Combating Radiation Exposure before Disaster Strikes

by Eric R. Braverman, MD; Robert J. Baker, PhD; Bernard Loeffke, PhD; and Gustavo Ferrer-Gonzalez, MD

A 20-year-old woman hiking in the mountains of Ecuador falls and becomes disoriented. She does not find her way back to the trail until late the next afternoon. By this time, she is completely sunburned and blistered, dying of radiation from the blazing sun’s UV light. If she only had the right protection – a simple bottle of sunscreen – her skin’s damage, premature aging, and potential death could all have been avoided.

In Hiroshima, many individuals who were spared from the initial impact survived.1 It is clear from the research of the history of Hiroshima that if one can get good nutrition, shelter, and water, and keep general health, one can survive increased radiation exposures. Our work dealing with Chernobyl and other nuclear accidents demonstrates the adaptability in radiation hormesis that occurs in individuals exposed to radiation. The plan that we propose will require further experimentation, but is likely to be a critical step in preparing for nuclear incidents.

The program that we describe as CLEAN ME ASAP provides a regimen that can protect from and prevent illness and aging. This is important: the threat of radiation to any population remains a real concern, whether from excessive daily exposure (i.e., frequent airplane travel), damage to a nuclear power station, accidental or deliberate launch of a ballistic missile, or a terrorist attack.

An October 15, 2011, article in the New York Times reported that Tokyo residents were showing signs of radiation more than 6 months after the March 11 accident at the Fukushima Daiichi nuclear power plant, more than 160 miles away. Test results proved that the level of radioactive cesium found in more than 20 spots in and around Tokyo was equal to those in some contaminated areas around Chernobyl, making the latest Japanese catastrophe the second worst nuclear accident in history.

The article stated

... that the vagaries of wind and rain had scattered worrisome amounts of radioactive materials in unexpected patterns far outside the evacuation zone 12 miles around the stricken plant. But reports that substantial amounts of radioactive cesium had accumulated as far away as Tokyo has risen new concerns about how far the contamination had spread, possibly settling in areas where the government has not even considered looking.2

Fortunately, in the US, nuclear reactors are built according to strict regulations that require two or three barriers between radioactivity of the reactor and the environment.3 The Chernobyl reactors were not protected by containment structures like those required for US reactors, allowing radioactive particles to freely enter the environment.4

Exposure to radiation can be measured in minute particles called millirems (mrem). The average person is exposed to 360 mrem each year, which we can easily tolerate. However, small quantities can dangerously add up – a single CT scan is equal to 1100 mrem. The likelihood of radiation affecting our health depends on our current health status. Children, older people, and those with existing health problems will be the first to be affected. For example, we may be able to withstand the equivalent of 10 to 40 CT scans in one day before suffering significant damage, or even death.5

In Japan, the government’s failure to act quickly may have led to radiation exposure of many more people than originally believed. Here in the US, close to 116 million Americans – or 1 in 3 of us – currently live within a 50-mile radius of a nuclear power plant.6 Surviving an incident takes a combination of knowledge, practice, checklists, and optimum mental and physical health, as well as a strong immune system. We believe that we need to be better prepared. Loeffke was the US Army attaché stationed in Moscow in the late 1970s, where he witnessed how the Soviets took civil defense seriously. He watched nuclear drills conducted for the general population on a regular basis. Sadly, even 40 years later, we are no closer to having
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a uniform government response to a nuclear terrorist attack on American soil. That is why we need to know what the dangers of radiation are, how to identify them, how we can detoxify, and, most importantly, what we can do now to prevent illness later.

We have been working, both together and separately, on developing new treatment options and preventative measures. Braverman has lectured at Los Alamos on the effects of radiation, and published a paper in 1988 wherein he suggested that cesium chloride was not being used adequately after the Chernobyl incident. Since then, cesium has been used aggressively in the Marshall Islands and elsewhere, including the recent Scandinavian studies, where the hypothesis has been proved but still needs refinement.

In the early 2000s, Loeffke treated citizens who had lived on the Marshall Islands during the past 50 years. Many had weak immune systems. These same citizens could have withstood the assaults to their health if they had healthier immune systems. It is also interesting to note that several of the atolls in the Marshall Islands continue to be classified as “off limits” because radiation on the beaches is still evident, although the water surrounding the beaches is considered safe.

