxide (a common industrial byproduct also used in some medical treatments), chromate copper arsenate (widely used as a wood preservative that also acts as an insecticide), and pesticides. Lead arsenate, calcium arsenate, 'Paris Green' (copper acetoarsenite) and sodium arsenate are all pesticides derived from inorganic arsenic.

**Arsenic in drinking water**

The tainting of well water supplies across the globe with arsenic trioxide is a mounting catastrophic problem affecting more than 137 million people who have been exposed to levels exceeding 10 parts per billion (ppb) in drinking water, the standard set by both the United Nations World Health Organization (WHO) and the U.S. Environmental Protection Agency (EPA). A geological study conducted by Peter Ravenscroft at the University of Cambridge further discovered that some 57 million people are drinking water at peak contamination rates of more than 50 ppb -- putting them at serious risk for cancer and other health effects.

**Arsenic in Bangladesh and West Bengal**

This problem with arsenic contamination in water is most concentrated in Bangladesh and the neighboring Indian state of West Bengal, where nearly half the population drinks from contaminated sources after decades of Western aid directed the construction of tube wells that tapped directly into arsenic-tainted water reservoirs. Because of this, Bangladesh has 27 million people drinking from sources that contain greater than 50 ppb or arsenic while West Bengal and a few other areas of India have a combined 11 million people exposed to carcinogenic levels of arsenic-tainted drinking water.

An astounding 80 million people in this region drink water containing more than 10 ppb. Bangladesh is considered the "biggest arsenic catastrophe in the world," where 59 out of 64 districts are affected,
and more than half the total population is at risk of arsenic contamination. This repeated exposure to arsenic is known as *arsenicosis*, which is typically diagnosed via visible skin lesions, although symptoms can also include dehydration, abdominal pain, vomiting, diarrhea, dark urine, delirium, vertigo, shock and eventually death.

A study carried out in Bangladesh also confirmed a link between high arsenic exposure and anemia, a condition where a person lacks healthy red blood cells and suffers from inadequate oxygen delivery to the body's cells and tissues.xxv

Other parts of the world face significant arsenic levels in drinking water as well. Another 5.6 million people in China and an astonishing 3 million in the United States also drink water that's heavily contaminated with arsenic. Several million more people across the Southeast Asia and the Pacific Region, Russia, the Middle East, South America and other pockets of the map are exposed to arsenic in their drinking water.xxvi

While lakes, streams and groundwater remain unregulated for arsenic, the U.S Environmental Protection Agency (EPA) has limited public drinking water sources to 10 ppb. Despite this, several thousand water districts across the U.S. continue to contain dangerously high levels of arsenic.

**Arsenic in the food chain and biosphere**

Arsenic has thoroughly contaminated our food chain and the environment. Chronic exposure to arsenic compounds in food -- even in low doses over time -- has been definitively linked with the development of cancers, especially in the skin, liver, bladder and lungs.xxvii

The ability of inorganic arsenic to destroy and kill has also made it an important and widespread element in a cocktail of pesticides as well as an important wood preservative that doubles as an insecticide. As a result of the widespread use of agricultural and industrial arsenic compounds, arsenic has entered the soil and our surrounding environment at nearly every conceivable point -- ultimately tainting the world's food supply.

In addition to organic arsenic compounds which are frequently found in small amounts in many foods, a number of inorganic arsenic varieties have contaminated production crops that feed America and the world. The real sources of concern are those accumulated from widespread pesticide and fertilizer use, runoff from industrial production and -- a factor of greater importance than most people realize -- from pressure-treated wood.

