

HOW TO HELP SUPPORT THE BODY'S HEALING AFTER INTENSE RADIOACTIVE OR RADIATION EXPOSURE

The Medical, Naturopathic, Nutritional, Herbal,
Commonsense External and Internal Approaches

By Bill Bodri

Top Shape Publishing, LLC
www.MeditationExpert.com

Copyright

Copyright © 2004, William Bodri
All rights reserved in all media

First edition 2004.

Top Shape Publishing, LLC
1135 Terminal Way Suite #209
Reno, Nevada 89502

No part of this book may be reproduced, stored in a retrieval system, or transmitted by any means, including but not limited to electronic, mechanical, digital copying, printing, photocopying, recording, or otherwise without written permission from the author.

www.MeditationExpert.com

Health Disclaimer

This information should not be construed as medical advice or instruction, and is not intended to replace the attention or advice of a physician or other health care professional. It is published for educational and informational purposes only under First Amendment rights.

No actions should be taken based solely on the contents of this book. The journalistic information within is for education purposes only, and should not be interpreted as a recommendation for a specific treatment plan, nor should this information be used in place of the medical opinion of a qualified health care professional.

Anyone who wishes to embark on any dietary, drug, exercise, or other lifestyle change or protocol intended to treat or prevent a specific condition should first consult with and seek clearance from their doctor; readers who fail to consult appropriate health authorities assume the risk of any injuries.

Radiation and/or radioactive exposure is an extremely serious affair. Do not try to treat yourself after exposure to radiation or radioactive substances. Please call a physician. Anything you do for radiation/radioactive exposure should be done under the care and approval of a physician.

The author and publisher are not responsible for any errors or omissions in this book. Please call a health professional immediately if you think you may be ill.

Table of Contents

Health Disclaimer	3
Table of Contents	4
The Effects of Radiation Exposure on Human Health	5
Potassium Iodide	21
The Radiation Detox Bath	31
Spirulina, Chlorella, and Seaweed	35
Bathable and Edible Clays for Radiation Detox.....	53
Homeopathics for Radiation Injury	59
Eat A “Nucleotide Rich” Diet to Maximize Cellular Repair	69
Foods, Herbs and Supplements That Are Radioprotective	74
Revisci and Fatty Acids	99
Prussian Blue, DTPA and Neupogen	103
Summary	113
Appendix 1: Emergency Procedures for Isotope Exposure	117
Appendix 2: Tasty Sea Vegetable Recipes	121

The Effects of Radiation Exposure on Human Health

For years I have been collecting materials on how you can partially or fully detoxify the body from the effects of radiation and radioactivity exposure.

Why?

Search the literature on the internet and you'll find hundreds if not thousands of articles that basically say, "Radiation is bad for you. In high doses it can kill you." In today's world, we have a big risk of radiation exposure but no one has put together any information on what to do about it. Go to the internet and you'll find all these articles about how radiation affects us in negative ways, but you'll find hardly any information on the detoxification of radiation exposure.

To me, it seems the emphasis has been misplaced!

Fine, we know that radiation can kill or impair you, so the big question is, **"What do you do to save your own life after you've been exposed?"**

Study after scientific study keeps going on to investigate radiation from one angle or another, but it seems that barely a word is said on what you can do ... and **MUST** do ... if you are exposed to excessive radioactivity or ionizing radiation and want to take the logical step of detoxing yourself ... to prevent cancer or save your life.

It irks me to no end that there are millions spent every year on radiation research, any yet it seems there is no one out there controlling the funds who realizes what these studies should be focusing on.

In other words, let me phrase it again another way.

How do you help heal or "detox" yourself after radiation and radioactive exposure ... and because excess radiation can cause cancer, what do you do to help your cells so that they can revert back to normal once you've been exposed to high doses of radiation or radioactivity?

To find any answers to this for you, I have gone to a variety of sources over the years.

Let's see, we have background studies on ionizing radiation, radiation toxicity studies, FDA and CDC documents on radiation drugs, information on the Chernobyl disaster and radiation treatments after Nagasaki and Hiroshima, scientific studies on supplements noted to have radioprotective effects or proven usefulness in RNA/DNA repair, NAVY and ARMY manuals on nuclear disaster preparedness and medical treatment, Homeland Security directives on radiation emergency medicine, information on coping with cancer radiotherapy for survival, radiation exposure on space flights ... there are too many sources for me to mention and go into.

Besides, if you are like me, all you want are the results. If there's an emergency, you don't want theory -- you just want what's happening, what works and you want answers quickly.

Basically, you and I both want to know what to do about excessive radiation exposure of all types and radioactive contamination, so that's what you're going to get.

Not too much theory, just the results of what has been reported to work.

As one famous radiation researcher wrote to me, "There are many good ideas in the lab [for radiation cellular detox or repair supplements], but there have not been the resources needed to establish these approaches as safe and effective in humans. The research says that radiation effects can be treated after exposure. The problem is that it is very difficult to move the research from the lab to clinical availability: (1) how do you test it? (2) who wants to spend the money developing something for which there may be no market?"

I'm always pulling together information that we need as a national concern and as a strategic imperative even though there is no market for it. That's just my vow as a form of contribution and service, which is why I've also produced a volume on "Antibiotic Alternatives for Doctors and their Patients." This is another such project, and hopefully you will never need it to save your life.

If you are buying it, hopefully it's for preparation or because you were exposed to some form of radiation in a non-lethal situation and simply want a set of detox protocols to help you get well.

Much of the information in this manual is undocumented from the standpoint of double-blind studies and so forth for the very reasons the radiation scientist has just mentioned -- there's been no money to fund any studies, so all we have in many cases are theories and anecdotal instances.

They may be anecdotal, but if I found any radiation detoxification strategies that embody some commonsense and might save someone's life, I've taken it as my

responsibility to tell you about them and let you decide. If you find any that are missing, then let me know, too, so we can add them to the manual.

As the normal disclaimer you'd expect for any health related topic, nothing within this manual is to be construed as medical diagnosis or advice, so I am simply empowering you with journalistic information to start the search for your own answers.

Therefore let's start -- and let's start with the *scary* stuff.

Remember that nuclear or ionizing radiation (radiation that penetrates the body) can affect your body in a number of different ways, and the adverse health effects of extreme radiation exposure may not be apparent for many years.

Those adverse health effects can range from mild results, such as a simple reddening of the skin, to permanent genetic alterations and serious effects such as leukemia, cancer and death.

That's a good reason for wanting methods on radiation detoxification.

Here's the rule for determining what will likely happen to you upon radiation exposure:

The results you experience due to radiation exposure will entirely depend on the amount of radiation your body absorbs (the dose), the type of radiation you're exposed to, the route of exposure (the susceptibility of the tissue), and the length of time over which you are exposed.

The three basic ways to reduce radiation exposure are therefore through decreasing the amount of time you spend near a source of radiation, increasing your distance from the radiation source, and increasing the shielding between you and the radiation.

Persons working with radioactive materials or X rays protect themselves from excessive radiation exposure by lead shields and special clothing that contains lead. Processes involving radioactive substances (such as manufacturing and manipulation) are observed through thick plates of specially prepared lead glass that exclude the harmful radiation, too.

A **dosimeter**, which is a device that measures the amount of radiation to which a person has been exposed (Remember James Bond checking radiation shields posing as "Klaus Hergersheimer" in *Diamonds are Forever?*), is always worn by persons working in radioactive areas.

Radiation can damage every tissue in the body but the most vulnerable tissues are the fastest growing tissues because radiation can go so far as to triple its effects during the growth phase of cells. That means that a fetus in the womb is very sensitive to radiation just as are bone marrow cells (which make blood) since they are the fastest growing cells in the body. Children are very vulnerable to radiation because their body cells are dividing rapidly due to growth.

The cells in the testes and ovaries are only slightly less sensitive and as most people know, they can be rendered sterile with very small doses of radiation. The lining cells of the body, such as the skin and in the intestines, are much more resilient while the most resistant cells are the brain cells because they grow the slowest.

The relative sensitivity of various body tissues gives a good idea of the wide range of symptoms the body would likely experience due to heavy doses of radiation. The radiation exposure numbers below represent the minimum damaging doses for body tissues. The unit of dose is the "gray" (abbreviated Gy) which is roughly equivalent to a sievert. The gray represents the absorption of an average of one joule of energy per kilogram of mass in the target material and this new unit has officially replaced the "rad," an older unit (One gray equals 100 rads):

- Fetus--2 grays (Gy).
- Bone marrow--2 Gy.
- Ovary--2-3 Gy.
- Testes--5-15 Gy.
- Lens of the eye--5 Gy.
- Child cartilage--10 Gy.
- Adult cartilage--60 Gy.
- Child bone--20 Gy.
- Adult bone--60 Gy.
- Kidney--23 Gy.
- Child muscle--20-30 Gy.
- Adult muscle--100+ Gy.
- Intestines--45-55 Gy.
- Brain--50 Gy.

The length of exposure to radiation, and its intensity, makes a big difference in what happens to an exposed individual.

Exposure to very large doses of radiation can cause death within a few hours while exposure to lower doses of radiation may lead to leukemias, cancers of the thyroid, brain, bone, breast, skin, stomach, and lung, cataracts or other adverse health effects much later on in life.

Basically, the survival rate after radiation exposure depends on the radiation dose. For those who do survive, full recovery typically takes from a few weeks to 2 years.

Over time the accumulating radiation damage from prior exposure, if it is not enough to simply kill body cells, distorts cell growth and causes scarring and/or the cancers just mentioned. The damage done also depends on the ability of the affected tissues to repair themselves.

Some tissues and some types of damage produce much greater consequences than others. Basically, our job in this book is to go over the various ways to eliminate radiation poisoning and buttress the body's health so that the tissues can achieve full recovery whenever possible. So let's jump in and start with the thing people fear most, which is a discussion of severe radioactive exposure.

We're just starting, so later we'll talk about radiation detox methods for more gentle degrees of exposure, too.

The source of heavy radioactive exposure can be due to all sorts of reasons -- a nuclear power plant incident, nuclear/atomic bomb, fallout from another type of nuclear incident, eating food that has been radioactively contaminated, work in uranium mines or at a nuclear processing facility, and even exposure to the depleted uranium used in the military.

There is also radiation exposure from radon gas in basements, excessive cigarette smoking, X-ray, CT scanner and fluoroscope exposure, usage of nuclear medicine for imaging, working with radioactive products, or even extreme radiation exposure due to cancer radiation therapy.

A variety of products contain radioactivity such as potassium chloride salt substitutes (which contain radioactive isotope potassium-40), some smoke detectors (which contain Americium-241), some 1940's spark plug (which contained polonium), 1936-43 Fiesta ware from the Homer Laughlin China Co. of Newell W. Va (which contained uranium oxide in the glazing), vaseline glass (contains uranium dioxide), old glow in the dark radium dial watches (which have produced countless cases of radium poisoning), tritium glow lights, thoriated tungsten electrodes welding rods (which contain thorium dioxide), and thorium camping lanterns. Porcelain dental crowns and dentures containing uranium will

expose some people to three times the total amount of radiation absorbed annually by the average American per tooth.

We also have exposure to ionizing radiation from living at high altitudes or from frequent airplane flights. For instance, did you know that living at 5,000 feet altitude in Denver, Colorado doubles your exposure to radiation? Did you know that a commercial airliner flight increases your radiation exposure 150-fold by lifting you above 80% of the atmosphere?

When we're talking about radiation exposure, there are two types you need to differentiate between: (1) irradiation and (2) contamination. Here are the definitions:

Irradiation is exposure to external radiation that passes directly through your body and can make you sick immediately, producing what's called "acute radiation illness" (ARS). Irradiation does not make your tissues radioactive and it does not make the person radioactive, but just damages your tissues. In high doses, irradiation can even permanently damage your genetic material (DNA) causing chronic latent disorders, such as cancer and birth defects. Irradiation has no emergency treatment itself, but doctors closely monitor the person exposed for the development of various syndromes and treat the symptoms as they arise.

Contamination means coming into contact with and retaining radioactive material, typically in the form of a radioactively contaminated materials that you eat, inhale, absorb through skin breaks, or which may fall on your skin (where it can fall off or be brushed off to contaminate other people and objects). You can have both internal and external contamination. If it is absorbed, radioactive material will be transported to various sites in the body, such as the thyroid or bone marrow, where it will continue to release radiation.

"Contamination" requires the immediate removal of the radioactive material to prevent it from being absorbed by the body and so contaminated skin should be scrubbed immediately with large amounts of soap and water, small puncture wounds should be cleaned vigorously to remove all radioactive particles (even though the scrubbing may cause pain), contaminated hair is clipped off rather than shaved because shaving may abrade the skin and allow the contamination to enter the body. Just like in the James Bond movie *Doctor No* (you can tell I'm a big fan), scrubbing of skin surface areas continues until a Geiger counter shows that the radioactivity is gone.

If a person has recently swallowed radioactive material, vomiting must be induced. Some radioactive materials have specific antidotes, which we'll get into, that can prevent the absorption of ingested material. These antidotes are usually given only to people exposed to significant radioactive contamination. Potassium iodide prevents the thyroid gland from absorbing radioactive iodine-131 and other drugs, such as DTPA, EDTA chelation, and penicillamine can be given intravenously to remove certain radioactive elements after they have been absorbed. Although this absorbed radiation contaminant often will not cause "acute radiation sickness," it can lead to chronic disorders (such as leukemia or cancer) over time unless it's removed through these methods.

Now the first emergency worry from radiation exposure is whether you develop **acute radiation sickness**, or **ARS**. We therefore need to know how to identify it, detox yourself if you get it, and recover if at all possible. Emergency detoxification should always be performed by physicians, but I'm going to tell you what to expect. Later we'll talk about home detoxification methods such as when you work at a nuclear facility or live in a high radiation area in general.

Acute radiation sickness is the scary stuff you see in movies like *The Day After*, so while this probably isn't your situation, I want you to know the worst and then we'll come back to the common situation of detoxing simple ionizing radiation or radioactive exposure.

Radiation exposure produced two types of radiation injury: **acute** (immediate) and **chronic** (delayed). Radiation sickness, known as "acute radiation sickness (ARS)," generally occurs in people whose entire body (or a large portion of it) has been exposed to radiation, usually over a short period of time.

Many survivors of the Hiroshima and Nagasaki atomic bombs and many of the 1986 Chernobyl Nuclear Power Plant accident firefighters became ill with *acute radiation sickness* because of their heavy radiation exposure. The signs and symptoms of radiation sickness naturally vary according to the dose of radiation and tissues exposed, but the general symptoms include:

- Nausea and vomiting
- Diarrhea
- Skin burns (skin reddening)
- Weakness
- Lethargy and fatigue
- Loss of appetite (anorexia)
- Fainting
- Dehydration
- Inflammation of tissues (swelling, redness or tenderness)

- Hemorrhages under the skin
- Bleeding from your nose, gums or mouth
- Anemia (low red blood cell count)
- Hair loss (usually from just the scalp)
- Decrease in platelets

This information was initially compiled mostly from survivors of the atomic bomb blasts over Japan in 1945, so let's revisit history and go over what happened in Hiroshima and Nagasaki.