Radiation is An Age Accelerator

Radiation is a form of energy. All of us are exposed to some each day, from naturally occurring sources such as uranium, thorium (both found in soil), radon (in the air), and certain forms of potassium and carbon naturally occurring in our bodies. Cosmic and UV radiation from the sun also contributes to our daily dose. Table 1 explains each exposure and how it ages us prematurely.

Table 2: Exposure Rates

| Radiation Source | Average dose to US public from all sources | Average dose to US public from natural sources | Average dose to US public from medical sources | Coal-burning power plant | X-rays from TV set (1 inch) | Airplane ride (39,000 ft) | Nuclear power plant (normal operation at plant boundary) | Natural gas in home | Radionuclides in the body | Building materials (concrete) | Drinking water | Pocket watch (radium dial) | Eyeglasses (containing thorium) | Chest X-ray | Extremities X-ray | Dental X-ray | Head/neck X-ray | Cervical spine X-ray | Lumbar spinal X-rays | Pelvis X-ray | Hip X-ray | Upper GI series | Lower GI series | CT (head and body) | PET (whole body) | Tobacco products | Therapeutic thyroid treatment | Therapeutic thyroid treatment (dose to the whole body) |
|-----------------|------------------------------------------|----------------------------------------------|-----------------------------------------------|--------------------------|----------------------------|----------------------------|-------------------------------------------------|-----------------|---------------------|--------------------------|--------------|-----------------|-----------------------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                 | 360 mrem/year                             | 300 mrem/year                                | 53 mrem/year                                  | 0.165 mrem/year          | 0.500 mrem/hour             | 0.500 mrem/hour             | 0.600 mrem/year                                           | 9 mrem/year     | 39 mrem/year       | 3 mrem/year               | 5 mrem/year    | 6 mrem/year      | 6–11 mrem/year                               | 8 mrem        | 1 mrem          | 10 mrem        | 20 mrem        | 22 mrem        | 130 mrem        | 44 mrem         | 83 mrem       | 245 mrem      | 405 mrem       | 1,100 mrem   | 1,600 mrem7 | 2,000 mrem/year | 10,000,000 mrem | 7000 mrem |

Table 1: The Sun’s Radiation Causes Age Acceleration

<table>
<thead>
<tr>
<th>Effects of UV Radiation/Sun Damage</th>
<th>Aging Processes</th>
<th>Clinical Manifestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>High BP and cholesterol, excess atherosclerosis</td>
<td>Metabolic aging</td>
<td>Diabetes, cardiovascular disease, stroke, hypertension, and dementia</td>
</tr>
<tr>
<td>Short telomeres increase sensitivity to radiation</td>
<td>Telomere shortening</td>
<td>Cardiovascular disease, segmental aging in some progerias</td>
</tr>
<tr>
<td>Brain growth retardation</td>
<td>Brain damage</td>
<td>Seizures and mental retardation</td>
</tr>
<tr>
<td>Breaks in DNA, cellular death, and inflammation</td>
<td>Free-radical damage and oxidative stress</td>
<td>Cancer, cataracts, atherosclerosis, and Alzheimer’s plaques</td>
</tr>
<tr>
<td>Oxidative damage to mitochondrial DNA</td>
<td>Mitochondrial damage</td>
<td>Damage to the brain’s neurons and cancer</td>
</tr>
<tr>
<td>Inhibits immune system</td>
<td>Immunological decline</td>
<td>Viral and bacterial infections</td>
</tr>
</tbody>
</table>

We are also exposed to radiation from human sources, such as X-rays, medical procedures, power plants, and older television sets. Some people, including nuclear plant operators, flight crews, and nuclear medicine staff, may also receive an occupational radiation dose.

Table 2 shows typical exposure rates. The EPA states that there is no firm basis for setting a “safe” level of maximum radiation exposure, but we estimate it as the safe occupational dose threshold for workers at nuclear power plants: an additional 5000 mrem of radiation a year above the 360 mrem level, the equivalent of five CT scans a year.
Detection: Signs and Symptoms of Radiation Exposure

Radiation insidiously enters the body either through the air that we breathe or from the food that we eat, and spreads following the same mechanism as a floating cancer cell. These radioactive microelements interact with our bodies just as their natural, healthy elements do, except with a disastrous twist. For example, while strontium is known to improve bone health, radioactive strontium will seep into our bones and cause death.