**Arsenic as a pesticide**

Before the development of DDT, lead arsenate -- a deadly cocktail of the heavy metals lead and arsenic -- was one of the most widely used pesticides, virtually dominating agriculture in the first half of the 20th Century. Along with other arsenic-based pesticides like calcium arsenate and 'Paris Green', arsenic was used to control moths and other pests, especially in apple orchards and other fruit trees as well as cotton crops -- despite the fact health concerns over arsenic residues had been officially acknowledged as far back as 1919.xxviii Other inorganic varieties and a few organic varieties of arsenic were used for mosquito control and as insecticides, rodenticides and herbicides sprayed on everything from curbs to sidewalks to road perimeters.

In addition to pesticide applications, a number of phosphate and micronutrient fertilizers -- even those
meant for organic food production -- have been found to contain elevated arsenic and heavy metal levels, further contaminating many soils.xxix

The EPA's first comprehensive report on arsenic pesticides in 1972 listed numerous compounds and their known uses and hazards.xxx They include lead arsenate, 'Paris Green' (copper(II) acetate triarsenite), calcium arsenate, basic copper arsenate, ammonium arsenate, arsenic acid, arsenic pentoxide, arsenic trioxide, sodium pyroarsenate, sodium arsenate, potassium arsenate as well as several harmful "arsenic-containing organic compounds used in formulating pesticides" including cacodylic acid -- just to name a few.

According to the EPA, although DDT replaced much of the use of lead arsenate in the post-war period, that later reversed after federal regulations severely limited the use of DDT and other organochlorine insecticides. Subsequently, the use of some arsenicals as pesticide resumed by the late 1960s. By 1969, annual production of arsenic trioxide had increased to 66,000 tons. Meanwhile, more than 4 million pounds of lead arsenate and some 2 million pounds of calcium arsenate were also produced for industrial purposes.

Control of moths, beetles and other pests made these varieties particularly useful in orchards during the period spanning 1890-1940, where lead arsenate was sprayed directly onto fruits, including apples, apricots, cherries, peaches, pears, plums, prunes, nectarines, quinces and grapes.

Calcium arsenate was also frequently used as a pesticide on a wide range of agriculture crops including asparagus, beans, blackberries, blueberries, boysenberries, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, celery, collards, corn, cucumbers, dewberries, eggplant, kale, kohlrabi, loganberries, melons, peppers, pumpkins, raspberries, rutabagas, spinach and squash -- until the EPA canceled registration for its use in 1988. The registration was cancelled after it was found that these pesticides posed "cancer risks to workers and acute toxicity to the general public."xxxi

Not only were edible crops treated with it, but cotton crops spanning millions of acres in states including Texas and Oklahoma were annually sprayed with arsenic acid, leaving soils contaminated at levels measured as high as 830 parts per million (ppm).xxxii

According to the EPA, many farmers who had been interviewed claimed their orchard trees lived shorter lives and that their fields were unsuitable for various forage crops typically grown during alternating years, giving support to the case for the negative effects presented by widespread arsenic soil contamination. The heaviest scheduled uses were in repelling Syneta beetles in apricots, peaches and quince at a rate of 5-6 pounds of arsenic-laced pesticide per 100 gallons of water, a mixture used on these crops for decades. Grapes were also subject to some of the heaviest doses of arsenic, with sodium arsenate fungicide registered for use at a average rate of 3-9 pounds per acre in effort to stop black measles and crown gall.

While arsenic pesticides have been found to metabolize into secondary forms with the aid of microorganisms, researchers have discovered that about 20% of the toxins remained in the soil decades later in their original form, even on fields that received only a single topical soil application. Researchers also found that 55% of croplands sprayed with pesticides containing arsenic trioxide back in the 1950s were irreversibly leaching into both groundwater and soils over time.xxxiii

Thus, repeated and widespread applications of lead arsenate and other pesticides has contributed to significant accumulations of lead and arsenic in soils, and these toxins can still be found even decades
after their use declined or was banned -- with horrible health implications that continue to this day.xxxiv

Ken Rudo, who has worked as the state toxicologist for North Carolina's Division of Public Health for more than 24 years, confirmed that arsenic compounds bind tightly to the soil, presenting a multitude of potential issues. “These chemicals have just tremendously long half-lives in the ground,” Rudo stated in an EPA report.xxxv The extensive spread of lead arsenate has made remediation of soils difficult, particularly as arsenic particles tend to move to the subsoil layers much more quickly and pervasively compared with other metals like leads.