According to Japanese observations, the early symptoms of radiation injury closely resembled the same symptoms observed in animals (and humans) who received extremely large doses of X-rays. That's how we first got these symptom models. The initial symptoms reported by the Japanese and (later by American) observers were the loss of hair from the scalp, bleeding into the skin, inflammation of the mouth and throat, vomiting, diarrhea, and fever.

Nausea and vomiting that appeared within a few hours after the explosion was frequently noted and while it usually subsided by the following morning, occasionally it continued for 2-3 more days. Diarrhea of varying degrees of severity was also observed and in severe cases, it was frequently bloody. For reasons which are not yet clear, the diarrhea in some cases was quite persistent, perhaps due to changes in the intestines.

Lesions of the gums, the oral mucous membrane, and the throat were often observed. The affected areas usually became deep red in color and in many instances ulcerations and necrosis (tissue breakdown) followed. Blood counts done on such patients by the Japanese commonly showed leucopenia (low-white blood cell counts) and in extreme cases the white blood cell count fell below 1,000 (whereas a normally healthy WBC count is around 7,000).

In association with the oral symptoms, a variety of other infective processes were then seen.

Wounds and burns which were healing adequately later developed pus and serious necrosis. Ulcerations were observed to appear in the larynx, bowels and in the genitalia for females. Fever frequently accompanied these lesions. Eye injuries consisting of retinal hemorrhage and exudation were observed while 75% of the patients showing them had other signs of radiation injury.

The medical community says that people exposed to radiation will succumb to acute radiation sickness only if:

- The radiation dose was high (doses from medical procedures such as chest X-rays are too low to cause ARS; however, doses from radiation

therapy to treat cancer may be high enough to cause some ARS symptoms),

- The radiation was penetrating (that is, able to reach internal organs),
- The person's entire body, or most of it, received the dose, **and**
- The radiation was received in a short time, usually within minutes.

That's exactly what happened at Hiroshima, Nagasaki and Chernobyl in 1986. From further studies over the years, the syndromes of acute radiation illness have been divided into three categories,

The **cerebrovascular (brain) syndrome** occurs when the total dose of radiation is extremely high, exceeding 20 to 30 Gy. A person with radiation sickness cerebrovascular (brain) syndrome rapidly develops confusion, nausea, vomiting, bloody diarrhea, and shock. Within hours their blood pressure falls due to heart and circulatory damage, accompanied by the inability to coordinate gait, seizures and coma. Patients often die within hours (usually within the first two days) after severe radiation exposure.

In particular, the cerebrovascular syndrome has 3 phases: the first period of nausea and vomiting; then listlessness, drowsiness, apathy and confusion; and finally, tremors, convulsions, seizures, coma, with death usually within a few hours. Since the cerebrovascular syndrome is always fatal, treatment is geared toward providing comfort by relieving pain, anxiety, and breathing difficulties.

The **gastrointestinal syndrome** occurs when the radiation dose is smaller but still high, and is due to the effects of radiation on the cells lining the digestive tract. Doses in the 10-20 Sv range affect the intestines, stripping their lining and leading to death within 3 months due to causes of vomiting, diarrhea, starvation, and infection. Victims receiving 6-10 Sv all at once usually escape an intestinal death, but instead face bone marrow failure and death within 2 months from loss of blood coagulation factors and the protection against infection provided by white blood cells.

The symptoms of people suffering from gastrointestinal syndrome include nausea, vomiting and diarrhea that can lead to severe

dehydration, diminished blood plasma volume and vascular collapse that can result in death within 3-10 days. Severe nausea, vomiting, and diarrhea begin 2 -12 hours after exposure to 4 Gy or more of radiation and the symptoms may lead to severe dehydration, but they usually resolve themselves after 2 days.

During the next 4 or 5 days, the person usually feels well but this is misleading as the cells lining the digestive tract, which normally act as a protective barrier, die and are shed off. The amino acid **L-glutamine** is standardly used by nutritionists to help rebuild intestinal walls, and preclinical studies by Fasano (2002) suggest glutamine might be useful in treatment of radiation injuries to the gastrointestinal tract.

After this period of feeling well, severe diarrhea (often bloody) returns, once more producing a state of dehydration. As the intestines deteriorate, the bacteria inhabiting the digestive tract start to invade the rest of the body producing severe infections.

People with the gastrointestinal syndrome require intravenous fluids and sedatives. They need to be kept isolated so that they do not contact infectious microorganisms. Oral antibiotics, such as neomycin, are given to kill intestinal bacteria that may invade the body and antifungal and antiviral drugs are also given intravenously when necessary.

The **hematopoietic syndrome** is caused by the effects of radiation on the bone marrow, spleen, and lymph nodes, which are the primary sites of blood cell production (hematopoiesis). Between 2-6 Sv gives a fighting chance for survival if victims are supported with blood transfusions and antibiotics. One or two Sv in exposure produces a brief, non-lethal sickness with vomiting, loss of appetite, and generalized discomfort.

The hematopoietic syndrome is characterized by loss of appetite, apathy, lethargy, nausea and vomiting that usually begin 2-12 hours after exposure to 2 Gy or more of radiation and may be maximal within 6-12 hours from this yet smaller radiation exposure. The symptoms typically subside completely within 24-36 hours after the exposure, and the person typically feels well for a week or more.

However, during this symptom-free period the lymph nodes, spleen and bone marrow begin to waste away leading to a severe shortage of white blood cells, which are the body's main defense against infection, followed by a shortage of platelets and then red blood cells. Anything you can do nutritionally during this time to build blood cells and increase immunity would help the individual, otherwise many hematopoietic patients die within 30-60 days after exposure.

When the blood producing organs atrophy due to the radiation, this dramatically raises the susceptibility to infection, hemorrhage and anemia, all of which pose potentially lethal threats. **Mushroom supplements** (from JHS Naturals) can help rebuild the immune system during this period. The shortage of red blood cells (anemia) causes fatigue, weakness, paleness, and difficulty breathing with physical exertion. **Bee pollen** may also be useful as it helps increase RBC and WBC counts, enhances vitality and energy, is a general immune stimulant, and has been found to protect people from radiation sickness.

Blood transfusions and injections of growth factors (such as erythropoietin and colony-stimulating factor) that stimulate blood cell production are given to decrease bleeding and increase blood counts. If the bone marrow is severely damaged then these growth factors may be ineffective, and sometimes a bone marrow transplantation is performed although the success rate is low. See the information on Revici for a discussion of this.

The shortage of platelets, which cause blood clotting, may cause uncontrolled bleeding, although a natural remedy for increased platelet production (often used in chemotherapy) is **shark alkyglycerols** which you can buy in health food stores. **Panax ginseng** has also prevented hemorrhaging after radiation exposure, prevents bone marrow death and stimulates blood cell formation, so it's another supplement to add to one's protocol.

After 4 to 5 weeks, if the person survives, blood cell production rises once more, but the person feels weak and tired for months. Nutritional supplements and herbs that can help regenerate the affected organs and increase the production of blood cells (such as beets) are warranted for this type of condition.

In an emergency involving many people, medical science has no way of telling the difference between people who have received fatal doses and who will

certainly die -- despite all efforts -- and others who received less radiation and can be saved. From this information, it becomes clear that in a radiation emergency with limited resources, there is a great need to have some idea of the radiation dosage received by individuals as early as possible so that attention can be directed to those victims in the 2-10 Sv range that might survive with treatment.

Blood transfusions, infection control, and possibly the use of bone-marrow transplants (to rejuvenate the supply of white blood cells) or newer stimulants to blood formation can save many victims in this category.

Basically, people who survive from radiation exposure or suffer disorders caused by radiation therapy receive treatment directed at their symptoms. Even if they survive hematopoietic and gastrointestinal injury, they often experienced delayed complications including interstitial pneumonitis (respiratory failure), renal failure, cataracts and developmental abnormalities.

We've just gone over the three categories or types of acute radiation sickness, but this is so important that I want to take the time to summarize it in another way to make it clearer because lives may one day be at stake.

To summarize the stages of ARS another way, acute radiation illness progresses through several stages beginning with early symptoms followed by a symptom-free period (latent stage).

Various patterns of symptoms follow which depend on the amount of radiation the individual received. The greater the amount of radiation people were exposed to, the more severe their symptoms and the quicker they progress from the early symptoms to the actual radiation syndrome. The chances of survival decrease as someone's radiation dosage increases.

The symptoms and their progression for acute radiation toxicity are consistent for a given amount of radiation exposure, and doctors can usually predict a person's radiation exposure from the timing and nature of the symptoms that express. Doctors divide acute radiation syndromes into the three groups we just mentioned based on the main organ system affected, although there is some overlap of symptoms among these groups

Once again, the early symptoms of ARS typically involve nausea, vomiting, headache and diarrhea which will start within minutes to days after the exposure, last for minutes up to several days, and may come and go. The person will usually look and feel healthy for a short time -- mistakenly thinking they are all well -- after which they will become sick again with loss of appetite, fatigue, fever, nausea, vomiting, diarrhea, and possibly even seizures and coma. This seriously ill stage may last from a few hours up to several months.

People with ARS typically also suffer some kind of skin damage which can start to show within a few hours after exposure and can include swelling, itching, and redness of the skin (like a bad sunburn). Various **homeopathic remedies** can help with this type of condition. A mainstream treatment of radiation injury is the use of **Aloe vera** preparations on damaged areas of skin because it has demonstrated remarkable healing properties even for chronic ulcerations resulting from radiation exposure.

As with the other symptoms, the skin may heal for a short time and then the swelling, itching, and redness can return days or weeks later. There can be skin atrophy and ulceration, thickening of skin, breaking of surface blood vessels, and ultimately squamous cell carcinomas (skin cancer). The complete healing of the skin may take anywhere from several weeks up to a few years depending on the radiation dose the person's skin received and the efforts one puts into detoxification and rebuilding. The supplement Vitalzym, which contains the enzyme **serrapeptase**, may help with reverting fibrosis.

There also can be hair loss as well, just as there is due to cancer radiation or chemotherapy treatments. Other delayed effects resulting from exposure to radiation include cessation of menses, decreased fertility and libido, and anemia.

Remember, most people who do not recover from acute radiation syndrome will die within several months of exposure. The cause of death in most cases is the destruction of the person's bone marrow, which results in infections and internal bleeding. The important thing is to help rebuild the immune system and blood. For the survivors, this recovery process may last from several weeks up to two years.

Obviously, this book is meant for these individuals and for very mild cases of radiation poisoning that can benefit from home detoxification protocols. Nevertheless, you can use MUCH of this information in an area-wide emergency. This is the only manual out there telling you what you can do.

For severe cases of radiation exposure, all treatments can and should be done under the care of physicians. Overall, the prognosis of a radiation sufferer depends upon their radiation dose, dosage rate and the physical distribution of their radiation exposure.

The conventional treatment for radiation exposure involves the immediate removal of the radioactive materials. Skin contamination is handled through copious water washing of the exposed areas, and special chelating solutions containing EDTA should be used for skin contamination when available, though there must be *vigorous* treatment of any wounds to prevent radioactive materials from entering the body.

Ingested material is removed promptly by induced vomiting if the exposure is recent and if the radiation is inhaled, solutions to block thyroid uptake are given and treatments to increase urination are administered. You can see Appendix 1 for the details on the emergency detoxification of various radioactive isotopes.

In the most severe cases of **Acute Cerebral Syndrome**, the medical treatment is usually directed towards administering comfort, relieving pain and anxiety, treating shock and giving sedation for the control of seizures and convulsions because death is believed to be inevitable. There's very little that can be done.

After modest exposure producing **Gastrointestinal Syndrome** patients, doctors usually apply sedation and medication to reduce nausea and vomiting along with intravenous fluids, electrolytes and blood plasma. When the person can eat, a bland diet is usually prescribed, but please see all the information we've collected on the diet and give it to your doctor. Antibiotics may be given to victims of this category in the first week to prevent infection of the vulnerable intestinal tract.

As to management of **Hematopoietic Syndrome** victims, it primarily involves the use of antibiotics, anti-nausea medications and oral chelating agents to promote the excretion of radioactive materials. Once again, see our diet recommendations, especially as regards miso soup, seaweeds, and spirulina/chlorella. Anemias are treated with whole blood transfusions and bleeding tendencies with platelet transfusions. Various herbs and nutrients can be taken to help rebuild the blood and immune system. Radiation sores or ulcers can be removed or repaired surgically and the use of high-pressure (hyperbaric) oxygen therapy can help heal them, or homeopathy, aloe vera and other alternative treatments.

Medications to stimulate bone marrow production and bone marrow transplants can be implemented. Investigators are currently exploring ways to prevent or reduce radiation-induced normal tissue injury using cytokines, growth factors, and various other therapies which we'll briefly mention so you're informed. We will also go into the specific use of alternative medicine treatments for radiation exposure, including free radical treatment, for some radiation conditions.

Of course the long term chronic effects for radiation exposure survivors can include cellular changes resulting in cancers such as leukemia, thyroid cancer, skin cancers, bone cancers as well as cataracts and sterility. No treatment can reverse sterility, but doctors will prescribe hormonal supplementation for sterility and decreased libido.

As to cancer, it usually strikes 4.5% of people exposed to radiation in the 1-Gy range, and one-quarter of those individuals will likely contract leukemia. Data from Hiroshima residents showed an increased frequency of lymphocyte chromosomal mutations after the blast and workers involved in the Chernobyl cleanup showed a 20% increase in mutation frequency.

Okay, that's how bad it is. I have not hidden the truth from you -- now you know the chances of survival if something serious ever happens.

We're going to be talking about effective ways of radiation detox in just a moment, but we should still be responsible and answer one more important related question -- **how can you protect yourself during a radiation emergency?**

Here's what you do, though the most appropriate course of action will naturally depend on the situation.

First, tune your radio or TV to the local news station or emergency response network and monitor it for information and instructions. The authorities will know best. After any release of radioactive materials, the local authorities will definitely be monitoring the levels of radiation and determining what protective actions you should take.

If a radiation emergency involves the release of large amounts of radioactive materials, officials may advise you to "shelter in place," which means to stay in your home or office. You might also be advised to leave the area and move to another location.

If you are advised to shelter in place, you should do the following:

- Close all doors and windows and fireplace dampers (exposed to outside air)
- Turn off all fans, air conditioners and heating units that bring in air from the outside (since it may be contaminated)
- Bring the family and pets inside
- Move to an inner room or basement because it affords much higher radiation shielding
- If you are advised to evacuate, follow the directions provided and leave the area as quickly as possible. Take along a flashlight, portable radio, batteries, first-aid kit, supply of sealed food and water, can opener, medicine, and sufficient cash and credit cards

That's it.

That's the chapter I didn't want to write because I wanted to move right on into various detoxification techniques, but now you know about the seriousness of radiation exposure, the stages of radiation sickness, what you should do in a radiation emergency, and you've had a little fore-taste of alternative treatments for radiation exposure.

Let's now begin.

References:

“Acute Radiation Syndrome,” Emergency Preparedness and Response, CDC,
<http://www.bt.cdc.gov/radiation/ars.asp>

“Fact Sheet on Biological Effects of Radiation,” U.S. Nuclear Regulatory Commission,
<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/bio-effects-radiation.html>

“Questions and Answers: I-131 and Radioactive Fallout,” National Cancer Institute,
<http://www.cancer.gov/newscenter/pressreleases/I131QandA>

Cecil RI, Plum F, Bennett JC, eds. Cecil Textbook of Medicine. 20th ed. Philadelphia, PA: W.B. Saunders; 1996.

