

ARSENIC, NANORUST, NANOBINS and BREAST CANCER

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White arsenic, the trioxide As_2O_3 , is historically the most important of the poisons used for criminal purposes. It is profoundly irritating and corroding to tissues. It produces inflammation of the gastrointestinal tract, violent purging and vomiting, hemolytic jaundice, hematuria (blood in the urine) and anuria (complete suppression of urinary secretion). A single dose of 0.12 g may be fatal. If death does not occur, changes in the peripheral sensory nerves cause pain, and paresthesia may follow. Later there may be motor paralysis, loss of hair, deformity of the nails, skin lesions and symptoms of upper respiratory tract irritation. In many cases that develop slowly, the same symptoms, although less severe, have been observed.¹

Arsenic is particularly difficult to characterize as a single element because its chemistry is so complex, and there are many different compounds of arsenic. It may be trivalent or pentavalent and is widely distributed in nature. The most common inorganic trivalent arsenic compounds are arsenic trioxide, sodium arsenite, and arsenic trichloride. Other forms may include arsenic pentoxide, arsenic acid, arsenates such as lead arsenate and calcium arsenate. Organic compounds may also be trivalent or pentavalent, such as arsanilic acid or even in methylated forms as a consequence of bimethylation by organisms in soil and fresh and seawater.² Arsenic has even been found in random sampling of colloidal silver formulations in the form of lead arsenic.³

Acute ingestion may be suspected from damage to mucous membranes such as irritation, garlic odor of the breath, vesicle formation and even sloughing. Sensory loss in the peripheral nervous system is the most common

neurologic effect, appearing one or two weeks after large exposures and consisting of Wallerian degeneration of axons. But is reversible if exposure is stopped and detoxification occurs. Anemia and leucopenia, particularly granulocytopenia, occur in a few days after exposure and are reversible.^{4, 5}

The toxicity of arsenic has been studied since it was first used as a common poison in lieu of divorce proceedings. Many studies have been done on its toxicity to humans, animals, fish and hamsters, but many scientists neglect to comment on the toxicological cellular effects on the cell organelle, the mitochondria.

Arsenic affects mitochondrial enzymes and impairs tissue respiration.⁶ This seems to be related to the cellular toxicity of arsenic.

Mitochondria accumulate arsenic, and respiration mediated by NAD-linked substances is particularly sensitive to arsenic and is thought to result from reaction between the arsenite ion and dihydrolipic acid cofactor, which is necessary for oxidation of the substrate.⁷ Arsenite also inhibits succinic dehydrogenase activity and uncouples oxidative phosphorylation, which results in stimulation of mitochondrial ATPase activity.⁸ Mitchell, et. al,⁹ proposed that arsenic inhibits energy-linked functions of mitochondria in two ways: competition with phosphate during oxidative phosphorylation and inhibition of energy-linked reduction of NAD and increased porphyrin levels. The inhibition of energy may simply be a result of the blocking of the immunochemical and photo sensory mechanism of the endoplasmic reticulum, where cytochrome P-450 is used to generate enzymatic reactions.

The mitochondria exist in high amounts in energy functioning organs, such as the kidney, liver, lungs, heart, pancreas and stomach. Arsenic has an affinity for the mitochondria of these organs; in particular the kidney and the pancreas. If arsenic is present within these organ systems' mitochondria, then arsenic in the trioxide form or arsine gas will cause the inhibition of cellular respiration and the buildup of carbon monoxide and carbon dioxide. When carbon monoxide builds

up in these organs, they tend to compress like an accordion, thus causing severe pain and discomfort. The only antidote for this particular reaction is the use of oxygen and large amounts of vitamin C, which are among the supplemental antidotes of arsenic.¹⁰

In 1987, the U.S. Environmental Protection Agency and the IARC classified arsenic as a carcinogen for which there is sufficient evidence from epidemiological studies to support a casual association between exposure to arsenic and skin cancer. Intratracheal instillations of arsenic trioxide produced an increased incidence of pulmonary adenomas, papillomas and adenomatoid lesions, suggesting that arsenic trioxide can induce lung carcinomas,¹¹ but other studies testing trivalent and pentavalent arsenic compounds by oral administration or skin application have not shown potential for either promotion or initiation of carcinogenicity, which may mean that additional environmental stress factors, viral (SV40 -45), endotoxins from bacteria or mycotoxins may be part of a potentiation factor of the mechanisms of cancer initiation, promotion and transformation processes.¹²

Arsenic has been a primary concern for ground water contamination, especially in foreign lands such as Mexico. In May 2009, Rice University researchers announced that they were to conduct the first field tests of "nanorust," the university's revolutionary, low-cost technology for removing arsenic from drinking water in Guanajuato, Mexico.¹³

The CBEN arsenic-removing technology is based on the unique properties of particles called "nanorust," tiny bits of iron oxide that are smaller than living cells. In 2006, Vicki Colvin, Rice's Pitzer-Schlumberger Professor of Chemistry and director of Rice's Center for Biological and Environmental Nanotechnology (CBEN), and colleague Mason Tomson, professor of civil and environmental engineering, and their students published the first nanorust studies. Their initial tests indicated nanorust which naturally binds with arsenic – could be used as a low-cost means of removing arsenic from water. The

technology may be an ideal way to remove arsenic, but how do we remove the continual buildup of the new complex that nanorust would make with arsenic, chemical agent and iron. And would the nanorust create an iron overload in the human body, animals or plants that may be exposed to this water through irrigation or as drinking water.¹⁴ The smaller the particle size and its capabilities of the nano molecule, the better the chance it has to go through the cell membrane and affect various organelles within the cell, including DNA.