Soil analysis studies in the arsenic- and lead-tainted orchards of Massachusetts have revealed that the two metals "Pb and As bind 'tightly' to soil HA [humic acids] molar mass fractions."xxxvi

A study in Taiwan found an important relationship between the geographical concentrations of leading heavy metals, including arsenic and nickel, and the prevalence of oral cancer in patients who smoked or chewed Betel quid -- a combination of betel leaf, areca nut and slaked lime. That is, cancer and other malignancies predominated in areas where the soil was contaminated with those elements.xxxvii

**Arsenic-treated wood**

About 90% of the arsenic produced for industrial purposes is ultimately used in wood preservation in the form of copper chromated arsenic (CCA). While CCA has now been phased out, it still permeates much of the existing infrastructure. This arsenic compound has been used in lumber treatment to both prevent rotting and to act as an insecticide that kills termites, ants and other unwanted pests.

This arsenic-treated wood has been almost universally used in utility poles and for fencing and wooden decks around businesses and residences.xxxviii The Federal Insecticide, Fungicide and Rodenticide Act now prohibits the use of CCA-treated wood in residential areas, but decades of nearly ubiquitous use has left an enormous exposure footprint in the environment.

The EPA has warned parents not to allow their children to play anywhere on, under or even near patios and decks that were built with arsenic-treated wood, as the highly-toxic arsenic compound is known to leach into the surrounding dirt or soil, as well as the surrounding landscape and any water sources.

Even worse, CCA-treated wood also contains chromium VI, better known as hexavalent chromium, the element which caused so many people in Hinkley, California to get sick after industrial contamination in the based-on-a-true-story film *Erin Brockovich* starring Julia Roberts. Hexavalent chromium leaches into the environment at greater levels than arsenic and is considered a genotoxic carcinogen, meaning that it is linked with both cancer and damage to the DNA structure itself.

In addition to these concerns are neighborhood fences, electric poles, picnic tables and playgrounds. In conjunction with its facilitation of the lumber industry's voluntary "phasing out" of what was once widespread CCA treatment, the EPA has provided oversight for "Focusing on Children" by assessing "the potential exposure of children to playground equipment built with CCA-treated wood" since 2001, while considering ways to deal with the countless structures in society that were built with components saturated in this harmful compound.xxxix

Testing performed in areas around utility poles that had been heavily coated with a CCA treatment have confirmed that significant levels of both Arsenite and Arsenate had leached into soils and groundwater
in the area.xl

Some mitigation treatments have successfully converted the toxic inorganic arsenic trioxide to a less harmful pentavalent arsenate form; however, this form readily competes with phosphorous inside the body and thus has been known to impair essential bodily functions.

As far back as 1972, the EPA knew of the toxicity issues with arsenic-based pressure treatments and injection treatments including arsenic acid, arsenic pentoxide dehydrate, sodium arsenate, sodium hydroarsenate and disodium arsenate, but the agency considered the implications of the loss of use to be a "national disaster" and thus downplayed the real environmental implications.

**Arsenic in food**

More than a century ago, it was arsenic that helped pave the way for modern reforms to clean up the food supply. A case in Bradford, England in 1858 later spurned the 1868 Pharmacy Act when a sweet shop worker misidentified and then accidentally mixed some 12 pounds of arsenic trioxide into delicacies. Even though several of the experienced workers thought the sweets looked odd, prompting one vendor to demand a discount, 20 people were ultimately killed and at least 200 others were sickened.xli This haphazard poisoning opened the door to regulations that took on food adulteration as a major issue.