Both acute and chronic radiation exposure cause ionization in the molecules of living cells, which results in the removal of electrons and the formation of ions or charged atoms. The ions then react with other atoms in the cell, causing damage. Symptoms of radiation exposure depend on how severe the exposure is. In general, the greater the radiation exposure, the more rapid and more severe our symptoms will be.

At low doses, cells can repair damage. When doses reach up to 100,000 mrem in a single exposure, cells cannot repair as quickly, resulting in cellular death or permanently altered structures. The affected cells then go on to produce more abnormal cells when they divide, and these cells may become cancerous over time.

Cellular mutation can lead to diseases that we can pass on to our children, and other radiation-associated noncancerous diseases such as cardiovascular, circulatory, digestive, and respiratory diseases. The most common disease associated with radiation exposure is thyroid cancer because radioactive iodine accumulates in the thyroid. Nuclear reactor accidents release a number of radioactive elements, the most common of which is iodine.

Radioactive iodine is readily absorbed into the body and rapidly taken up into the thyroid gland. In the thyroid, ionizing radiation given off by the isotope damages DNA and causes cancer. Leukemia and other cancers are other typical outcomes, even decades following exposure. Long-term lower-level exposures that overcome genetic repair mechanisms may lead to myeloid leukemia, osteosarcoma, and lymphoma.

Radioactive strontium is chemically similar to calcium, which is why it can be easily absorbed into the bones. Radioactive strontium isotopes incorporate into bone and irradiate bone cells, bone marrow, and potentially the soft tissues surrounding bone, especially in the skull.

Table 3 shows that the first area of the body to be affected by exposures above 75,000 mrem is the tissue in the intestinal lining, leading to nausea, diarrhea, radiation burn, and general weakness. This is often referred to as radiation sickness. The amount of time between the initial exposure and when these symptoms develop is an indicator of how much radiation a person has absorbed. Without medical attention and depending on prior health, a wide range of doses, up to 400,000 mrem, can kill 50% of exposed people from infections within 60 days. It is likely the types of radiation exposure that would be dealt with in a nuclear accident, would be measured in thousands mrem or less, leaving these exposures very survivable and able to be managed.

We have a variety of ways to test for radiation exposure, but in an emergency situation, there might not be time. Remember these signs and symptoms, and check the urine for signs of internal bleeding. The stool should not be black, and there should not be blood in the urine. If we find either, see a doctor immediately for further testing.

Radiation Exposure

We have all experienced how damaging even the smallest amounts of radiation can be: just think about what happens to skin after strong sun exposure. Our skin and often our digestive systems begin to experience the effects of radiation sickness and burns. And we also know that all we need to avoid this is simply good skin coverage using a sunscreen with significant SPF, which will save our skin, and ultimately, our lives.

Detoxification: The Established Principles of Radiation Protection

Most radioactive elements released during a nuclear accident are unpredictable. However, some aspects are predictable, such as cesium-134, cesium-137, strontium-90, various forms of plutonium, americium, and iodine-131.

Fortunately, supportive data reveal that by following the right protocol immediately following an incident, we can optimize our defenses against radiation exposure and detoxify. The treatments proposed here may reduce very high levels of radiation.

Good Potassium Iodide Antidotes

Potassium iodide (KI) is a stable salt of iodine. It is also the most important chemical needed in the body to make thyroid hormones. Typically, the recommended daily value is easily obtained through the American diet. However, potassium iodide supplementation before and during radiation exposure will help protect the thyroid gland from permanent

<table>
<thead>
<tr>
<th>Source of Exposure</th>
<th>Equivalent in Years of a Single Exposure</th>
</tr>
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<tbody>
<tr>
<td>Earliest onset of radiation sickness</td>
<td>208.3 years</td>
</tr>
<tr>
<td>Onset of hematopoietic syndrome</td>
<td>833.3 years</td>
</tr>
<tr>
<td>Onset of gastrointestinal syndrome</td>
<td>2,777.8 years</td>
</tr>
<tr>
<td>Onset of cerebrovascular syndrome</td>
<td>27,777.78 years</td>
</tr>
<tr>
<td>Threshold for cataracts (dose to the eye)</td>
<td>555.6 years</td>
</tr>
<tr>
<td>Doubling dose for cancer</td>
<td>1388.9 years</td>
</tr>
</tbody>
</table>
Radiation Exposure