Dambro MR. Griffith's 5-Minute Clinical Consult. 1999 ed. Baltimore, MD: Lippincott Williams & Wilkins, Inc.; 1999.

De Vita VT, ed. Cancer: Principles and Practice of Oncology. 5th ed. Philadelphia, PA: Lippincott-Raven Publishers; 1997.

Fauci, Anthony S, et al, eds. Harrison's Principles of Internal Medicine: 14th edition, (McGraw-Hill, New York, 1998).

Feldman M, ed. Sleisenger & Fordtran's Gastrointestinal and Liver Disease. 6th ed. Philadelphia, PA: W.B. Saunders; 1998.

Gruenwald J, Brendler T, et al, eds. PDR for Herbal Medicines. Montvale, NJ: Medical Economics Company; 1998: 898,899,924,925.

Morrison R. Desktop Guide to Keynotes and Confirmatory Symptoms. Albany, Calif: Hahnemann Clinic Publishing; 1993.

Pizzo PA, Poplack DG. Principles and Practice of Pediatric Oncology. 3rd ed. Philadelphia, PA: Lippincott-Raven Publishers; 1997.

Rakel RE, ed. Conn's Current Therapy. 51st ed. Philadelphia, PA: W.B. Saunders; 1999.

Upton, Arthur C. “Radiation Injury,” Cecil Textbook of Medicine, ed. by J. Claude Bennett and Fred Plum, (W.B. Saunders, Philadelphia, 1996).

Wilson JD. Williams Textbook of Endocrinology. 9th ed. Philadelphia, PA: W.B. Saunders; 1998.

Potassium Iodide

The amount of information out there on taking **potassium iodide (KI)** tablets after a radioactive incident -- in order to block the thyroid gland and protect it from absorbing radioactive iodine -- is overwhelming. In fact, sometimes I think that taking potassium iodide tablets is the only thing people know to do in case of an emergency involving radioactive fallout.

The reason officials recommend taking potassium iodide (KI) is because this substance, which we add to salt to make it "iodized," contains 76.5% iodine. The thyroid gland will use any iodine that's in your bloodstream for its functioning and it cannot tell the difference between regular iodine and radioactive iodine. Because of this fact, it will readily absorb any radioactive iodine that comes to it in the blood, such as any radioactive iodine-131 that is absorbed from the fallout of a nuclear accident, which in turn may lead to thyroid cancer a few years later.

When you "stuff" the thyroid with natural iodine, however, there is less chance that the thyroid will absorb any radioactive iodine from the food, air or water that might become contaminated with radioactive iodine. That's the purpose of taking KI tablets during some types of radiation emergencies.

Saturating your thyroid with non-radioactive iodine can therefore possibly limit the risk of damage to your thyroid gland because the KI (potassium iodide) supplies enough non-radioactive iodine that your thyroid glands absorb it and becomes saturated *before* any radioactive iodine (from fallout or other contamination) presents itself.

When it is saturated, the thyroid cannot absorb too much extra iodine, so you take the KI tablets at the first sign of a radiological disaster.

When the thyroid becomes saturated with iodine due to KI, it is said to be "blocked" and any excess iodine in the blood -- either radioiodine or stable iodine -- is quickly eliminated from the body. However, that happens only after the thyroid has become saturated with one or the other type of iodine, so get the KI stuff in there *first!* Scientists say that only about 1% as much additional iodine can be readily absorbed after the thyroid is blocked.

Hence, KI will saturate the thyroid gland with iodine if you ingest it in time, thus decreasing the amount of harmful radioactive iodine that can be absorbed by your thyroid.

Potassium iodide isn't the only substance that can do this, for you can also buy **potassium iodate (KIO3)** tablets that are cheaper, have an extended shelf life, and no bitter taste compared to KI tablets. A 1999 World Health Organization report showed that KI and KIO3 are equals in terms of the bioavailability of stored iodine.

The big worry to radioactive iodine is that when it is ingested or inhaled, iodine-131 tends to persist in the body and since it concentrates in the thyroid, this will provide such a large radiation dose to thyroid cells that thyroid cancer, loss of thyroid function, or nodules in the thyroid will eventually develop.

The individuals most likely to see the worst effects of radioactive iodine-131 exposure are growing children rather than adults. Children have top priority for the tablets.

For instance, many of the Chernobyl children who have now grown up are presently experiencing thyroid cancers. In the area affected by the Chernobyl accident, by July of 2002 there have already been at least 1,800 cases of thyroid cancer in children who were under 15 years of age when the explosion occurred, which is a far higher incidence of occurrence than normal.

Beginning approximately 4 years after the Chernobyl nuclear accident, which sent clouds of radioactive contaminants into the air, the first sharp increase in the incidence of thyroid cancer among children and adolescents in Belarus and Ukraine (areas covered by the radioactive plume) was observed. In some regions, for the first four years after the accident the observed cases of thyroid cancer among children aged 0-4 years exceeded expected numbers by 30- to 60-fold. During the ensuing years, in the most heavily radiated areas the incidence of thyroid cancer increased as much as 100-fold compared to pre-Chernobyl rates (Robbins and Schneider 2000; Gavrillin et al., 1999; Likhtarev et al., 1993; Zvonova and Balonov 1993).

So there we have about 2,000 "excess" cases of thyroid cancer in Ukraine, Belarus and nearby areas which have already been attributed to Chernobyl radiation and according to the World Health Organization, that particular radioactive incident is likely to cause 50,000 new cases of thyroid cancer among young people living in the areas most affected by the Chernobyl disaster.

Putting the numbers another way, researchers have found that in certain parts of Belarus, 36.4% of children, who were under the age of four at the time of the Chernobyl nuclear accident, can expect to develop thyroid cancer and experts now contend that as much as 40% of the thyroid nodules that develop are cancerous with 5-10% of the cancers becoming fatal. Thyroid cancer can usually be treated, but that may require surgery, regular monitoring and lifetime medication.

If we turn to Poland, however, we find that over 18 million doses of potassium iodide (KI) were administered to 97% of the children, and there has been no similar increase in thyroid cancer in the country. Part of this successful result is due to Poland's radioiodine protective strategy, which involved an aggressive ban of radioiodine contaminated food stuffs and milk. Approximately 10.5 million children under age 16 and 7 million adults received at least one dose of KI in Poland.

That, in short order, is why KI then becomes useful in certain types of radioactive emergencies. In fact, the FDA has stated that " the increase in thyroid cancer seen after Chernobyl is attributable to ingested or inhaled radioiodines. A comparable burden of excess thyroid cancers could conceivably accrue should U.S. populations be similarly exposed in the event of a nuclear accident. This potential hazard highlights the value of averting such risk by using KI as an adjunct to evacuation, sheltering, and control of contaminated foodstuffs."

Here's what else you have to remember though ...

People keep concentrating on taking potassium iodide tablets, but **KI tablets only protect the thyroid gland and do not provide protection from any other radiation exposure!** Once again, KI does not prevent the effects of other radioactive elements ... using KI will only protect the thyroid gland from radioactive iodine but it will not protect other parts of the body from other radioactive materials that may be released.

There is no medicine that will effectively prevent nuclear radiations from damaging the human body cells that they strike. KI itself only provides protection from radioiodines for the thyroid -- and only if taken in time. **It has no impact on the uptake by the body of other radioactive materials and provides no protection against external irradiation of any kind.**

Please remember that.

Please also note that radioactive fallout can travel hundreds of miles on the winds and remain a threatening concern even though the radioactive isotopes start becoming dispersed and diluted along the way, and even though their likelihood of causing harm diminishes with this dispersal.

I've been told the story of a radio-chemistry class at Rensselaer Polytechnic Institute (located in Troy, New York) where students studied the fallout from an atmospheric bomb blast (code named Simon) detonated 300 feet above the desert in Nevada. Remember -- *Nevada!*

Even though they were 2,300 miles away, the students could measure the radioactive fallout carried by the winds on the paved streets, roofs and even plants of New York. Just a few hours after the explosion, the students reported

that the average radiation readings in nearby towns were 20-100 times higher than usual and found that concentrated hydrochloric acid was only partially effective in removing the radiation from many surfaces!

That's how widespread and dangerous the fallout from an atomic detonation can be. You should stock up on one or two bottles of KI even if you never need them.

What people usually overlook is the fact that there will also be many other types of dangerous radioisotopes released along with the radioiodine in an atomic explosion or nuclear meltdown. The thyroid blocking activity of potassium iodide tablets is geared to just one type of radioactive contaminant -- iodine-131.

Frankly, you don't want to be exposed to any type of radioactive cloud whatsoever and when exposed, KI is not going to do everything ... just protect your thyroid a bit. Even for the thyroid, KI may not provide people with 100% protection against the absorption of radioactive iodine. Its effectiveness will depend on a wide variety of factors, including

- when a person starts taking it (and for how long),
- how much iodine is already stored in the person's thyroid,
- how fast the body processes the KI, and
- the amount of radioactive iodine-131 the person becomes exposed to.

The FDA emphasizes that the use of KI should be as an adjunct to evacuating a contaminated area, sheltering away from any radioactive clouds (that's why you close your windows), and controlling the foods you eat so as to eliminate the likelihood of eating products that are contaminated with Iodine-131. Of all measures, in a radiation emergency evacuation is usually your best bet.

I'm not going to wax eloquent on this subject other than to say you should pre-stock 1-2 bottles of KI in your house because once there's a nuclear emergency, experience has shown this stuff flies off the shelves and you will have practically no way of buying it. Seriously!

Only a few companies manufacture KI and every time there's a nuclear emergency somewhere, their inventory stock becomes instantly depleted so you have to order it ahead of time and keep it in ready storage yourself. KI tablets can be stored for at least 5 years without losing their potency, and LIO3 even longer.

Furthermore, if there ever was an emergency and you needed it, then even assuming it was available for purchase, waiting for a package to arrive by mail (if mail service was available) would usually prove too late for the KI to be of much use. It's said that even the government would not be able to distribute enough of it because its "better-late-than-never" inventory stockpiles are currently tiny and woefully insufficient.

So you cannot count on the arrival of new government potassium iodide (KI) supplies to come to your family if there really is an emergency. For instance, one report said, "In the immediate aftermath of Three Mile Island, officials prepared 237,000 doses of potassium iodide, but the drug didn't make it to the scene for six days -- too late to do any good."

So what do you do if you don't have any KI handy when there's an accident and you cannot leave the area?

According to research by Ken Miller, health physicist at the Hershey Medical Center, using 24 healthy adult male test subjects he found that an adult could get a blocking dose of stable iodine by **painting 8 ml of a 2 percent tincture of iodine on the abdomen or forearm approximately 2 hours prior to I-131 contamination.**

The abstract of his study is titled "Effectiveness of Skin Absorption of Tincture of I in Blocking Radioiodine from the Human Thyroid Gland" from *Health Physics*, June 1989, Vol. 56, No. 6, pages 911-914. The author wrote,

Although there were large variations within each subject group in regard to serum-I levels and thyroid uptakes, the increase in serum-I concentration after topical-I application was effective in reducing the thyroid uptake of I131. The authors conclude that in the absence of KI, most humans would benefit from topical application of tincture of-I, and that in some the effectiveness would equal that of oral KI.

Don't try to drink or swallow iodine such as iodine water purification tablets, tincture of iodine, or Povidone-iodine solutions (like the Betadine® brand solution). If you do that you are going to get sick because iodine is a poison. That's why iodine bottles are marked poisonous!

In Nuclear War Survival Skills by Cresson H. Kearny, (Original Edition Published September, 1979, by Oak Ridge National Laboratory, a Facility of the U.S. Department of Energy, Updated and Expanded 1987 Edition, p. 115) the author states:

Elemental (free) iodine is poisonous, except in the very small amounts in water disinfected with iodine tablets or a few drops of tincture of iodine. Furthermore, elemental iodine supplied by iodine tablets and released by tincture of iodine dropped into water is not effective as a blocking agent to prevent thyroid damage. If you do not have any potassium iodide, **DO NOT TAKE IODINE TABLETS OR TINCTURE OF IODINE.**

Iodized table salt will not provide enough iodine to protect the thyroid either in a nuclear emergency either and should not be used as a substitute for potassium iodide. You'd need 5 cups per day of iodized salt to equal the iodine content in one KI tablet. Forget it! Kelp tablets are not going to help you either.

Moral? Buy 1-2 bottles and keep them in stock.

Okay, time for dosing and usage indications.

Some people are allergic to iodine and should not take KI. Pregnant and nursing women and babies and children may also take it. You can also take potassium iodide if you are taking medicines for a thyroid problem (for example, a thyroid hormone or anti-thyroid drug) but in this case you should check with your doctor. In general, always check with your doctor about any concerns you have about taking potassium iodide.

As to adverse reactions, based on the FDA adverse reaction reports and an estimated 48 million, 300-mg doses of potassium iodide administered each year the NCRP (National Council on Radiation Protection and Measurements) estimated it has an adverse reaction rate of from about 1 in a million to 1 in 10 million doses.

Potassium iodide (KI) should only be taken in a radiation emergency that involves the release of radioactive iodine, such as an accident at a nuclear power plant or the explosion of a nuclear bomb. A "dirty bomb" most likely will not contain radioactive iodine.

Local emergency management officials will tell people when to take KI, so in an emergency, stay tuned to your TV or radio for information. If a nuclear incident occurs, officials will have to find out which radioactive substances are present before recommending that people take KI.

If radioactive iodine is not present, then taking KI will not protect people. If radioactive iodine is present, then taking KI will help protect a person's thyroid gland from the radioactive iodine.

Remember, taking KI will not protect people from other radioactive substances that may be present along with the radioactive iodine. If public health officials tell you to take KI, then take it as soon as possible after the announcement. You should take one dose (130 mg) every 24 hours.

More than one tablet will not help you because the thyroid can only "hold" limited amounts of iodine and will wash the rest out of the body. In fact, taking larger doses will only increase the risk of experiencing side effects. You will probably be told not to take the drug for more than 10 days.

The Food and Drug Administration (FDA) recommends that KI be taken as soon as the radioactive cloud containing iodine from the explosion is close by. Potassium iodide may still have some protective effect even if it is taken 3-4 hours after exposure to radioactive iodine, so it's better to be late rather than sorry. Because the radioactive iodine will be present in the initial blast and decays quickly, a single dose of KI may be all that is required.

The FDA has posted recommendations on KI that can be reviewed at [Potassium Iodide as a Thyroid Blocking Agent in Radiation Emergencies](#).

KI comes in 130-mg tablets and for adults, a one-time dose at the levels recommended according to the following information is usually all that is required. However, if a person expects to be exposed to radioactive iodine for more than 24 hours, another dose should be taken every 24 hours. Remember to listen to emergency management officials for the particular instructions to follow after a radioactive incident.

In general, according to the FDA and CDC,

- Adults should take just one 130-mg tablet of KI.
- Children between 3 -18 years of age should take one-half of a 130-mg tablet (65 mg).
- Children between 1 month and 3 years of age should take 1/4 of a 130-mg tablet (32 mg).
- Infants from birth to 1 month of age should be given 1/8 of a 130-mg tablet (16 mg).
- Women who are breastfeeding should take the adult dose, and their infants should receive the recommended infant dose.
- Children who are approaching adult size (greater than or equal to 150 pounds) should take the adult dose regardless of their age.