Though subsequent regulation has banned the use of many arsenic-based pesticides and curbed some of the chemical's industrial use, arsenic accumulation in the soil has thoroughly contaminated many areas throughout the world. Even low levels have shown carcinogenic effects through chronic exposure – raising serious concerns about staple food crops.

This problem is compounded by the volume of food exports coming from China and other countries where environmental standards are often lax.

By far the biggest source of total arsenic in foods comes from seafood, including some fish, crustaceans and seaweed. The CDC reports that the "biological half-life of ingested fish arsenic in humans is estimated to be less than 20 hours, with total urinary clearance in approximately 48 hours."xlii Most researchers have dismissed the role of organic sources of arsenic in causing any harm, but inorganic forms are widely recognized as being harmful to human biology.

**Arsenic in apple juice**

Controversies surrounding the arsenic content in juices and rice have made their way into the mainstream media lately. The prominent TV show host Dr. Mehmet Oz created a significant stir after releasing test results that showed what his team considered dangerous levels of arsenic in apple juicesxliii – many were top brand name products typically found in grocery stores across the U.S. Many established voices tried to discredit the claims laid by Oz by preying on the public-at-large's innocence, focusing on the lack of differentiation between arsenic's organic and inorganic speciation.

However, watchdog Consumer Reports followed up with confirmation that juices -- including those of the ever-popular apple and grape varieties -- were indeed found to contain arsenic levels higher than the federal standard for drinking water and the majority of this arsenic was inorganic and linked to potentially deadly health effects including cancer.xliv Approximately ten percent of the 88 samples
showed arsenic levels above the 10 ppb threshold.

Consumer Reports identified Denise Wilson, PhD, a professor at the University of Washington as having tested apple juice samples for contamination. Wilson stated “We are finding problems with some Washington state apples, not because of irresponsible farming practices now, but because lead arsenate pesticides that were used here decades ago are still in the soil. Heavy metals like lead and arsenic just don’t go away.”

Concern was further elevated by the fact that more than 60% of juice imports come from China, where the use of arsenic-based pesticides may still be on-going and regulations for foods are even shadier than those in the U.S.

After significant public pressure, the U.S. Food and Drug Administration (FDA) was forced to consider new rules and finally conducted its own tests. After the results were released in July 2013 essentially confirming the arsenic tainting that it had previously attempted to sweep under the rug, the agency established a new proposed limit of 10 ppb for inorganic arsenic levels in apple juice -- the same as EPA standards for drinking water. While maintaining that no specific danger was posed by the arsenic levels it found in juice, the FDA did acknowledge that "the arsenic in these samples was predominantly the inorganic form" -- a form that is a Class A known human carcinogen.

The agency claims there is no "short-term risk" from arsenic levels in food. However, the data backing this up primarily consists of measurements of total arsenic (as opposed to inorganic arsenic) and sets aside altogether any consideration of risk potential from long-term, chronic, bioaccumulated exposure. Prior to this, the FDA had few limits on how much arsenic was tolerated in specific foods and no general limit, though it set up a Total Diet Study program back in 1991, supposedly to monitor food safety.

The European Food Safety Authority also has no hard limits on arsenic in food, but concluded that the "possibility of a risk to some consumers cannot be excluded," revising its provisional tolerable weekly intake (PTWI) levels in 2009 after acknowledging that previous data had not properly considered the levels of inorganic arsenic or its propensity to cause cancer in the lungs, bladder and skin.

The Joint FAO/WHO Expert Committee on Food Additives (JECFA), which set the Codex Alimentarius International Food Standards, have since laid down limits on inorganic arsenic, setting the Provisional Tolerable Daily Intake (PTDI) at 0.002 mg/kg bodyweight, which is approximated for the average-sized person as 0.12 mg/day (for a 60kg adult). There is no U.S. federal limit for inorganic arsenic levels in food.

Arsenic in rice

Rice is known for its higher arsenic absorption levels. The food staple found itself surrounded by controversy when laboratory tests in 2012 tests revealed high levels of arsenic in numerous commercial rice products across nearly every variety.