Damage: it will block the absorption of radioactive potassium iodine because the body cannot tell the difference between the two. It also accelerates excretion. It has long been approved by the FDA for this purpose. In fact, it is considered to be the gold standard of radiation protection. Research scientist William L. Robison at Livermore National Laboratories has already successfully eliminated the appearance of radioactivity in coconuts and other fruits and vegetation growing on the Marshall Islands, the most radioactive island in the world, using a combination of cesium and potassium.

The current issue with this protocol is distribution. We believe that every American has to have a stockpile of potassium iodide in either pill or salt form. The American Thyroid Association (ATA) believes that it is necessary to revisit its 2002 recommendations of predistributing potassium iodide to individuals living within a 10-mile radius of nuclear power plants to now cover a greater area of up to 50 miles. We believe that we can do better, and incorporate areas as far away as 200 miles because of the proven capacity for winds to blow radiation far from its original source. The recent findings in Tokyo support this.

Currently, there is neither a sufficient supply nor production capacity to obtain potassium iodide during a nuclear reactor accident (only Vermont has implemented a program for distributing potassium iodide to citizens living within 10 miles of nuclear facilities). What is more, if there were a terrorist attack, distribution of potassium iodide would be difficult at best.

Potassium iodide treatment may be the equivalent of erasing 20 years of accumulated radiation in one day. This means that if we use this as a preventative treatment, most of us will be able to tolerate the equivalent of 20 years of radiation in a single day without significant side effects.

Good Cesium Chloride Antidotes

Radioactive Cesium

Another important compound necessary for detoxification is cesium chloride. Soluble cesium is not only a very lethal pesticide, it can penetrate concrete. Radioactive cesium can stay in the atmosphere and in soil for decades because it is mobile, as is noted now in Tokyo, and to some extent it is still recorded near Chernobyl. In the body, it accumulates in red blood cells.

However, cesium is more soluble than salt in water, which means that it can be used to solve its own problems. Large doses of cesium chloride can protect against radiation toxicity by blocking sites on red blood cells and resulting in increased excretion and clearance of radioactive cesium. A dose of 50 mg maintains elevated blood cesium levels for 80 days, and further exposure would be eliminated from the body rapidly. It has also been shown that dosages of cesium chloride at 250 mg can double the effectiveness of flushing radioactive cesium from both humans and animals, cutting the effective half-life of radiocesium from 110 to 60 to 80 days, thus decreasing the chances of developing cancers. Best of all, it is readily available: the Tanco mine in the province of Manitoba, Canada, has a massive natural supply of cesium chloride.

Good Strontium Antidotes

Radioactive Strontium

Strontium-90 is a highly dangerous, radioactive component of nuclear fallout. As a result of above-ground nuclear testing in the 1950s, radioactive strontium spread throughout the environment and contaminated the American food supply, and subsequently accumulated in the bones of both children and adults, causing cancer and ultimately death.

However, stable, nonradioactive strontium is almost completely nontoxic, even when administered in large doses for prolonged periods. It appears to be one of the most effective substances for the prevention and treatment of osteoporosis and other bone-related conditions.

Antioxidants Provide Protection

Antioxidants and other vitamins (A, B, C, D, and E) have also been reasonably proved to be beneficial. New data suggest that maintaining high levels of antioxidants affords some protection against radiation-induced free radicals. They may help to maximize the body’s ability to withstand the particular free radical damage that leads to radiation-induced cancer.

Dr. Kieran Murphy, a radiologist at the University of Toronto, believes that a combination of antioxidants such as what we prescribe taken regularly can cut the damage done to DNA by even the most common radiation from CT scans by as much as 50%.

The “ACE” vitamins (A, C, and E) in particular offer protection because of their molecular structures. Beta-carotene, the precursor of vitamin A, has been used clinically following the Chernobyl nuclear accident as a treatment for children exposed to radiation. It was found that supplementation of 40 mg per day for three months reduced the amount of radiation-induced oxidized lipids. Other studies show that vitamin A ameliorates other radiation effects and enhances death of cancerous cells.