People should remember that taking a higher dose of KI, or taking KI more often than recommended, will not offer more protection and can cause severe illness and death due to allergic reaction.

The high concentration of iodine in KI can be harmful to some people. People allergic to iodine (and possibly to shellfish -- ask your physician or pharmacist), who have certain skin disorders (such as dermatitis herpetiformis or urticaria vasculitis) or individuals who have had thyroid disease (such as hyperthyroidism, thyroid nodules, or goiter) should consult their doctor about taking KI because it may or may not hurt them.

That pretty much concludes what you need to know about potassium iodide in case of a nuclear emergency. This entire manual is about radiation detoxification, but I thought I'd throw this in there about radiation protection in order to make things complete.

The story you need to know is the following:

1. You should stock up on KI tablets *before* a nuclear emergency
2. They cannot protect you from other types of radiation
3. You should follow the direction of public health officials on how much KI to take in case of an emergency
4. Don't take other forms of iodine and poison yourself, though if no KI (or KIO₃) is available you can try swabbing your skin according to Ken Miller's instructions
5. Evacuation or shelter so there's no exposure are always the best options

Now on to the real ways to detox your body of radioactive contamination and exposure.

References:

Astakhova LN, Anspaugh LR, Beebe GW, Bouville A, Drozdovitch VV, Garber V, Gavrilin YI, Khrouch VT, Kuvshinnikov AV, Kuzmenkov YN, Minenko VP, Moschik KV, Nalivko AS, Robbins J, Shemiakina EV, Shinkarev S, Tochitskaya VI, Waclawiw MA. "Chernobyl-Related Thyroid Cancer in Children in Belarus: A Case-Control Study." *Radiat Res* 1998; 150:349-356.

Baverstock K, Egloff B, Pinchera A, Ruchti C, Dillwyn W. "Thyroid Cancer After Chernobyl" (letter to the editor). *Nature* 1992; 359:21-22.

Becker DV, Robbins J, Beebe GW, Bouville AC, Wachholz BW. "Childhood Thyroid Cancer Following the Chernobyl Accident: A Status Report." *Endocrinol Metab Clin North Am* 1996; 25(1): 197-211.

Bongers-Schokking JJ, Koot HM, Wiersma D, Verkerk PH, de Muinck Keizer-Schrama SMPF. "Influence of timing and dose of thyroid hormone replacement on development in infants with congenital hypothyroidism." *J Pediatrics* 2000; 136(3): 292-297.

Calaciura F, Mendoria G, Distefano M, Castorina S, Fazio T, Motta RM, Sava L, Delange F, Vigneri R. "Childhood IQ Measurements in Infants With Transient Congenital Hypothyroidism." *Clin Endocrinol* 1995;43:473-477.

Davis S, Kopecky KJ, Hamilton T, Amundson B, Myers PA. *Summary Final Report of the Hanford Thyroid Disease Study*. Seattle: Fred Hutchinson Cancer Research Center, 1999.

Fisher DA. "The importance of early management in optimizing IQ in infants with congenital hypothyroidism." *J Pediatrics* 2000; 136(3): 273-274.

"Frequently Asked Questions on Potassium Iodide," CDER, www.fda.gov/cder/drugprepare/KI_Q&A.htm

Gavrilin YI, Khrouch VT, Shinkarev SM, Krysenko NA, Skryabin AM, Bouville A, Anspaugh LR. "Chernobyl Accident: Reconstruction of Thyroid Dose for Inhabitants of the Republic of Belarus." *Health Phys* 1999; 76(2):105-119.

- Gilbert ES, Tarone R, Bouville A, Ron E. "Thyroid Cancer Rates and ^{131}I Doses From Nevada Atmospheric Nuclear Bomb Tests." *J Natl Cancer Inst* 1998; 90(21): 1654-60.
- Harrison JR, Paile W, Baverstock K. Public Health Implications of Iodine Prophylaxis in Radiological Emergencies. In: "Thomas G, Karaoglou A, Williams ED.", eds. *Radiation and Thyroid Cancer*. Singapore: World Scientific, 1999; 455-463.
- IARC- International Agency for Research on Cancer. IARC Monographs on the evaluation of carcinogenic risk to humans. Volume 78- Ionizing radiation, Part 2: Some internally deposited radionuclides. IARC Press, Lyon, France; 2001.
- Il'in LA, Arkhangel'skaya GV, Konstantinov YO, Likhtarev IA. *Radioactive Iodine in the Problem of Radiation Safety*. Moscow, Atomizdat 1972; 208-229.
- Ivanov VK, Gorski AI, Pitkevitch VA, Tsyb AF, Cardis E, Storm H. "Risk of Radiogenic Thyroid Cancer in Russia Following the Chernobyl Accident." In: Thomas G, Karaoglou A, Williams ED., eds. *Radiation and Thyroid Cancer*. Singapore: World Scientific, 1999; 89-96.
- Jacob P, Goulko G, Heidenreich WF, Likhtarev I, Kairo I, Tronko ND, Bogdanova TI, Kenigsberg J, Buglova E, Drozdovitch V, Goloneva A, Demidchik EP, Balonov M, Zvonova I, Beral V., "Thyroid Cancer Risk to Children Calculated." *Nature* 1998; 392:31-32.
- Kazakov VS, Demidchik EP, Astakhova LN. "Thyroid Cancer After Chernobyl" (letter to the editor). *Nature* 1992; 359:21.
- Likhtarev, IA, Shandala NK, Gulko GM, Kairo IA, Chepurny NI, "Ukrainian Thyroid Doses After The Chernobyl Accident." *Health Physics* 1993; 64(6):594-599.
- Likhtarev IA, Sobolev BG, Kairo IA, Tronko ND, Bogdanova TI, Olelnic VA, Epshtein EV, Beral V. "Thyroid Cancer in the Ukraine." *Nature* 1995; 375:365.
- Mettler FH, Becker DV, Walchholz BW, Bouville AC., "Chernobyl: 10 Years Later." *J Nucl Med* 1996; 37:24N-27N.
- Nauman J, Wolff J. "Iodide Prophylaxis in Poland After the Chernobyl Reactor Accident: Benefits and Risks." *Am J Med* 1993; 94: 524-532.
- "Potassium Iodide," CDC, <http://www.bt.cdc.gov/radiation/ki.asp>
- "Potassium Iodide Anti-radiation Pills FAQ," www.ki4u.com
- "Potassium Iodide Pills: Protection against radiation exposure," Mayo Clinic, <http://www.mayoclinic.com/invoke.cfm?id=CC00027>
- Robbins J, Adams WH. "Radiation Effects in the Marshall Islands." In: Nagataki S, ed. *Radiation and the Thyroid. Proceedings of the 27th Annual Meeting of the Japanese Nuclear Medicine Society*. Amsterdam, Excerpta Medica, 1989; 11-24.
- Robbins J, Schneider AB. "Thyroid Cancer following Exposure to Radioactive Iodine." *Reviews in Endocrine and Metabolic Disorders* 2000; 1:197-203.
- Rubery ED. "Practical Aspects of Prophylactic Stable Iodine Usage." In: Rubery E, Smales E., eds. *Iodine Prophylaxis Following Nuclear Accidents: Proceedings of a Joint WHO/CEC Workshop*. Oxford, Pergamon Press, 1990; 141-150.

Souchkevitch GN, Tsyb AI., eds. *Health Consequences of the Chernobyl Accident: Scientific Report*. World Health Organization, Geneva, 1996; 248-250.

Stepanenko V, Tsyb A, Skvortsov V, Kondrashov A, Shakhtarin V, Hoshi M, Ohtaki M, Matsuura M, Takada J, Endo S. "New Results of Thyroid Retrospective Dosimetry in Russia Following the Chernobyl Accident." In: Thomas G, Karaoglou A, Williams ED., eds. *Radiation and Thyroid Cancer*. Singapore: World Scientific, 1999; 333-339.

Stsjazhko VA, Tsyb AF, Tronko ND, Souchkevitch G, Baverstock K. "Childhood Thyroid Cancer Since Accident at Chernobyl." *BMJ* 1995; 310:801.

UNSCEAR. United Nations Scientific Committee on the Effects of Atomic Radiation. Sources, effects and risks of ionizing radiation 2000 Report to the General Assembly, with annexes, New York, N.Y., United Nations; 2000.

Williams ED, Becker D, Dimidchik EP, Nagataki S, Pinchera A, Tronko ND. "Effects on the Thyroid in Populations Exposed to Radiation as a Result of the Chernobyl Accident." In: *One Decade After Chernobyl: Summing up the Consequence of the Accident*. Vienna, International Atomic Energy Agency, 1996; 207-230.

World Health Organization, Geneva, *Guidelines for Iodine Prophylaxis following Nuclear Accidents: Update 1999*.

"Report on the Joint WHO/CEC Workshop on Iodine Prophylaxis following Nuclear Accidents: Rationale for Stable Iodine Prophylaxis." In: Rubery E, Smales E., eds. *Iodine Prophylaxis following Nuclear Accidents: Proceedings of a joint WHO/CEC Workshop*.

Zvonova IA and Balonov MI. "Radioiodine Dosimetry and Prediction of Consequences of Thyroid Exposure of the Russian Population Following the Chernobyl Accident." Pages 71-125 in : *The Chernobyl Papers. Doses to the Soviet Population and Early Health Effects Studies. Volume I* (S.E. Mervin and M.I. Balonov, eds.). Research Enterprises Inc., Richland, Washington, 1993.

The Radiation Detox Bath

The first thing people commonly recommend for detoxing any exposure to radioactive material is a hot Epson salt and Salt bath, or a Clorox water bath.

What? ... you've got to be nuts!

Nope, here's the scoop.

After a radioactive incident, doctors will usually rub you down with copious amounts of water to wash off any contaminants. They'll even vigorously scrub wounds with a special chelation agent in order to prevent radioactive materials from entering your body.

But what do you do at home?

What do you do if you've been working in a nuclear facility without gross contamination and just want to do as much as possible to detoxify the body of radiation exposure?

If we're talking about a nuclear accident, you get the scrub down as well and the shower washing to wash off contamination. I used to work in a chemical factory and they had emergency showers everywhere in case of contamination like this.

At home, however, I'm presuming the emergency or exposure is over and you're trying to detox yourself from contamination over years or months, so you take a therapeutic bath to try and pull any heavy metal toxins out of your skin!

Therapeutic bathing is another form of detox cleansing, especially as our skin is the major organ of elimination for the body.

Some people even suggest **niacin flushes** after radiation exposure to drive contaminants out from the skin but there's no evidence that niacin works to do that. Of course, since a niacin flush is pretty harmless (except for people with liver troubles) you always have that option to try if you are interested.

The idea behind therapeutic baths for radiation exposure was popularized by naturopath Dr. Hazel Parcells ([Live Better Longer](#)), "Grande Dame of Alternative Medicine."

Dr. Parcells had a medical degree in naturopathy and another in chiropractic (and two PhD.s -- one in nutrition, the other in religion), and lived to be 106. Over

the course of her life, she invented a number of “kitchen chemistry” remedies for all sorts of health conditions and having lived in New Mexico, she was particularly concerned with radiation and detoxed quite a few people of radiation exposure.

The idea of a therapeutic hot water bath is to first wash off any radioactive debris that might be clinging to the skin, and to also flush out of the skin cells any heavy metals they have absorbed through radioactive contamination.

Hot water bathing will draw toxins to the surface of the skin because of the change in temperature ... and as the water cools, the cool water will draw those toxins out of the skin. That's why you always have to stay in the water until it cools to get the benefits of this mechanism of therapeutic cleansing.

The Epsom Salt Bath

Here's the typical **Epsom salt bath** formula for detoxifying the body from general radiation exposure, such as from Cobalt-60 irradiated food, X-rays, or air flights where you are subject to high levels of ionizing radiation.

Dissolve 1 pound of sea salt or rock salt and 1 pound of baking soda in a hot bath -- as hot as can be tolerated -- and soak into the water until the bath becomes cool. This usually takes about 20-25 minutes. Afterwards, do not shower or rinse the salt off your body for 4-8 hours.

The Clorox Heavy Metal Bath

If you've been exposed to heavy metals or carbon compounds (carbon monoxide), insecticide sprays and chemicals, you can also take a hot water **Clorox bath** which tends to eliminate metallics from the body.

Just add 1 cup of regular Clorox bleach to a tub of hot water -- as hot as can be tolerated -- and once again soak in it until the water becomes cool or body temperature. Again, don't wash off for at least 4 hours and make sure you're using sufficient water.

Don't worry -- this amount of bleach in a large amount of water won't hurt you (be sensible and use lots of water and don't increase the bleach) but it will remove toxins from your skin, and you'll usually feel the energizing effects of the bath in a few hours.

For Extra Pull

If you've been exposed to low-grade radioactive materials from the atmosphere, you can dissolve 2 pounds of baking soda in a tub of hot water, and follow the previous instructions by staying in the water until it cools.

When taking this type of bath, you should also be sipping certain teas or alkalizing your body by mixing ½ teaspoon of baking soda in a glass of warm water and sip it during the bath.

With radioactive fallout, Parcells recommended a stronger mixture of drinking an **8-ounce glass of water** containing ¼-teaspoon **natural sea salt** (Chico-san brand) and ¼-teaspoon **baking soda**. According to the severity, this was to be drunk every 2-3 hours and each glass was to be taken with 3 tablets of **calcium lactate**, which is a very easy to absorb form of calcium.

If an individual seemed to be experiencing symptoms in the head, sinuses, chest, glands, neck, throat, they were to add ¼-teaspoon of **cream of tartar** to the mixture. Once again, don't shower for at least 4 hours after the bath.

Dr. Parcells claimed that the best time for this type of bathing was at night when the body was geared to detoxification, and said you should only do one bath per day. Don't mix the ingredients from different baths together, but follow the Parcells instructions for one bath at a time. You can alternate the baths on different evenings if you feel you have need for them all, though in a severe case you might do a baking soda bath in the morning and Clorox bath at night.

The radiation detoxification baths can be continued until you feel relief from radiation symptoms though you should remember to use common sense and cut back or discontinue them if they are too strong or unpleasant.

Regardless of what you think as to their usefulness, the baths are harmless yet recommended by a number of doctors and naturopaths to help detoxify the exposure to radiation from nuclear testing, nuclear accidents and leaks from nuclear power plants which is in our air, food, and water. Why? Because they help you shed excess heavy metals in the skin, and radioactive contaminants are heavy metals.

After radiation exposure I certainly would have nothing to lose from following this Epsom salt or Clorox bathing routine, which I once heard a student of Dr. Parcells explain was particularly effective in helping detoxify nuclear workers. The student said that her husband had a high level of radiation exposure and Dr. Parcells just kept him taking the baths, and drinking tea, until a few days later his radiation levels had dropped.

This is your first home radiation detox strategy, which is both cheap and easy and can be kept at until you feel better.

Though I cannot find any specific medical references verifying the treatment history, I've also been told that radiation detoxification baths containing specialty clays were used at Chernobyl and were found to help remove radiation from the body more quickly.