After playing a significant role in exposing arsenic levels in popular juice brands, Consumer Reports turned its spotlight on rice in November 2012. Testing more than 200 samples, the organization determined that the daily limit of five ppb arsenic (the original limit proposed by the EPA for drinking water that was not adopted) was frequently exceeded by double and triple those amounts -- including in brands specifically marketed towards gluten free and health conscious niches. Brown rice was also
found to have more arsenic overall than white rice in every sample Consumer Reports tested.

Some attribute the elevated arsenic levels in rice to paddies like those in the southern United States which are generally found near areas where arsenic pesticides for cotton or other crops were traditionally used on a wide scale -- and subsequently accumulated by rice plants through tainted soil and water.

A bigger offender than even rice and apple juice, which received significant negative press, is the consumption of arsenic in vegetables, which also absorb trace amounts of arsenic from contaminated soils and water. Studies estimate that about a quarter, or 24%, of the average arsenic-laced foods ingested are vegetables; this is more than the approximate 18% of dietary arsenic derived from fruits and their juices, and the 17% of dietary arsenic contributed by rice, according to Consumer Reports' findings.

**The big secret: arsenic in chicken**

While the alarm has been sounded on foods like fruit juices, rice and even vegetables grown in soils contaminated by pesticides tainted with dangerous arsenic compounds, little has been said about the effects of arsenic in poultry and swine.xlix 1

Drugs used in animal feed for chickens to control internal parasites and promote growth during factory farm confinement have long contained high levels of inorganic arsenic. These compounds have been ingested by humans in significant quantities for decades. Alarming concentrations of these arsenic compounds in the liver and muscle of young chickens have been discovered at levels far exceeding anything found in rice, grains, fruits or vegetables.

A 2004 study conducted by the USDA used monitoring data for the Food Safety and Inspection Service National Residue Program to determine average consumption levels between 1989-2000 for people who ate significant quantities of poultry.li Researchers discovered mean concentration levels of .39 ppm, or 390 ppb arsenic, levels three to four times higher than in other meats. The report concluded, "At mean levels of chicken consumption (60 g/person/day), people may ingest 1.38–5.24 μg/day of inorganic arsenic from chicken alone" (emphasis added). When vegetables, fruits and rice consumption are factored into the mix, people are likely eating much more arsenic in a day than they previously thought possible.

Revelations about these high levels of toxic, inorganic arsenic led to pressure on the poultry industry and resulted in the voluntary withdrawal of Pfizer's arsenic-based animal drug roxarsone from the market in 2013.lii Unfortunately, other agricultural arsenic drugs are still being used every day all over the world. One example, nitarsone, a chemically similar arsenical drug to roxarsone, is still being used in mass quantities today on turkeys destined for human consumption throughout the U.S. where turkey consumption is only going up.liii

A study published in May 2013 and conducted by the Johns Hopkins Center for a Livable Future examined samples of conventional, antibiotic-free and organic chickens purchased when roxarsone was still widely available on the market. These researchers discovered that levels of inorganic arsenic -- again, a known carcinogen -- in conventional chicken were *four times higher* than what they found in organic chicken.liv The authors of the study found the industry boasting about the use of roxarsone in 88% of some 9 billion birds raised in the U.S., and recommended the FDA ban the use of all arsenicals based upon these results.
Further, fertilizers created with poultry waste tainted by inorganic arsenic could be leaching even more toxins back into the soil, which in turn accumulate in crops and humans.

**Burning coal and airborne arsenate trioxide**

Another source of widespread environmental arsenic contamination comes from burning coal. Scientists estimate that 80,000 tons of arsenic is released into the air each year through the burning of fossil fuels. In the southwest Guizhou region of China for example, at least 3,000 arsenic-contaminated patients have been diagnosed with skin lesions and elevated urinary levels upon exposure to inorganic arsenic emitted from coal-burning power plants. Among this group, the Center for Disease Control in China has noted that high cancer and mortality rates in the area are far more prevalent than those found in areas with heavily contaminated drinking water.