Still other studies reveal that vitamin A can actually prevent radiation-induced cancer. The “ACE” vitamins (A, C, and E) have been shown to enhance death of cancerous cells. Antioxidants ameliorate other radiation effects and enhance death of cancerous cells. Still other studies reveal that vitamin A can actually prevent radiation-induced cancer.

Vitamin C, together with natural antioxidant systems such as glutathione, helps protect DNA and chromosomes from oxidative damage. Vitamin C also inhibits radiation-induced death of human blood cells through modulation of protective gene expression. Remarkably, vitamin C can counteract radiation-induced long-lived
radicals” (LLRs) that destabilize chromosomes and induce cancerous mutations.39

Like vitamin C, vitamin E reduces free radicals that have formed.40 It enhances the growth-inhibiting effect of radiation on cancer tissue, while simultaneously protecting normal cells.41 Animal studies show that vitamin E significantly protects mice from dying after exposure to otherwise lethal levels of gamma rays.42

N-acetylcysteine, or NAC, is an antioxidant that is important part of radiation therapy, which has been recognized for more than 20 years since Braverman first presented this information at Los Alamos National Laboratory. This sulfur-containing compound supports natural intracellular antioxidant systems, particularly glutathione, rendering it an effective radioprotective agent.43 NAC has been shown to minimize liver damage from radiation in mice, reducing oxidative damage and resultant DNA damage – both before and after radiation exposure.44–45 Through a separate underlying mechanism, NAC also stimulates release of cytokines that protect bone marrow against radiation injury.46 NAC also protects bone marrow cells from radiation, largely by preventing DNA damage.47,48

Lipoic acid is often referred to as the “universal antioxidant.” It drives energy production in the body and quenches free radicals in both aqueous and lipid-soluble environments, such as cellular membranes.49 It promotes and strengthens the effects of other antioxidants (particularly vitamins C and E). While its role as a therapy and as cellular membranes.

Lipoic acid may offer important protection against the threats posed by various types of radiation exposures. When used in combination with other antioxidants, including selenium, vitamin C, vitamin E, NAC, and coenzyme Q10, lipoic acid helped improve survival of mice following total-body irradiation.31 Lipoic acid has been proved to support the immune health of individuals who were involved in the clean-up of the Chernobyl nuclear accident, even years after the event.52 Lipoic acid is available in two forms: R-lipoic acid and S-lipoic acid. While most commercially available products contain a 50:50 mixture of the two forms, only R-lipoic acid is naturally produced and is likely to be the more potent of the two.53,54

CoQ10 is a natural component of the electron transport chain and participates in aerobic cellular respiration, generating energy in the form of ATP. Its involvement in mitochondrial energy conservation was long suggested to release single electrons to dioxygen out of sequence.55,56 In recent years, coenzyme Q has increasingly been assumed to exert antioxidant functions, including detoxification.

Lastly, we also believe that melatonin supplementation may be an effective antiradiation treatment as well as a sleep supplement. Studies have shown that melatonin protects dividing cells and circulating blood cells from chromosomal injury by radiation.57,58

### Detoxification Dosages for Adults and Children

Table 4 gives typical dosages. Larger dosages may be necessary and will vary depending on the extent of exposure. Adult dosages are based on body weight of 150 pounds or more.

<table>
<thead>
<tr>
<th>Detoxifying Agent</th>
<th>Adult Dosage</th>
<th>Child Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium iodide</td>
<td>130 mg</td>
<td>65 mg</td>
</tr>
<tr>
<td>Cesium chloride</td>
<td>250 mg–5 g</td>
<td>50–250 mg</td>
</tr>
<tr>
<td>Strontium</td>
<td>680 mg–2 g</td>
<td>50–500 mg</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>25,000–100,000 mg</td>
<td>1,000–10,000 mg</td>
</tr>
<tr>
<td>Vitamin B</td>
<td>1–4 g</td>
<td>0.5 g</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>3–10 g</td>
<td>100–500 mg</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>5000–50,000</td>
<td>400–1000</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>400–1,600 mg</td>
<td>100–200 mg</td>
</tr>
<tr>
<td>N-acetylcysteine</td>
<td>2–7 g</td>
<td>250–1500 mg</td>
</tr>
<tr>
<td>CoQ10</td>
<td>200–500 mg</td>
<td>50–100 mg</td>
</tr>
<tr>
<td>Lipoic acid</td>
<td>250–1000 mg</td>
<td>100 mg</td>
</tr>
<tr>
<td>Melatonin</td>
<td>1–3 mg</td>
<td>50 micrograms</td>
</tr>
</tbody>
</table>

Please consult your physician and your child’s physician before taking any supplements.