The idea of clay baths is also that the clay draws out heavy minerals from the skin, and the radioactive metals are the heaviest metals of all. Any type of internal or external heavy metal detoxification routine will probably prove useful for radiation detoxification, though of course some protocols will be more effective than others.

One new and interesting heavy metal detoxification protocol is the current use of the **ionCleanse** or **Befe** (Bio Electric Field Enhancement) device for foot baths that is supposed to draw heavy metals out of the body through the feet.

There are supposed to be laboratory reports available on the effectiveness of these ionic foot baths in reducing toxic metals from human blood and tissues, but I have not seen them and do not know whether -- even if the results were accurate -- the devices would be suitable for radioactive detoxification. Nevertheless I'm reporting on these devices because they may indeed work and the foot bath is an enjoyable experience.

Soon we'll turn to the clays as a form of radiation detoxification, but for now we'll turn to several well proven radiation detox techniques.

References:

Blazickova, S., Rovensky, J., Koska, J., Vigas, M., "Effect of Hyperthermic Water Bath on Parameters of Cellular Immunity," International Journal of Clinical Pharmacology Residents 20. 1-2 (2000): 41-6.

Boyle, Wade, ND and Saine, Andre, ND, Lectures in Naturopathic Hydrotherapy, Sandy: Eclectic Medical Publications, 1988: 17-18, 135.

Dispenza, Joseph, Live Better Longer, (Harper San Francisco, San Francisco, 1997).

Ernst, E., Pecho, E., Wirz, P., Saradeth, T., "Regular Sauna Bathing and the Incidence of Common Colds," Annals of Medicine, 22.4 (1990): 225-7.

Ioncleanse, <http://altcancer.silvermedicine.org/ioncleanse.htm>

Spirulina, Chlorella, and Seaweed

After the atomic bombing of Nagasaki and Hiroshima, a great many people died from radiation poisoning.

Strange enough, many hospital patients at St. Francis's Hospital in Nagasaki survived radiation sickness even though the hospital was only one mile from the blast site!

How?

Nagasaki Doctor Saves Hospital Patients and Staff with Sea Vegetables

At the time of the atomic bombing of Japan, Tatsuichiro Akizuki, M.D. was Director of the Department of Internal Medicine at St. Francis's Hospital in Nagasaki and fed his staff and patients a strict diet of **brown rice, miso and tamari soy soup, wakame, kombu and other seaweed, Hokkaido pumpkin, and sea salt** and **prohibited the consumption of sugar and sweets**.

Sugars and sweets were forbidden because they suppress the immune system!

Because of this diet -- which was rich in sea vegetables -- he saved everyone in his hospital while many other survivors perished from the radiation sickness. (Tatsuichiro Akuziki, M.D. Nagasaki 1945, London Quarter books, 1981).

Spirulina Saves Children of Chernobyl from Radiation Poisoning

Now let us turn to the nuclear disaster at Chernobyl, Belarus which produced radiation sickness in countless people.

When disaster struck with the 1986 reactor meltdown at Chernobyl in the Ukraine, approximately 134 plant workers and firefighters battling the fire at the Chernobyl plant were exposed to high radiation doses -- 80,000 to 1,600,000 mrem (800 to 16,000 mSv) -- and suffered from acute radiation sickness. Of these, 28 died within the first 3 months from their radiation injuries. Two more patients died during the first days as a result of combined injuries from the fire and radiation.

Not just the Ukraine, but the neighboring state of Belarus was also affected. It

received 70% of the radioactive fallout and 23% of its territory became contaminated with radioactivity.

In total, over 160,000 children and 146,000 cleanup workers became victims of radiation poisoning that produced higher incidents of birth defects, leukemia, anemia, cancers, thyroid disease, degeneration of spinal fluids, liver and bone marrow, and severely compromised immune systems.

A British company, Earthrise UK, is reported to have sent shipments of **spirulina tablets** and **spirulina powder** (spirulina is a super green sea algae) to clinics in Belarus for the treatment of children suffering from radiation sickness after Chernobyl. Earthrise sent shipments to the Children of Chernobyl Committee in Minsk and Soviet physicians used the supplements in clinics in Minsk and Grodno, Belarus as well as in Kiev, Ukraine.

By taking **5 grams of spirulina a day for 45 days**, the Institute of Radiation Medicine in Minsk found that the children showed enhanced immune systems and T-cell counts and *reduced radioactivity*.

The Institute also reported regeneration of bone marrow, spinal fluids, blood and the liver. Dangerously low white blood cell counts of about 1000, typical of leukemia, rose to an average of 3000 in 20 days, and the spirulina produced rapid improvements in the health of treated children compared to others who did not receive the algae.

In particular, **spirulina reduced urine radioactivity levels by 50% in only 20 days** time and so the Institute developed a special program to treat 100 children every 20 days with spirulina. Amazingly, health restoration was reported even when radiation sickness was so advanced that the children's eyeballs were bulging out of their sockets. Furthermore, the healing occurred during the continuous presence of radiation as well as the presence of radiation contaminated food and water sources.

Based on the Institute of Radiation Medicine in Minsk results, the Belarus Ministry of Health concluded that **spirulina accelerates the evacuation of radionuclides from the human body**.

In particular, spirulina given to children with accumulated high doses of radionuclides reduced radioactive cesium. No side effects were registered. The Ministry of Health considered spirulina advisable for the treatment of people subject to radiation effects and requested more spirulina from overseas.

The reports on these spirulina studies by the Belarus Hospital of Radiation Medicine can be found in BSSR Mission to the UN. "The Chernobyl Tragedy and the Children of Byelorussia" National Paper, World Summit for Children, Sep.

1990. and Correspondence from the Children of Chernobyl Committee, Minsk. 5/15/90.

A 1993 report confirms the 1990-91 research with spirulina on children with radiation sickness and concluded:

Use of spirulina decreases radioaction dose load received from food contaminated with radionuclides, Cesium-137 and Strontium-90. Spirulina is favorable for normalizing the adaptative potential of children's bodies in conditions of long-lived low dose radiation.

As a result of this and other successes in treating radiation poisoning, in 1994 a Russian patent was awarded for spirulina as a medicine to reduce allergic reactions from radiation sickness.

There is also a report that children, aged 3 to 7 years old in Beryozovka (near Grodno on the Polish border), also suffered from the radioactivity released from the Chernobyl accident. The children were also victims of lead poisoning due to the presence of a strong local leaded glass industry. When spirulina was given to 49 of these children for 45 days, the physicians also found T-cell suppressors and beneficial hormones rose. In 83% of the children, the radioactivity of the urine once again decreased.

To date, we don't really know why or how protection from radiation is exactly achieved by consuming spirulina. We just know it works. It has a high content of beta carotene that reduces free radical damage to cells and has even been used for treating cancer.

Spirulina is also extremely rich in highly bioavailable iron, which helps people recover from anemia. A significant portion of radiation sickness concerns the development of anemia, so eating anything that can help build the blood after radiation exposure would be helpful to the body.

Because it is extremely digestible, the super green algae spirulina also allows victims of malnutrition and malabsorption to absorb food more effectively and stems off those conditions. That's an important concern in radiation sickness as well, and a reason this should become part of the standard diet. It's chock full of nutrients and easy to digest and absorb when the body's abilities in these areas are their weakest.

Spirulina has also been shown to reduce kidney poisoning in rats from heavy metal poisoning and pharmaceutical drugs ("The effect of spirulina on nephrotoxicity in rats," Yamane Y, et al. Chiba Univ. Presented at Annual Symposium of the Pharmaceutical Society of Japan, April 15, 1988), and perhaps this heavy metal protective effect has a tie-in with binding and eliminating radionuclides.

The kidneys are usually some of the first organs to suffer damage in radiation toxicity, and research suggests when spirulina is taken with anti-cancer, antibiotic and painkilling drugs, toxic side effects to the kidneys can be significantly reduced and shorter recovery times may be possible.

That's another radioprotective tie-in.

Spirulina and other algae also contain high amounts of metallo-thionine compounds, which scientists think may strip the body of radioactive metals and protect against radiation damage. That may be the major beneficial process we've been looking for in order to put a name on it.

Research presented in Japan showed proteins combined with metals (metallo-thionine) had a strong protective effect from radiation, and since spirulina is a source of these compounds, that may help to explain its protective effects (Matsubara et al. "Radioprotective effect of metallo-thionine," presented at Radial Rays Conference, Tokyo Japan 1985).

Research from China in 1989 also showed that an extract of spirulina had a positive protective effect from gamma radiation, too ("Radioprotective effect of extract from spirulina in mouse bone marrow cells studied by using the micronucleus test," Qishen P, Kolman et al. *Toxicology Letters* 1989; 48: 165-169).

So we now have definite cases here where -- beyond the shadow of a doubt -- seaweeds and spirulina algae were found to help detoxification in cases of radiation poisoning.

The reasons, of course, are complicated but involve the presence of rich sources of iodine, an overabundance of minerals and vitamins that promote healing and a healthy immune system, and the ability of compounds within these sea plants to bind heavy radioactive substances and eliminate them from the body.

Here, now, is the specific research we've been seeking regarding other related foods you should eat that *specifically* bind radioactive substances within, and which will thereby help someone who suffers with immediate radiation poisoning.

Seaweeds Contain Sodium Alginate Which Binds Radioactive Compounds

In 1968 a group of Canadian researchers at McGill University of Montreal, headed by Dr. Stanley Skoryna, studied the question as to whether seaweed could help rid the body of radioactive toxins (Skoryna S.C. et al, "Intestinal Absorption of Radioactive Strontium," *Canadian Medical Association Journal* 191: 285-88, 1964).

Dr. Skoryna and his team were trying to devise a method to counteract the effects of nuclear fallout and reported that sodium alginate from brown algae "permitted calcium to be normally absorbed through the intestinal wall while binding most of the strontium. The sodium alginate and strontium was subsequently excreted from the body. The experiments were designed to devise a method to counteract the effects of nuclear fallout and radiation."

The key finding of this study was identifying that sea vegetables contained a polysaccharide substance -- called **sodium alginate** which is present in large quantities in brown algae such as Laminariae (kelp), Fucus (bladderwrack) and Ascophyllum (fertilizer seaweed) -- that *selectively* bound radioactive strontium and eliminated it from the body.

Sodium alginate (Alginic acid) is one of the important intercellular polysaccharides found in large brown algae like Kelp and Alaria, and was found to reduce the amount of strontium 90 absorbed through the intestinal wall. The study reported:

In laboratory experiments, sodium alginate prepared from kelp, kombu (Laminaria) and other brown seaweeds from off the Atlantic and Pacific coasts was introduced, along with strontium and calcium, into rats. The reduction of radio-active particles in bone uptake, measured in the femur, reached as high as 80% with little interference with calcium absorption.

So let's get this straight ...

Scientists at the Gastro-Intestinal Laboratory at McGill University in Montreal demonstrated that alginates derived from Laminaria could reduce by 50-80% the amount of radioactive strontium absorbed through the intestine.

We therefore have another winner ... another thing you should eat to detox your body of radiation exposure.

Sodium alginate, from sea vegetable sources, is something you definitely should be eating after exposure to radiation. When we look again at Tatsuichiro Akizuki's success in protecting his hospital staff and patients from radiation sickness, we now know part of the reasons why he was so successful.

In his book Fighting Radiation with Foods, Herbs and Vitamins (East-West Health Books, 1988), Steven Schechter, N.D. reports that the U.S. government has also performed research on the abilities of Kelp alginates to detoxify the body, and has produced findings similar to the Canadian research.

The EPA's own Environmental Toxicology Lab found that alginates from kelp could bind and help eliminate radionuclides such as Strontium 90 *and* heavy metals such as cadmium.

One example of an EPA experiment, conducted by J.F. Stara, showed that sodium alginate significantly reduced the amount of radioactive strontium in the bones of cats. Stara reported that radioactive strontium from the bones was re-secreted into the intestines, bound by the alginates, neutralized and then excreted in the feces:

The chemical pollution in air, soil and water is particularly serious, since the pollutants find their way into the food chain and their absorption into the body can be hazardous ... Our investigation has shown that alginate can bind radioactive strontium .. binds with other metal pollutants such as excess barium, cadmium and zinc.

This is why alginates have become a key component of many heavy metal detoxification supplements. Sodium alginate binds tightly to such substances as strontium, calcium, barium, cadmium and radium.

Cows have been fed sodium alginate, which binds to radioactive strontium 90, causing it to pass out of the body without any of it getting absorbed. Sodium alginate has also been used to treat the "ouch-ouch" or Itai-Itai-Byo disease of Japan (which causes painful joints) that scientists believe is caused by cadmium poisoning due to cadmium-containing water used to irrigate rice.

More important than cows, a combination of sodium alginate and egg-shell powder was also used in Russia to prevent radiation damage in children who had been exposed to cesium-137 (Sukhanov, B.P., et al. "Medical and biological evaluation of new food products for children exposed to excessive radiation." *Gig Sanit*, 1994 Sept-Oct; (8):24-26), once again proving the effectiveness of the ingredient.

In short, the ingredients within kelp can help alleviate past as well as present toxic contamination. In his book, Steven Schechter also said:

There is no family of foods more protective against radiation and environmental pollutants than sea vegetables ... sea vegetables can prevent assimilation of different radionuclitides, heavy metals such as cadmium, and other environmental toxins.

Schechter explains:

Alginate is non-toxic and is not reabsorbed into the rest of the body from the gastrointestinal tract. Alginate is specific and consistent in its reaction, is resistant to stomach acidity and the enzymes present

in the intestinal tract ... it has also been shown to have no adverse effect on the ability of humans to assimilate calcium and other natural minerals.

Additionally, Yukio Tanaka et. al. reported the following in "Studies on Inhibition of Intestinal Absorption of Radio-Active Strontium," (*Canadian Medical Association Journal* 99:169-75):

The evaluation of biological activity of different marine algae is important because of their practical significance in preventing absorption of radioactive products of atomic fission as well as in their use as possible decontaminators."

In 1974 a report was published by I. Yamamoto et. al. in the *Japanese Journal of Experimental Medicine*, (44: 543-46) wherein the scientists reported that several varieties of **Kombu Mojaban** (common sea vegetables eaten in Asia and traditionally used as a decoction for cancer in Chinese herbal medicine) were effective in the treatment of tumors in laboratory experiments:

In three of four samples tested, inhibition rates in mice with implanted sarcomas ranged from 89-95%.

In fact, the researchers reported that, "The tumor underwent complete regression in half of the mice in each treated group." Similar experiments on mice with leukemia have also shown promising results.

What this is suggesting is that all sorts of seaweeds can help after radiation poisoning.

If you asked me which one seaweed product I would take in case of an emergency. One stands out first and foremost. **MODIFILAN**. This is the one you should look into.

Made from kelp, it contains organic iodine, alginate and is a heavy metal chelator extraordinaire that boosts the immune system, helps decrease high blood sugar, detoxifies heavy metals such as heavy radioactive contaminants. And it's even made in the United States!

Seaweed Sales Skyrocket After Radiation Disasters

Some people already know all this, so after the Chernobyl nuclear disaster occurred in Russia, sea vegetable companies' sales shot up, especially sales of Kelp. Two weeks after the accident, all miso and seaweed disappeared from European store shelves. As to America, Shep Erhart, of Maine Coast Sea Vegetables (www.seaveg.com) told me that not only did sales jump about 20%, but both East and West coast seaweed producers collaborated to send a CARE package of brown algae to the survivors of Chernobyl.