Even though it was known that coal plants were spewing more toxic pollutants into the air than any other industrial source -- some 386,000 tons of 84 unique hazardous air pollutants including arsenic, lead and mercury are released from over 400 U.S. plants each year alone -- the EPA did not even formally introduce standards to limit this type of toxic pollution from power plants until December 2011.

**Arsenic interference in the body**

Central to the issue of heavy metals in the body is their propensity to compete with essential nutrients. Phosphate, for example, is required by the body to build healthy bones and teeth; phosphate also makes muscles contract and helps nerves function properly. Both arsenic and phosphate are in the same group on the Periodic Table, and both have five electrons on their outer shells; thus, they biochemically compete inside the body for binding and absorption. Because of this, arsenic can block the production of necessary enzymes and proteins by binding in places where phosphate would normally go.

As with other toxic heavy metals such as mercury, arsenic has also been shown to inhibit thiol compounds including glutathione, which is one of the body's key detoxification agents and mandatory for a properly functioning immune system and for warding off disease. Arsenic compounds also alter the body's ability to use pyruvate properly. This deficiency allows lactic acid to build up to toxic levels, leading to neurological problems including seizures, intellectual deficits and problems with even basic motor skills like walking. Most children suffering from pyruvate dehydrogenase deficiency don't live very long past childhood, and those that do suffer developmental disabilities.

**Treatments for arsenic toxicity**

Arsenic is quickly metabolized and distributed throughout the body via the lungs, liver, kidney where it settles into keratin-rich tissues like the hair, nails and skin. While the half-life of inorganic arsenic in the body is a relatively short -- the majority of it is excreted within less than a day -- chronic, repeated exposure to arsenic is where the real danger lies. Currently, there are no 100% cure-alls for mitigating arsenic's carcinogenic effects.

Well-known treatments for arsenic poisoning include chelating the metalloid with several agents including British Anti Lewisite (BAL), sodium 2,3-dimercaptopropane 1-sulfonate (DMPS), and meso 2,3 dimercaptosuccinic acid (DMSA) among others. These chelation agents bind with arsenic and
allows it to be flushed out of the body via excretion.

In 1938, it was discovered that arsenic actually protected against selenium poisoning. Shortly after, arsenic began being used as a tonic by industrial hygienists to cure workers of selenium poisoning. More recent research with animals has shown selenium is effective at countering arsenic toxicity, and studies are eying selenium supplementation as a low-cost way to counter chronic arsenic poisoning.

Several studies have linked the use of garlic to limit the effects of arsenic toxicity on cells.

**Natural arsenic binders**

My own laboratory research at the Natural News Forensic Food Labs (Labs.NaturalNews.com) has identified many natural substances which have a natural affinity for binding to arsenic. Throughout 2013, I developed a testing methodology called "Metals Capturing Capacity" which is able to determine how well any given substance naturally binds with and captures arsenic molecules compounds.

Metals Capturing Capacity (MCC) is explained in more detail in videos found at http://labs.naturalnews.com/Videos.html

After testing more than 1,000 substances for their natural arsenic binding properties, I found that the substances with the highest arsenic MCC were:

* Powdered fruit seeds
* Sodium alginate
* Dehydrated powders of certain rare seaweeds

After completing the research, I formulated a series of dietary supplements that maximize the binding and capturing of heavy metals, including arsenic. This resulted in the release of a fruit-based formula with an arsenic reduction of 14.8%, and then a much stronger "Metals Defense" formula with arsenic reduction of 92.9% and an MCC of 6.0, meaning each gram of the formula binds with 6.0 micrograms of arsenic.

Those formulas are described in more detail at www.MetalsDefense.com or NaturalNews.com

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