### Exercise and Nutrition Increase Metabolism and Excretion of Radioactive Materials

Exercise and nutrition are important for internal cleansing, especially if the supplements listed above are not immediately available. Everyone excretes toxins when they are exercising and eating right, both over the long term and during a crisis.

Exercise increases blood circulation, primarily to the lymphatic system, which is integral for detoxification. The rapid “elbow to opposite knee” movement is the best way to increase activity in the lymphatic system. Push-ups and sit-ups are excellent ways to maintain good conditioning.

Depending on our state of health, we could survive a large amount of radiation. This is why maintaining a healthful lifestyle now is critically important to our future survival. For example, if we have to evacuate an area by foot, with luggage, we need to be able to walk at least 10 miles a day to reach a safer environment. The former Soviet Union had a civil defense goal that every citizen should be able to walk 20 miles with 20 pounds of supplies. So if we are looking for another reason to start exercising, this is it.
Radiation Exposure

Hydration is critical for effective detoxification. In abnormal situations, we need to drink half our body weight in ounces every day to efficiently and quickly rid the body of radiation. Make sure to have three days’ supply of water, stored in a cool, dry place, for every member of the family to prepare for an emergency.

Nutrients are also important for treating radiation exposure. Nuclear factor-kappa B (NF-kB) is a protein complex that has been implicated in the onset of 95% of all cancers. NF-kB stimulates genes to produce inflammatory cytokines and other cell-signaling molecules that promote cancer growth and development. The resulting processes make it more likely that a cancer-prone cell will form a malignant tumor, which is more resistant to radiation. The following “nutraceuticals” have been shown to inhibit NF-kB from moving into cell nuclei and becoming activated. They may also cause cancer cell death by apoptosis. Since the beginning of the nuclear age when the first bombs were dropped on Hiroshima, there are stories of people who survived unharmed. We do not know why some survive radiation exposure, and others do not. We believe that it may be linked to a protective diet that includes the following:

- turmeric
- garlic extracts
- ginger
- green tea
- soy
- foods high in omega-3 fatty acids (salmon, shrimp, eggs)

Prevention and Maintenance

While the suggestions listed above offer good advice for those faced with an emergency, the best medicine is preventative. Nothing accelerates aging faster than radiation. Just as the frequent application of a high-quality sunscreen protects our skin against the daily effects of radiation, the same supplements listed above can be taken prophylactically to lower our risk for sickness and mortality. So while it is critical to apply sunscreen after we have been in the sun for two hours and feel as if we have been burned, it is still better to apply prior to exposure. We have found that if we can take these remedies now, we will be better off in the future. What is more, they all have beneficial effects on our overall health.

The infusion of nutrients and trace elements into our society for the improvement of public health is well known: we add chlorine to swimming pools, iodide to salt, fluoride to the water supply, calcium and magnesium to foodstuffs, vitamin D to milk, niacin and other B vitamins to white flour to reduce pellagra. We can begin to tackle the problems of radiation exposure in the same way. Ultimately, our goal is to create a preventative weekly dosage in a single pill – consisting of strontium, iodide, and cesium – that will be taken at the very least by those who live in high-risk areas. Extra iodide, cesium, and microunits of strontium can also be added to salt to protect the youngest among us.

Cesium chloride could be added to table salt as a preventative treatment policy as well as an ongoing maintenance program, as radioactive cesium can remain in the environment for more than 30 years. By prophylactically loading the body with cesium chloride, toxic cesium may not be absorbed in the GI tract. An oral dose of 50 mg maintains elevated blood cesium levels for 80 days. Larger doses of 2 to 9 grams produce no observed harmful effects and maintain elevated cesium blood levels for up to a year. These data suggest that there is a threshold of cesium in the blood; if maintained, additional cesium exposure would be excreted.