Now you know why customers were so interested in consuming kelp and other sea plants ... It's because the studies have proven that the sodium alginate found in sea plants in the **kelp family** (**kombu**, **sea palm**, **wakame**, and others) can bind with radioactive strontium to pass it out of our intestinal tracts with the stool.

The Russians since then have been seriously researching the use of their own kelps from Vladivostok, from which they have isolated the polysaccharide **U-Fucoidan**, another radioactive detoxifier.

U-fucoidan is a polysaccharide found mainly in brown seaweed, and you can easily buy it as a supplement on the internet. Many seaweeds and sea plants -- such as **wakame**, **mozuku**, and **hijiki** -- contain U-fucoidan but **kombu** (*Laminaria japonica*) seems to be the richest in this substance.

Research has shown that U-fucoidan, when administered to cancer cells multiplying at uncontrolled rates, caused them to dissipate within 72 hours and helps the immune system in many ways.

Two American studies also found that fucoidan increases and mobilizes stem cells, which have the potential to transform into 200 different types of cells. Stem cells enable your body to replace dead cells, thereby enabling tissue and organ regeneration and slowing down the aging process. You want faster healing and repair after radiation exposure, so these facts may prove useful.

Now, you already know about the usefulness of potassium iodide (KI) in preventing the absorption of radioactive iodine after a radiation emergency, so the following information will be easy to understand.

Another very important function of the sea vegetables in helping our bodies fight radiation poisoning is the fact that they contain Iodine-127 which will be absorbed by our thyroid and thus prevent the uptake of radioactive, toxic Iodine-131.

Radioactive Iodine-131 has a constant background presence in our food, air and water supplies since it is given off from nuclear power plant emissions ... and because we are also regularly imbibing radioactive isotopes from the total world continual radioactive fallout from all nuclear weapons facilities and past nuclear "tests."

By therefore "loading" the thyroid with healthy iodine in the diet through sea vegetables like kelp, we can maintain our health even if fallout levels increase dramatically. This is how to help detoxify or protect your body even if there isn't a radiation disaster.

Most seaweeds are a very good nutritional source of Iodine-127, which is the form of iodine our thyroid gland needs for its proper functioning. Ryan Drum, Ph.D., points out that **bladderwrack** (*Fucus* species) provides di-iodotyrosine (DIT), which is a precursor to forming the essential thyroid hormones thyroxine (T-4) and tri-iodothyronine (T-3). By providing the immediate precursors for T-4 and T-3, *Fucus* seems particularly effective in treating both hypothyroidism and Graves hyperthyroidism.

Previously I recorded that after the Nagasaki bombing, people who ate a strict **macrobiotic diet** -- including **brown rice and miso soup with sea vegetables** - did not suffer from radiation poisoning even though they were within a mile of the explosion. The high iodine content of their diet must have been extremely helpful on this account because if proper amounts of natural "healthy" iodine already exist in the thyroid gland, then it cannot absorb any other forms of iodine, such as the radioactive iodine contaminant. They were already exposed to the blast, so it was too late to give KI tablets, and yet this "home remedy" produced remarkable results.

Perhaps the Edgar Cayce supplement, **Atomidine** (iodine trichloride or "detoxified iodine"), can be useful here as an iodine supplement as well. In any case, during nuclear war or atomic disasters, it is therefore wise to keep our thyroids full of natural, organic iodine by eating sea vegetables (and in particular kelp), which are the best food source of iodine.

The sea vegetables also show strong, heavy metal detoxifying properties and can eliminate a wide range of radioactive particles from the body, including Strontium-90 and Cesium-137. In short, they contain natural substances that can protect us from radiation-induced damage.

Other Benefits of Sea Vegetables

There are all sorts of non-radioprotective benefits as well that merit adding sea vegetables to your diet ... and starting it now so you know how to buy and prepare the products *before* an atomic emergency. Appendix 2 contains several recipes so that you can start to learn how to cook them.

Having lived in Asia for years, I have to tell you that once you get used to them, the sea vegetables are quite delicious.

Dr. Ryan Drum, Ph.D., states that our friend fucoidan is found in brown sea vegetables like **kelp** and **bladderwrack** and "is ... extremely anti-proliferative against cancer cells. It also interferes with every stage of viral attack such as cell attachment, cell penetration, and intracellular virion production." He also notes that it's interesting that all human cells actually have receptor sites for the end

sugar group on the fucoidan molecule (from his papers "Sea Vegetables and Seaweeds," and "Seaweed Therapeutics," PHWHS 2001).

Therefore, kelp and bladderwrack are on the list of probable consumables.

Bladderwrack (*Fucus vesiculosus*), **Kelp** (*Laminaria sp.*) and **Sargassum** also contain calcium and sodium alginates, that gel-like substance we've discovered binds to heavy metals such as lead, mercury, cadmium, barium, radium, plutonium, strontium and cesium in the gastrointestinal tract to form insoluble salts that are excreted in the stools (Tanaka, Y. et al. "Application of algal polysaccharides as in vivo binders of metal pollutants." *Proc Seventh Int Seaweed Symp*, 602-607, Wiley and sons, 1972.).

That's another reason for their ingestion.

Sea vegetables also provide the dietary benefit that they are 10 -20 times higher in vitamins, minerals and amino acids than plants grown on land, which makes them ideal foods to eat -- if you suffer from radiation sickness -- just from the absorbability factor alone.

Here are the nutritional specifics on several of these seaweeds.

Wakame is a long, thin seaweed -- about 20% protein by content -- that turns translucent green when cooked ...and you've probably seen it if you eat at Japanese restaurants because it is used in miso soup.

Arame is a thin, wiry, dark seaweed that is sweet to the taste that contains niacin, calcium, iodine, potassium and sodium whereas **hijiki** is a thicker, darker seaweed (with long black strands) that has a deep, ocean aroma and strong flavor.

Hijiki (or hiziki), **arame** and **wakame** contain 10 times the calcium of milk. Hijiki, by the way, has 8 times more iron while wakame and the other kelps four times more content.

There is also **sea lettuce** which has 25 times more iron available than beef, which would be useful in cases of radiation anemia.

Nori, which is the paper-thin, dark green seaweed sheet used at sushi bars for a sushi wrap or nori rolls, has a protein content as high about 30% of its weight (the highest of any ocean vegetable) and it is also high in vitamin A. It can be toasted or added to soups, stews, casseroles or crumpled over salads and put into dressings, spreads or desserts.

Dulse is a very common, reddish-purple sea plant native to the Atlantic seaboard that should also be considered. It is so commonly eaten in the Canadian coastal

areas that you can always find it in grocery stores. It is rich in vitamin A, C, iron and beta carotene. It has a nutty flavor and can be used like spinach or another leafy vegetable.

Kombu and **Kelp** (Laminaria species) are thicker, darker yellow-brown seaweeds that are the longest of the sea plants. They are tasty delicacies you can put in any soup, are used for thyroid troubles in China and Japan, and are known for containing alginic acid that absorbs toxic elements out of the body. They are known as the brown seaweeds.

The U.S. Atomic Energy Commission recommends that we consume **two to three ounces (wet weight) of sea vegetables per week, or two tablespoons daily to protect from radiation toxicity**. This should be increased fourfold during or after direct exposure to radiation (US Dept Health and Human Services. "Dietary aspects of carcinogenesis," Nov. 1981).

Thus, you've got another official source telling you to increase your seaweed and sea vegetable consumption during radiation emergencies.

An ounce of caution is in order — remember that too much of a good thing can be no good. When you consume excessive quantities of kelp over a long time it can cause acne, or an autoimmune thyroid condition known as Hashimoto's thyroiditis. Also, health authorities in America discourage people from collecting kelp and other seaweeds along the shoreline because they could be contaminated by industrial pollution.

Some seaweeds are contaminated with lead or arsenic so you only want to consume seaweed that is deep ocean harvested or has been tested to be free of metal toxicity (such as kelp from the west coast of South Africa), and should not exceed eating two tablespoons daily over the long-term.

Start to eat the seaweeds now before a nuclear emergency and find out where to buy them because I guarantee that in the time of an emergency, by the time you find them the store inventories will be deleted. You'll have to visit a Japanese or Korean restaurant and ask them for seaweed-miso soup to get your dose.

Here are some sources you might consider for the seaweeds and seaweed cookbooks to get started on this culinary quest:

- Maine Coast Sea Vegetables, 207-565-2907, www.seaveg.com
- Rising Tide Sea Vegetables, 707-964-5663, www.loveseaweed.com
- Mendocino Sea Vegetable Company, 707-895-2996, www.seaweed.net
- Sea Vegetable Celebration by Shep Erhart
- Vegetables from the Sea: Everyday Cooking with Sea Vegetables by Jil Gusman

Chlorella

While we've mentioned spirulina, there's one other algae that deserves some of our attention -- chlorella.

Chlorella is honestly a natural wonder food. It is the most researched algae in the world, and countless studies show it has a **radioprotective effect** to gamma-ray induced chromosomal damage as well as antitumor properties.

Listen to what chlorella can do for you: chlorella builds your immune system, detoxifies heavy metals, normalizes blood sugar and blood pressure, balances your body's pH and fights cancer, protects against ultraviolet radiation and due to its high chlorophyll content helps detoxify the liver, bowel and bloodstream.

People commonly mention five grass superfoods as being able to rejuvenate your body when you get sick or get cancer: **chlorella, spirulina, blue-green algae, wheat grass** and **barley grass**.

These are all excellent sources of nutrients, but chlorella has the highest **chlorophyll content** than these others. In fact, it has the highest chlorophyll content of any known plant! It has 5-10 times the chlorophyll content of spirulina, wheat grass and barley grass.

Chlorophyll should interest our attention because animal tests have been performed in that past that indicate a **chlorophyll rich diet increases the survival of experimental animals after lethal doses of radiation**. In 1950, Lourau and Lartigue reported that cabbage supplement (chlorophyll) increases the resistance of guinea pigs to radiation and further research by Duplan in 1953 confirmed these findings. Later still, the US Army has found that cabbage, broccoli and alfalfa reduced the effects of radiation on guinea pigs as well. Of course spirulina and chlorophyll have high chlorophyll contents, too.

Bingo, another winner!

The protein content of chlorella is also significantly higher than these other foods as well. Chlorella is about 60% protein while spirulina is 73%, blue green algae 56%, barley grass 14% and wheat grass about 18% protein. Gram for gram, it might be the most dense nutrient on earth, and since digestion is impaired after radiation exposure, chlorella is supplying your body with a lot of readily available nutrients for rebuilding purposes.

Chlorella and the other algae are also abundant in beta-carotene, which is known to prevent cancer and fight cancer in high doses.

Besides the abundance of a high chlorophyll content, chlorella's tough cell wall offers advantages not found in these other four algae or grasses, including spirulina. **Its cell wall has an outstanding ability to eliminate toxins, pesticides, and heavy metals from the body** ... which may extend to radioactive contaminants as the cellulose cell wall can bind with these particles and flush them out of the body.

Research has primarily been done on spirulina in this regard, but what I would do is take both of these supplements together upon radioactive exposure. In fact, the best standalone heavy metal remover I've ever found is called **NDF** (available from www.PureHealthSystems.com) and is made from chlorella cell wall concentrates, cilantro (proven heavy metal chelator), mushroom extracts (for immune boosting properties), and cell wall lysates and enzymes from beneficial bacteria also proven to be extremely powerful heavy metal chelators.

This stuff eliminates 920% more heavy metals per month than DMPS, the standard heavy metal chelator most nutritionists and naturopaths use, and in addition to eating chlorella and spirulina tablets or green powder drinks, it's exactly what I'd be taking to trap heavy radioactive metals and escort them out of my body. If I was in a battlefield situation or living near an atomic testing range, I'd be taking this stuff every day along with zeolites, as well, to bind any heavy metals.

Just as with eating the seaweeds, taking both chlorella and spirulina is a key portion of any radiation detox that I would include in any mini-protocol.

Chlorella's cell wall also has the ability to induce interferon production, which helps with immune function (which is extremely important during radiation sickness), but the most important thing is that its nucleus contains "**chlorella growth factor**" (CGF) that possesses fantastic rejuvenating effects and sets it apart from these other four superstars.

Experiments have shown that CGF stimulates both plant and animal cells to reproduce at a faster rate, which stimulates healing and would be critical after radiation exposure. After radiation exposure, you want new blood cells to be produced as rapidly as possible.

What's promising along these lines are two studies by Devi and a team of researchers demonstrated the ability of algae diets to stimulate the regeneration of blood serum and liver proteins in rats. (Devi M et al. "Serum protein regeneration studies on rats on algal diets." *Nutrition Research International*. 1979; 19:785 and Lahitova, N, Doupovcova M, Zvonar J, Chandoga J, Hocman G. "Antimutagenic properties of fresh-water blue-green algae." *Folia Microbiologica*. 1994; 39(4):301-3). Other studies show a hematopoietic effect as well.

As to the CGF, scientific experiments have found that CGF has incredible rejuvenating effects, which is what we want after radiation exposure. Chlorella is also extremely rich in the nucleic acids, RNA and DNA, and has a high content of nucleotides. We'll get to the importance of nucleotides in a later chapter.

If I was to eat anything at all after radioactivity exposure, I'd double up on this with spirulina and the other sea vegetables to eliminate radioactive contaminants from my system.

That would be my main strategy, but wait ... there's more.

Just for your general information, laboratory mice that were fed chlorella have obtained significant life span increases of over 30%, which many researchers feel is due to the CGF content.

In Japan, where chlorella is the most common supplement taken, it is frequently added to tea, soup, milk, juice, noodles, yogurt and just about anything else. Japanese physicians have found that ulcers heal faster when you eat it, and that wounds which were unresponsive to various treatments finally healed rapidly when the patients took oral doses of chlorella and Chlorella Growth Factor.

That's of use with radiation burns.

Several years ago, Japanese doctors also discovered that giving chlorella to cancer patients going through radiation therapy helped **prevent leucopenia**, which is a sudden drop in your white blood cell count and a major problem with radiation illness!

We went over this previously, so you already know that leucopenia leads to low resistance to infections, fatigue, low energy and respiratory conditions.

Doctors found that if chlorella was given in advance of the radiation (or chemotherapy) treatment, the white blood cell count would not drop as low and would bounce back toward normal more quickly than usual.

In short, upon exposure to radiation I would emphasize the algae and seaweeds for a whole variety of reasons. They've been proven in studies, in Nagasaki and Chernobyl, and in radiation therapy.

This is the way to go.

References:

"*Legacy of a Disaster.*" Time Magazine. April 9, 1990. 68-70. Marie Stetson. "*Chernobyl's deadly legacy revealed.*" World Watch, pg 9. Nov-Dec. 1990.

Abrams K. Algae to the Rescue. Logan House. 1996:32.

Altman LK. "*Anti-AIDS chemicals in algae: chemicals stop growth of AIDS virus in test.*" New York Times, 8/16/89, A1.

Apsley J. The Regeneration Effect. Genesis Communications. 1996:75.