Some of the symptoms of iron overload in humans consist of the following: vomiting for one to six hours after ingestion, which may be bloody due to ulceration of the gastrointestinal tract. Stools may be black, which is followed by signs of shock and metabolic acidosis, liver damage and coagulation defects within the next couple of days.¹⁴

Arsenic is a colorless, odorless, tasteless element, and prolonged exposures to accumulative and dangerous levels of arsenic can lead to skin discoloration, sickness and cancer. Arsenic- poisoned drinking water is a global problem affecting tens of millions of people in communities in Asia, Africa, North America, South America and Europe. And the analytical methods employed to identify arsenic in drinking water would be completely different for identifying nanorust, because of the size of the molecule and whether or not the nanotechnology would cause aggregation, thus accumulating in a cluster and forming larger molecules which would be able to be monitored by standard analytical equipment (ICP, HPLC, Mass Spec) vs. the use of Raman Spectroscopy, Atomic Force Microscope and/or Micro Fourier Trans Infrared technology.

Northwestern University in July, 2010, issued a press release,¹⁵ indicating that they developed a new nanoparticle that blocks aggressive breast cancer and that the new drug is made from arsenic trioxide. Arsenic trioxide, as stated above, is a poison. However, it has been used in ancient Chinese medicine and more recently by

Western oncologists for treating a type of leukemia. The cancer is triple-negative breast cancer, which often doesn't respond well to traditional chemotherapy and can't be treated

by potentially life-saving targeted therapies. Women with triple negative breast cancer have a high risk of the cancer metastasizing and poor survival rates.

Prior to Northwestern's studies, arsenic hadn't been effective in solid tumors. After the drug was injected into the bloodstream, it was excreted too rapidly to work. The concentration of arsenic couldn't be increased, because it was then too toxic.

A new arsenic nanoparticle – designed to slip undetected through the bloodstream until it arrives at the tumor and delivers its poisonous cargo – solved all that. The nanoparticle, called nanobin, was injected into mice with triple negative breast tumors. Nanobins loaded with arsenic reduced tumor growth in mice while the non-encapsulated arsenic had no effect on tumor growth. The arsenic nanobins blocked tumor growth by causing the cancer cells to die by a process known as apoptosis.

The nanobin consists of nanoparticles of arsenic trioxide encapsulated in a tiny fat vessel (a liposome) and coated with a second layer of cloaking chemical that prolongs the life of the nanobin and prevents scavenger cells from seeing it. The nanobin technology limits the exposure of normal tissue to the toxic drug as it passes through the bloodstream. When the nanobin gets absorbed by the abnormal, leaky blood vessels of the tumor, the nanoparticles of arsenic are released and trapped inside the tumor cell.

And what exactly is a cloaking chemical. Could it be a polymer of nylon, vinylchloroacrylonitrile or any other polymer that would give life to the payload of nano delivery systems to the tumor cell? All are known to be animal and human carcinogens, especially acrylonitrile which caused 26 men to have testicular cancer during the heyday of

its manufacturing in Baton Rouge, LA.¹⁶ The cloaking chemical may even be a synthesized mycotoxin or venom that has specific target sub-unit action for the nanobin.

It is truly amazing to see the life cycle of arsenic from cradle to grave as a pesticide, then hazardous waste material, to poison and now a nanobin in the new field of nanomedicine. It is truly a world of a dye made of asbestos for nano enhancement to arsenic nanobins as the arrows to kill cancerous tumors.

The last two decades of global scientists, engineers and neuroscientists, along with other professions, have witnessed the "***New World of Science and Medicine***" to be truly dancing on the razor's edge of life. They have blended together hazardous materials and nanotechnology. While academia created it; industry commercialized it, and the military and the government funded its research.

All of these advanced nano materials being developed and used in nanomedicine will be the new therapies for our standard medical care. The real question here will be: what is truly going to be expelled in the patient's urine since it may contain a carbamate pesticide with a nano particle. Will this be the micro hazardous waste of the future which is currently going right down the toilet or a college laboratory drain?

Just like our parents or World War II depression era hoarders, all of whom dumped their prescription drugs down the toilets of the world, this created endocrine disruptors that have affected our hormones and contaminated our drinking water for more than the past 20 years with NO remediation or testing as part of the US EPA Safe Drinking Water Standards.

Our mothers have seen the pictures of the birth defects of thalidomide, radiation and mercury from the post World War II era as

well as the birth defects of the Middle East due to depleted uranium or from soldiers who used these materials in battle such as the Italian Army platoons who are dead from the leukemia it created. And now the mothers of Puerto Rico have seen the effects of hormones and antibiotics from poultry with their three- year- old female toddlers developing breasts and having a menstrual cycle.¹⁷

It is time for all the ***Mothers of the World*** to say to the World of Mankind that enough is enough, and the time is now for all of the men of the world to listen, not only to Mother Nature, but to the gender that gave you the seed of life and to God who gave you the quickening to start that life.

The use of hazardous materials in any technology, especially a technology that allows it to get into the core of the cell, means its nucleus will not only breed the destruction of life on this planet, but the resultant babies are now cloned babies because the human species is infertile.

The greed of this world is controlled by assets like black gold (oil), blue gold (water) and now the intellectual property assets of advanced nano delivery systems for environmental remediation, medicine, communications and weapons.

Lucrezia Borgia was known as the "Mother of Poisons" in the 16th century, especially after she arrived in Ferres from Rome to become the reluctant bride of her third husband who suffered from a little too much arsenic in his food and drink.¹⁸ You will always see the universal symbol of poison represented by the SKULL and CROSS BONES with the word ARSENIC right next to it.

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