Cesium chloride may prove to be an agent for improving brain health. One 2007 study from the Indiana University School of Medicine demonstrated that it can protect brain cell death and could potentially be used therapeutically for Alzheimer’s disease and other neurodegenerative diseases. It may also have antidepressive and prolocomotor activity effects because cesium is a calming nutrient similar to lithium or rubidium.

The Salts of the Periodic Table

The left side of the periodic table shows the relationship between these elements: cesium (Cs) is in the same column as lithium (Li), rubidium (Rb), sodium (Na), and potassium (K).

Strontium supplements not only protect the body against radiation damage but also help improve overall bone health. A significant portion of our population is osteopenic, and many of today’s young people are coming into adulthood with poor bone density. Strontium works as well as Forteo, a parathyroid-like hormone, on feeble bone and works better than biphosphate on bone density. In doses up to 1.7 g/day, this can be added directly to the water supply. It appears to offer a safe, effective, and inexpensive approach to preventing and reversing osteoporosis and may be of benefit in patients with osteoarthritis and cancer with bone metastases, as well as possibly helping to prevent dental cavities. Table 5 states that doses of 680 mg/day appear to be optimum, although lower doses are clinically effective.

Table 5: Strontium Dosages

<table>
<thead>
<tr>
<th>Dosage</th>
<th>Effects</th>
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</thead>
<tbody>
<tr>
<td>320 mg</td>
<td>Amount of Sr naturally found in human body</td>
</tr>
<tr>
<td>1.7 g/day</td>
<td>84% subjects reported relief of bone pain, probable increased bone mass observed in 78% subjects</td>
</tr>
<tr>
<td>680 mg/day</td>
<td>Best combination of efficacy and safety, increasing vertebral BMD and reducing incidence of vertebral fractures</td>
</tr>
<tr>
<td>6–10 mg/L in tap water supply</td>
<td>Reduced incidence of cavities</td>
</tr>
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Strontium supplements not only protect the body against radiation damage but also help improve overall bone health. A significant portion of our population is osteopenic, and many of today’s young people are coming into adulthood with poor bone density. Strontium works as well as Forteo, a parathyroid-like hormone, on feeble bone and works better than biphosphate on bone density. In doses up to 1.7 g/day, this can be added directly to the water supply. It appears to offer a safe, effective, and inexpensive approach to preventing and reversing osteoporosis and may be of benefit in patients with osteoarthritis and cancer with bone metastases, as well as possibly helping to prevent dental cavities. Table 5 states that doses of 680 mg/day appear to be optimum, although lower doses are clinically effective.
Stable strontium is readily available in many safe forms, including strontium citrate and strontium carbonate.

Studies prove that increasing the iodide levels in table salt would help protect against radioactive iodine. For example, taking one 14 mg pill of potassium iodide each week would protect our thyroids.

By supplementing with potassium iodide, we can also lower the rate of goiters, hypothyroidism, and thyroid-related diseases (not recommended for those already diagnosed with hyperthyroidism). More than half of our nation has thyroid deficiency. A study from the Mayo Clinic found thyroid nodules consistent with the beginning of hypothyroidism in 50.5% of surveyed subjects. Public health studies show that US research has observed trends of iodine level decline due to reduction of iodine levels in foods.

The average American consumes about 700 μg of iodine a day through table salt. The maximum recommended iodine dietary dose is 2 mg/day through salt. However, there is no government regulation for potassium iodide, and we could potentially increase iodine intake by more than 1 mg without foreseeing any problems related to hyperthyroidism. A review of the human trials on the safety of iodine ingestion indicates that neither the maximum recommended dietary dose (2 mg/day) nor the minimum recommended duration of use (3 weeks) has a firm basis. Rather than a clear threshold response level or a linear and temporal dose-response relationship between iodine intake and thyroid function, there appears to be marked individual sensitivity, often connected to underlying thyroid disease.

The issue is not whether we will ever have a nuclear incident; it is just a matter of when. By increasing cesium, potassium iodide, and strontium for the general population, we can reduce the overall fracture rate and improve bone health, reduce thyroid disease, reduce anxiety, improve osteoporosis, and reduce kidney stones and cavities, as well as protect against radiation sickness and death.