Babu, M. et al. Evaluation of chemoprevention of oral cancer with spirulina. 1995. Pub. in Nutrition and Cancer, Vol. 24, No. 2, 197-202.

Baojiang, et al. Study on effect and mechanism of polysaccharides of spirulina on body immune function improvement. G. April 1994. South China Normal Univ. China. Pub. in Proc. of Second Asia Pacific Conf. on Algal Biotech. Univ. of Malaysia. pp 33-38.

Belookaya T, Belarussian Comm. "Children of Chernobyl", Corres.5/31/91.

Ben-Amotz A et al. Effect of natural beta-carotene supplementation in children exposed to radiation from the Chernobyl accident. *Radiation Environmental Biophysics*. October 1988; 37(3):187-93.

Ben-Amotz A et al. Natural beta-carotene and whole body irradiation in rats. *Radiation and Environmental Biophysics*. November 1996; 35(4):285-8.

Besednova L, et al Immunostimulating activity of lipopolysaccharides from blue-green algae. . 1979. Pub. in Zhurnal Mikrobiologii, Epidemiologii, Immunobiologii, 56(12) pp 75-79.

Bewick E et al. *Chlorella: The Emerald Food*. Ronin Publishing, 1984: 20.

Bojkum N. "*Chernobyl's dying children*". S.F.Examiner, 4/25/91:A1.

BSSR Mission to the UN. "*The Chernobyl Tragedy and the Children of Byelorussia*" National Paper, World Summit for Children, Sep. 1990.

Colloway S, "Reduction of X-radiation mortality by cabbage and broccoli," *Proc Soc Exp Biol Med*, 1959, vol 100, p. 405.

Colloway S et al. *Quartermaster Food and Container Institute for the Armed Forces Report*, NR 12-61, 1961.

Corres. from K. Miyakawa. "*Improved determination of sulfolipids in spirulina.*" 5/91.

Corres. from the Children of Chernobyl Committee, Minsk. 5/15/90.

Dillon JC, Phuc AP, Dubacq JP "Nutritional value of the alga Spirulina." World Rev Nutr Diet 1995 77 32-46 .

Duplan, "Influence of dietary regime on radiosensitivity of the guinea pig," *Compt Rend Acad Sc* 1953, vol. 236, p. 424.

Dubovina et al. Protective action of alginic acid and sodium alginate on the receipt by the body of radioactive elements through gastrointestinal tract, *Gig Sanit*, May 1969, no. 5, pp. 105-107.

Evets L., et al. "Means to normalize the levels of immunoglobulin E, using the food supplement Spirulina." 1994. Grodenski State Medical Univ. Russian Federation Committee of Patents and Trade. Patent (19)RU (11)2005486. Jan. 15, 1994.

Gustafson K, et al. AIDS-Antival sulfolidis from cyanobacteria (blue-green algae), 1989. Pub. in Journal of the National Cancer Institute, August 16, 1989, pg 1254.

Hayashi, et al. Enhancement of antibody production in mice by dietary spirulina. June 1994. Kagawa Nutrition Univ. Japan. Pub. in Journal of Nutr. Science and Vitaminology.

Karpov L et al. The postradiation use of vitamin-containing complexes and a phycocyanin extract in a radiation lesion in rats. *Radiats Biol Radioecol* (Russian). May-Jun 2000; 40(3):310-4.

Kataoka N. Glycolipids isolated from spirulina. by, et al. 1983. Pub. in Agric. Biol. Chem. 47(10), 2349-2355.

Kumar S et al. Inhibition of radiation-induced DNA damage in plasmid pBR322 by chlorophyllin and possible mechanism(s) of action. *Mutation Research*. March 1999; 425(1):71-9.

Lisheng, et al Inhibitive effect and mechanism of polysaccharide of spirulina on transplanted tumor cells in mice.. 1991. Pub. in Marine Sciences, Qingdao, N.5. pp 33-38.

Loseva L.P. and I.V. Dardynskaya "Spirulina- natural sorbent of radionucleides." Sep 1993. Research Institute of Radiation Medicine, Minsk, Belarus. 6th Int'l Congress of Applied Algology, Czech Republic. Belarus.

Lourau M and Lartigue, *Experientia*, 1950, vol. 6, p. 25.

Matsubara et al. "*Radioprotective effect of metallo-thionine.*" Presented at Radial Rays conf., Tokyo Japan 1985.

Mitsuda H. J "Protein isolates from Chlorella algae." Nutr Sci Vitaminol (Tokyo). 1973; 19(1): 1-3

Needleman H, Landrigan P. Raising Children Toxin Free, Avon Books, 1994: 138.

Parks M. "*Chernobyl: The full impact of the nuclear nightmare is just beginning to emerge.*" Los Angeles Times, Orange County, April 23, 1991.

Pilugin N. "*Four years later, Chernobyl festers.*" S.F.Examiner, 4/26/90:A19.

Portoni B. et al. "Immune response activation in channel catfish *Ictalurus punctatus* fed spirulina enriched artemia." 1996. American Fisheries Society Fish Health Section.

Qishen P, Guo B, Kolman A. Radioprotective effect of extract from *Spirulina platensis* in mouse bone marrow cells studied by using the micronucleus test. *Toxicology Letters*. August 1989; 48(2):165-9.

Qishen, P. et al. Enhancement of endonuclease activity and repair DNA synthesis by polysaccharide of spirulina. 1988. Pub. in Chinese Genetics Journal, 15 (5) 374-381.

Qureshi M., et al Immunomodulatory effects of spirulina supplementation in chickens. . May 1995. North Carolina State. Pub. in Proc. of 44th Western Poultry Disease Conference, pp 117-120.

Qureshi M., et al. Immune enhancement potential of spirulina in chickens. August 1994. Poultry Science Assoc. Dept. of Poultry Science, North Carolina State, NC. Pub. in Journal of Poultry Science Vol 73, S.1. p. 46.

- Qureshi M., et al. Phagocytic potential of feline macrophages after exposure to a water soluble extract of spirulina in vitro. January 1996. Pub. in Immunopharmacology. in press.
- Qureshi M., et al. Spirulina extracts enhances chicken macrophage functions after in vitro exposure. 1995. Pub. in Jour. Nutritional Immunology, No. 3 (4) 35-45.
- Rotkowska D, Vacek A, Bartonickova A. The radioprotective effects of aqueous extract from chlorococcal freshwater algae (*Chlorella kessieri*) in mice and rats. *Strahlenther Onkologie*. November 1989; 165(11):813-6.
- Rotkowska D, Vatssek A, Bartonichikova A. Increase in the radiation resistance of mice using *Ivastimul*. *Radiobiologiya* (Russian). Sep-Oct 1989; 29(5):652-4.
- Sarma L, Tiku A, Kesavan P, Ogaki M. Evaluation of radioprotective action of a mutant (E25) form of *Chlorella vulgaris* in mice. *Journal of Radiation Research* (Tokyo). December 1993; 34(4):277-84.
- Schwartz J, G. Shklar, et al. Prevention of experimental oral cancer by extracts of spirulina-dunaliella algae. 1988. Harvard School of Dental Medicine. Pub. in Nutrition and Cancer, 11, 127-134. 1988.
- Schwartz, et al. Inhibition of experimental oral carcinogenesis by topical beta carotene. 1986. Harvard School of Dental Medicine. Pub. in Carcinogenesis, May 1986 7(5) 711-715.
- Singh S, Tiku A, Kesavan P. Post-exposure radioprotection by *Chlorella vulgaris* (E-25) in mice. *Indian Journal of Experimental Biology*. August 1995; 33(8):612-5.
- Skoryna SC et al. Suppression of intestinal absorption of radiostrontium by substances occurring in phaeophyceae, *Proceedings of the Fifth International Seaweed Symposium*, August 25-28, 1965, Pergamon Press, 1966, pp. 396-399.
- Skoryna SC et al. *Canadian Medical Association Journal*, vol 91, 1964, p. 285.
- Sokolovskiy V, First Secretary BSSR Mission to the UN, Corres.5/20/91.
- Strata JF. "Metabolism of internal emitters--repressive action of sodium alginate on absorption of radiostrontium in kittens," *Abstr Symp Nuc Med*, Omaha 1965.
- Sutton A, et al. Medical Research Council, Haswell, England. Rduction in the absorption of dietary strontium in children by an alginate derivation, *Intl Jor Rad Biology*, 1971, 19: 79-85.
- Tanaka Y, Waldron-Edward D and Skoryna SC, *Canadian Medical Journal Association Journal*, vol 99, 1968, pp. 169-175.
- Tanaka Y, Skoryna SC, and Waldron-Edward D, *Canadian Medical Journal Association Journal*, vol 99, 1968, pp. 1179-82.
- Tokai Y et al. "Effects of spirulina on caecum content in rats" 1987. Chiba Hygiene College Bulletin. Feb. 1987 Vol. 5, No. 2.
- Umegaki K, Takeuchi N, Ikegami S, Ichikawa T. Effect of beta-carotene on spontaneous and X-ray-induced chromosomal damage in bone marrow cells of mice. *Nutrition and Cancer*. 1994; 22(3):277-84.
- Vacek A, Rotkowska D, Bartonickova A. Radioprotection of hemopoiesis conferred by aqueous extract from chlorococcal algae (*Ivastimul*) administered to mice before irradiation. *Experimental Hematology*. 1990; 18:234-37.

Weiss J, Landauer M. Radioprotection by antioxidants. *Annals of the New York Academy of Science*. 2000; 899:44-60.

Yamane Y, et al. The effect of spirulina on nephrotoxicity in rats 1988. Chiba Univ. Presented at Annual Symposium of the Pharmaceutical Society of Japan, April 15, 1988.

Zhang Cheng-Wu, et al.. Effects of polysaccharide and phycocyanin from spirulina on peripheral blood and hematopoietic system of bone marrow in mice April 1994. Nanjing Univ. China. Pub. in Proc. of Second Asia Pacific Conf. on Algal Biotech. Univ. of Malaysia. p.58.

Bathable and Edible Clays for Radiation Detox

We want to know about all sorts of substances useful in the management of radiation detoxification, so we now come to the topic of edible clays.

Clays are particularly known for their ability to remove toxic metals from the air, water, and soil because of their unusual structure of “pores” (channels and holes) that allows them to absorb huge amounts of contaminant materials.

Toxic gases, chemicals, mold, heavy metals, and other toxins are drawn by the natural negative electrical charge into the crystal micro pores of the clay. The unique structure of clay provides literally millions of pores or sieves -- “shape-selective catalysts” -- that catch only molecules small enough to fit into the cavities while excluding larger molecules.

The unique structure of clays therefore gives them unusual filtering capabilities for absorbing toxic wastes, including radioactive contaminants.

In just one gram of **zeolite clay**, for instance, the three dimensional structure of the channels in its crystalline structure provide up to several hundred square meters of surface area on which absorption (and chemical reactions) can take place. The zeolites are particularly useful for removing heavy metals and radioactive species from water.

The way zeolite chelates out heavy metals is that within the structure of the zeolite molecule there are certain “structural cages” with positive ionic charges. The ionic charges within these cages attract heavy metals – such as cesium, strontium, uranium, mercury, etc. -- and the caged structure of zeolite tightly binds them. Next, these caged and binded heavy metals are excreted from the body without getting deposited in other places.

For an edible purified zeolite product like “**Natural Cellular Defense**,” it’s reported that 40% of ingested zeolite binds the heavy metals in the gastrointestinal tract, and 60% binds toxins in the bloodstream. At the Chernobyl disaster site, the crystalline structure of zeolites was used to trap and remove radioactive cesium and strontium-90 from the system of affected individuals.

While you can take an Epsom salt or Clorox bath, you can also take a radiation detox bath of zeolite clay that’s formulated with special herbs for the process. At www.blessedbaths.com you can find ordering information for the **Zeo-rad Detox Bath** which contains zeolite clay.

Clay has been used as a medium for air filters and water filters for ages. It is environmentally friendly for waste dump sites and has been used as a filter medium not only for the removal of heavy chemical toxins and heavy metals such as iron, zinc, cadmium, lead, and copper from individuals but for the removal of radioactive wastes. But what we really want to know is that clay has been used successfully for the extraction of radionuclides from human beings and animals as well.

First a bit about radioactive disposal.

All nuclear waste is mixed with zeolite clay before packaging and stored underground because it helps prevent radioactivity from seeping into the ground after prolonged storage. Surprisingly, zeolite clays are stable even under the highest levels of radiation, a fact proven after the fission reactor meltdowns at both Three Mile Island and Chernobyl where zeolites were used to mop up the waste caused by the accidents. In some cases they even become stronger.

The British Nuclear Fuels (BNF) also uses a specific type of zeolite clay to remove radioactive strontium and cesium-137 and, therefore, reduce the radioactivity of liquid waste discharged into the Irish Sea. The Hanford, Washington nuclear weapons facility uses clay to prevent contamination as well.

Basically, nearly all nuclear storage facilities are lined with clay to prevent contamination. Why? Because clay can absorb radioactive toxins and bind them.

A Swedish study showed another kind of zeolite could decontaminate live animals and meat affected by the Chernobyl disaster.

Many people have heard about the dietary or edible clays (**bentonite, Kaolin, Red Clay, Fuller's Earth, French Green Clay, Montmorillonite, etc.**) and in particular **bentonite clay**, which is often part of colon cleansing routines because it can absorb heavy metals and contaminants in the intestines. You can easily buy **liquid bentonite** (hydrated bentonite) in health food stores for these purposes.

There are over 200 different types of bentonite clay, and the problem with many of these bentonites is that they have an extremely high aluminum content, so you do not want to be ingesting them on a *frequent basis*. Years ago the same high alumina content problem existed with various colloidal mineral solutions in that they were chock full of heavy metals that people were ingesting. I had some spectroscopic studies of these performed and found the alumina contents at the time were off the charts!

As to the clays, some bentonite clays are composed of 65-75% aluminum, but once again it depends on the clays.

Putting that particular concern aside, the composition of the bentonite clay particles creates a large surface area in proportion to the volume of the clay and the greater the surface area, the greater its power to pick up positively charged particles or toxins ... including heavy metals ... and to suck them out of the body. That's why you would use them in a detoxification bath.

It's been reported that Russian scientists also used bentonite clay to protect their bodies from radiation when working with nuclear material. What I heard is ingenious. **They would first coat their hands and bodies with a hydrated bentonite mush mixture before donning radiation suits, and presumably the clay would help trap and stray radiation particles. Afterwards they would just wash it off.**

Bentonite adsorbs radiation so well that it was the material used to dump on top of the Chernobyl nuclear power plant after the nuclear meltdown in the former Soviet Union.

The fallout after Chernobyl in other countries was so great that livestock kept out in some areas were deemed not eatable at the radiation level. It's reported that by **feeding the cattle bentonite clay** for some time before "harvesting," farmers were able to get the level down to normal and acceptable levels.

Internet sites report that U.S. Army studies also show that bentonite may be a successful treatment for exposure to chemical warfare and that one Army emergency livestock protocol calls for immediate administration of bentonite internally to counter effects of radiation poisoning in livestock. However, I have not been able to track down these specific reports and studies or any confirming reports on clay's usefulness in post-radiation exposure treatment though its medicinal properties are well recognized.