**Have a Plan: Preparation and Evacuation**

The Red Cross (www.redcross.org) publishes a handbook which is available online that covers what we need for emergencies. Read this booklet well in advance, so that you can prepare an evacuation kit. You will need to have on hand three days’ water supply for every person in the family, as well as a supply of sodium bicarbonate, or baking soda, to use as an antiseptic in case of injury. It can also be used as a powerful neutralizer of radiation contamination both internally and externally. Zeolites are readily available minerals that are added to water to remove radiation. They are currently being used in Japan. We can add zeolites to drinking water after we have exhausted our stored supply.

If acute nuclear radiation were emitted, our local government would issue one of two orders: shelter-in-place or evacuation. When a shelter-in-place order is issued, residents are required to seek shelter where they are, seal the premises, and wait for further notice. Once inside, close all windows and doors, shut off all ventilation systems, go into a below-ground or lowest level room with the fewest doors and windows and access to a bathroom, and seal the room. Dampen towels and place them under the doors. Cut plastic sheeting to fit over windows and vents. Secure the plastic with duct tape. Then, tape around the door frame. Turn on the radio. And finally, do not let air out of the room or leave the sealed shelter until told to do so.

For the latter scenario, we first need to devise a plan for where our family will meet. This location should be outside a 60-mile radius from where the disaster has occurred: it could be a local landmark, a Red Cross shelter, or a friend’s or relative’s home. Take photos of our families with us for identification, along with important medical records and medicines.

**Radiation Exposure**

Once we are outside, move upwind or perpendicular to the path of the disaster.

As a way to remember the materials presented, we came up with: CLEAN ME ASAP:

**CLEAN**

C4: Cesium chloride, CoQ10, NAC
Lipoic acid
Excrete toxins with exercise and hydration
Antioxidants
Nutrients

**ME**

Melatonin
Evaluate urine and stool

**ASAP**

Arrange an evacuation plan and supply kit
Strontium citrate or carbonate
Assist others with zeolite filters and sodium bicarbonate
Potassium chloride

Though there are limited data supporting the effectiveness of cesium chloride and of strontium carbonate in radioactive Cs-134 and Cs-137 and Sr-90 respectively, other significant health benefits of cesium and strontium justify their use as dietary supplements; that is, cesium chloride for anxiety and brain cell apoptosis (cell death), strontium carbonate for bone density.

The American Thyroid Association took 50 years to gather sufficient scientific data before recommending that potassium iodide be “predistributed” to all Americans living within 50 miles of a nuclear power plant on March 30, 2011. This recommendation has yet to be implemented, and potassium iodide may need to be taken prior to an event. The US Navy is currently using techniques discussed in the article, such as zeolites, to deal with cesium chloride migration across Japan.

We cannot wait another 50 years to prepare for a nuclear disaster. Hysteria caused by cesium radiation exposure has frightened the Japanese people – as many Japanese now carry Geiger counters because of cesium’s rapid mobility. Due to concern over...
mass general hospital. 1998;74(2):159–. mass general hospital.

we are also developing a “smart medical records bracelet” with a usb card, containing software that permits essential medical records to be downloaded instantly (x-rays, physicians’ notes, procedures, and labs). the software will also be capable of tracking medical radiation exposure and adding the number of television hours watched, flight hours, and so on, to a patient’s total radiation exposure. the system will alert patients with a red flag when they have reached the national average of 620 mrem, which is above the personal recommended limit. the alert will advise them to discuss this report with their primary care physician. if a patient requires further ct scans, cxr, and so on, alternatives should be discussed. some alternatives are a combination of body ultrasounds (us) with a thorough physical exam, or mri, v/q scan, or blood tests such as d-dimer for pulmonary embolism among others. the system will also alert patients with a yellow flag when they are approaching 500 mrem and a green flag when personal exposure is below 350 mrem.

seeing how the events of september 11, 2001, disrupted new york city, it is apparent that nuclear agencies, government, and leaders around the country must be prepared to implement antidotes quickly and calm the public, which has a misconception that low levels of radiation are highly toxic. they are no more toxic than the low levels of lead, cadmium, aluminum, and mercury that we are all exposed to and have made adjustments to treat. the same adjustments can be made for low levels of radiation as long as the public does not go into widespread panic. the antidoting of water, land, and the human body should be achievable with a variety of salts and other techniques, allowing us comfort and control.

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31. Society of Interventional Radiology. Antioxidant formula Radiation Exposure