As a side comment, I have also seen recipes for dogs and cats composed of water, aloe vera juice, powdered dulse or kelp, Brewer's yeast, apple cider, ground rosemary and vitamin E that are recommended as a radiation detox cocktail, too. So clay isn't your only option. The big option is chlorella and chlorella cell wall extracts, which also bind heavy metals.

Bentonite will bind and take out a great number of nasty stuff from anything living, but you have to be careful about using clays for baths or internal consumption when they have a high alumina content.

LL's Magnetic Clay Baths has a superior **Environmental Detox Bath**, composed of **bentonite clay** with less than .5% aluminum content and no emulsifiers, that is useful for heavy metal detox and also to remove radiation.

With bentonite clays, you can even form thick clay compresses to wrap around certain locations of the body.

As with all clays, the more you use, the quicker you tend to detox. The **Environmental Detox Bath** is another possibility for any heavy metal detoxification routine you decide to undertake and is actually stronger than **Zeorad Bath**. This type of general purpose detoxification bath is usually taken just once a week for 6-10 weeks.

There's also **French Green clay**, which like bentonite clay has been used as an internal detoxification supplement for hundreds of years to remove disease symptoms. It has the ability to remove toxic metals and chemical residues, bacteria, and blood toxins with virtually no side effects of constipation, diarrhea, or stomach cramping and is also known to remove radiation, arsenic, lead, mercury, and aluminum amid other toxic metals in less than six weeks.

It's said that after the meltdown of the Chernobyl Soviet nuclear power plant in 1986, the Soviet Union put French Green clay in chocolate bars and dispensed them freely to the masses to remove radiation they may have been exposed to.

Whether it was truly French Green clay or a zeolite or bentonite clay I cannot confirm, but the point is that clay can be consumed for internal detoxification of radioactive particles because it tends to trap the particles in the gut and escort them out the body. The problem with most French Green clays is the frequently high alumina content once again, which most people do not check for yet which can create problems for environmentally sensitive people. For emergency situations, however, I think the point is moot.

If I had to ingest an internal clay and I had my choice, however, I would use a very pure **Pascalite** clay for internal detoxification consumption, or **Aulterra** clay if available. **Aulterra Clay**, which you can buy from www.spiritsupplements.com is also said to assist in the removal of the effects of radiation. You only need a few capsules or one teaspoon in a glass of water for internal detoxification purposes.

So there you have it -- another way to help detox after radioactive exposure is to eat the consumable clays which will bind radioactive particles in your intestine. They'll bind all sorts of other things as well, as does charcoal and all sorts of other supplements like chitosan (which latches on to heavy metals, amino acids and fat, which you may or may not want if you are trying to recover from radiation exposure) or even pectin. Charcoal, for instance, is known to be able to filter radioactive iodine from the air in air filter and medicinal charcoal that's ingested is often used to treat poisonings because it can absorb toxins.

Clays are sometimes fed to livestock when contaminated, and the consumption of clays by humans has been used for centuries to help remove toxins from the body. Clay consumption certainly won't hurt when you eat the right type, and offers the potential to trap some toxic materials when other alternatives are not readily available.

One more thing -- a few more words on clay baths ...

In Using Energy to Heal, Wendell Hoffman claims that a special bentonite clay used in a bath can actually draw out toxic chemicals through the pores of the skin and after many experiments, he came to the same conclusions as Hazel Parcells in that the optimum results are obtained by soaking in a tub of very warm water mixed with a special bentonite clay for 20 minutes!

For a clay bath to be of any use, not just any clay will do. There are hundreds of different bentonite clays -- ranging from health store brands such as AZTEC Healing Clay to expensive green clays -- and each one has different chemical compositions and purposes as I have stated. Many clays sold at health food stores contain chemical emulsifiers, defeating the whole purpose of the bath and many clays are very high in aluminum. Bentonite clays can vary tremendously in their ability to pull out toxic metals and chemicals.

Which one is best?

Without studies in front of me, all I can tell you is that specially formulated clay baths have been shown to be able to literally pull pollutants out like a magnet, getting rid of years of toxic accumulation in just one bath.

Usually you'll see a dark residue in the clay after the very first time you use it in a bath, and people normally take 6-10 baths (once per week) for regular detoxification purposes. Try www.magneticclay.com and www.blessedbaths.com for two options you can consider.

Various detoxification results can be achieved much more quickly when you use baths (whether clay or Epsom/Clorox) together with seaweed/chlorella/spirulina consumption.

Therefore, you might want to take a clay bath now just to see what they are like because they can really help your body as part of an overall detoxification regime.

References:

Barth, J., Mikalis, A.N., Harris, J.Y., Bruckner, B.H. "Evaluation of Clays as Binding Agents for Reduction of Radionuclides in Milk. Effect of Belle Fourche Bentonite on excretion in lactating goats," *J. Agr. Food Chem.* 17: 1347-9 (Nov-Dec 1969).

The Canadian Journal of Microbiology, Vol. 31, 1985, pp. 50-53, 1985.

Ibrahim IK, Shareef AM, et.al. "Ameliorative effects of sodium bentonite on phagocytosis and Newcastle disease antibody formation in broiler chickens during aflatoxicosis." *Res Vet Sci* 2000 Oct; 69(2):119-22

Shirley's Wellness Café <http://www.shirleys-wellness-cafe.com/clay2.htm>
Natural Detoxification, <http://www.tuberose.com/Detoxification.html>

Homeopathics for Radiation Injury

And now we come to homeopathics, or more properly, "homeopathic remedies" for radiation protection and treatment.

Homeopathy is a branch of medicine based on the principle of "like cures like." In homeopathy, the symptoms of a sick person are treated with extremely small doses of a medicine (doses so small they are "non-existent" by normal allopathic standards) that would bring about the same symptoms in a healthy person who received a full dose of that medicine.

In other words, homeopathic microdoses of a substance act with an oppositizing effect to the full dose of that substance.

Most homeopathic remedies are made from products found in nature. The medicines are extremely diluted with each dilution termed a "c" or "x" (representing the Roman numerals for a 1/100th or 1/10th dilution), so that only minute amounts are administered.

In homeopathy, the treatment is very individualistic and people presenting with the same condition may be treated differently according to the individualistic needs of their bodies. Learning homeopathy is extremely demanding, and people are not advised to self-administer homeopathic remedies except for very simple cases.

There are literally hundreds of hospitals in India that primarily use homeopathics to cure patients, the Royal Family of England depends upon homeopathic physicians, and the United States used to be crawling with homeopathic doctors until the AMA did everything possible to eliminate them (it vehemently pursued chiropractors as well).

Obviously, somebody thinks (or knows) that homeopathic medicine works!

In actual fact, countless replicated double blind studies -- the gold standard of the medical establishment -- prove beyond the shadow of a doubt the usefulness of homeopathic medicines. These studies cannot be ignored, unless you try, which is what people do because they cannot explain them.

You can also take a homeopathic remedy yourself and get results that are definitely NOT a placebo effect and yet, the regular medical establishment still ignores and disparages these reports as nonsense ... despite various studies

that prove the effect of microdoses on physiological functions beyond the bounds of placebo, etc.

Why deny that they work?

People tend to reject whatever they cannot understand (homeopathics being one such item because they do *not* work according to the presently accepted allopathic medical paradigm), and therefore the medical establishment rejects them entirely rather than broaden its own paradigm.

That's what happens when people don't know why something works (Gosh, we didn't know why aspirin worked for over 100 years until the 1990's). The fact that homeopathic medicines are dirt cheap -- and I mean *cheap* -- probably plays some role in this as well since they represent a threat of an extreme kind to the pharmaceutical establishment if they caught hold.

How and why do homeopathics work?

This is not the place to go into that. There are hundreds of internet articles and books that offer explanations. Frankly, all you and I are interested in are practical results and in particular, **how to use homeopathic remedies for radiation detox or protection if indeed they can be helpful** -- and there's hope on those accounts.

That's what we're going to concentrate on, but first, I want to go into just one interesting homeopathic study where a thyroid hormone homeopathic remedy, Thyroxine 30c, was placed in water containing developing tadpoles.

When they compared these homeopathic-exposed tadpoles to those tadpoles who were exposed to a placebo, the study showed that the morphogenic transformation of the tadpoles into frogs was actually slowed for those who were exposed to the homeopathic doses!

This is what one would expect if homeopathy indeed worked because the homeopathic remedy would produce the opposite effect of the originating substance. In other words, because thyroid hormone is well-known to speed up morphogenesis, it makes perfect sense -- from a homeopathic perspective -- that homeopathic thyroid hormone doses would slow it down.

In treating radiation, we'd also similarly want to take the homeopathic potencies (preparations, remedies or cures) of the radioactive substances to which we were exposed because it would tend -- if homeopathics do indeed work in this field -- to produce the opposite effect.

There's another interesting aspect to this hormone study in that when a glass bottle of the homeopathic thyroid hormone dosages was simply suspended in the

water with the lip of the bottle above the water line, the same results were produced.

This research was replicated at several other laboratories, which confirmed the same amazing results!

What this all implies is that the biological effects of homeopathy might in part be due to some type of radiational effect through the glass, which suggests some new areas of research if scientists ever wanted to look this way. While homeopathic remedies are certainly not radioactive, homeopaths have theorized that the method of succussion or trituration that produces the remedies releases some force from drugs analogous to radioactivity, although it works on the level of the "chi" or life force.

Well enough of that. Time for "radiation therapy" using homeopathy.

There's been quite a bit of homeopathic research to explore its possibilities in protecting against radiation. (Khuda-Bukhsh AR, Banik S, "Assessment of Cytogenetic Damage in X-irradiated Mice and its Alteration by Oral Administration of Potentized Homeopathic Drug, Ginseng D200," *Berlin Journal of Research in Homeopathy*, 1991, 1, 4/5:254. Also Khuda-Bukhsh AR, Maity S, "Alteration of Cytogenetic Effects by Oral Administration of Potentized Homeopathic Drug, Ruta graveolens in Mice Exposed to Sub-lethal X-radiation," *Berlin Journal of Research in Homeopathy*, 1991, 1, 4/5:264).

For instance, in one famous study albino mice were exposed to 100 to 200 rad of X-rays (sublethal doses) and then evaluated later after a period of 24, 48, and 72 hours. Two homeopathic medicines -- in particular Ginseng 6x, 30x, 200x and Ruta graveolens 30x and 200x -- were administered to the mice both before and after the radiation exposure. When those radiation exposed mice were compared with mice simply given a placebo as treatment, it was found that the homeopathic treated mice had *significantly less chromosomal or cellular damage*, which is exactly what we're after.

Another study involved homeopathics and albino guinea pigs.

The guinea pigs were exposed to small doses of X-rays, which caused reddening of the skin as radiation exposure normally does. The studies showed that Apis mellifica 7c or 9c had a radio-protective effect and a roughly 50% curative effect on X-ray-induced skin redness skin.

That's fine and dandy for tadpoles, mice and guinea pigs, but what about specific homeopathic remedies for a radiation reaction or injury?

Some of the following homeopathic remedies we'll go over can be used for radiation and uranium workers, but first a note about dosing.

Homeopathic Doses

Generally speaking, 30c and 200c are good homeopathic potencies to use, though you do not have to limit yourself to them as both higher and lower potencies may be employed. The actual potency a homeopath will use will depend on many factors too long to discuss, so we are only providing general emergency indications.

The 30c potency is a common dosage but for any homeopathic remedy ... and especially as regards a complicated case such as radiation exposure or poisoning ... you have to consult an experienced homeopathic practitioner for the right dosing option. Homeopathics, with self-treatment, can produce severe reactions despite what allopathic doctors say is nonsense as to their effectiveness.

In general, 30c or 200c homeopathic potencies can usually be taken +/- 3 times daily so long as the symptoms seem to improve as per the laws of homeopathy. According to standard homeopathic expectations, generally improvement in conditions should be seen with a correctly chosen remedy within 2-3 days in order to continue the chosen remedy.

Although some remedies require a single dosage repeated once a month for several months, and some will recommend several doses a day for a week or two ... possibly repeated a couple months later if there is no full recovery. If no improvement is seen you must consult your practitioner or medical doctor. Your homeopathic practitioner should be consulted for any questions regarding dosage or choice of remedy in individual cases.

The general ionizing radiation detox remedy I recommend for most people is **N-4 Radiation Antitox**, produced by **Apex Energetics** (1-800-736-4381), for symptoms related to radiation exposure (X-rays, geopathic stress, and electrodynamic stress). If there is no radiological emergency (such as a nuclear accident or atomic detonation) and you just want to do a radiation detox, this is a great first thing to try.

Along these lines of too much normal radiation exposure, many people are sensitive to working under **fluorescent lights** because of a specific kind of radiation they give off. The famous light researcher, Dr. John Ott, found that replacing fluorescent bulbs with **full spectrum bulbs** (which have been shielded with lead tape on the ends because of a harmful radiation given off), can often solve headaches, learning problems and other problems.

Some people who work under fluorescent lights all day long complain of aching legs, and a bath containing a hand of sea salt has been anecdotally known to help cure aching legs in 2-3 days.

Now with uranium exposure, the kidney is usually the first organ to show signs of chemical damage. In hospitals for emergency radiation treatment, oral doses or infusions of sodium bicarbonate help alkalize the urine, thereby promoting the excretion of the nontoxic uranium carbonate complex, and are therefore used.

The homeopathic drainage formula made by **Pekana**, **Renelix**, which is probably the best kidney drainage formula in the world, can be used at this time to help the kidney with excretion and without interfering in any allopathic modalities. You can order it from **DrNatura.com** (800-877-0414) or from other internet sites.

The **Apex kidney R-4 Kidney REGENRX** formula is also useful for rebuilding the kidneys afterwards, and is one of the most powerful kidney rebuilding formulas I know of.

As to specific radiation remedies, the following guide to homeopathic provings will be useful in selecting a particular remedy for the problems of radiation sickness:

RADIUM BROMATUM (radium bromide) can be used for illness resulting from radium, radiation burns and X-ray exposure. It can be used in the event of a radioactive release in your area because it can be helpful in counteracting the effects of exposure as well as in treatment of any radiation injuries you may sustain.

In the event of radioactive release, homeopaths recommend taking one daily dose of a 30c or 12c potency as long as the threat of radiation exposure exists, although naturally the best option is to evacuate the area immediately. Some homeopaths recommend up to 10 drops or 5 pellets taken three times a day with severe radiation exposure.

This remedy may be useful for all sorts of skin affections including x-ray caused radiation burns, dermatitis, radium burns, eczema, psoriasis, scleroderma, ulcers, and cancers. Radiation exposure will often cause skin burns, so this remedy may be of assistance in those cases. It is often prescribed for the depletion of energy and burning sensations of the skin after X-rays or radiation therapy to help counteract any side-effects of the treatment.

In general, symptoms calling for this homeopathic remedy involve cases of skin itching all over the body with burning skin, swelling and redness, necrosis and

ulceration -- an itchy burning of skin, as if on fire (burning heat), often with swelling, small pimples and ulceration that takes a long to heal.

When homeopathic radium bromatum is used because of an atomic or nuclear blast, the dosing schedule depends on how close you were to a source of radiation, such as an explosion. If you feel your skin burning, have a fever, nausea, vomiting or diarrhea then your condition is probably severe and you can put 5-8 pellets in a bottle of water and take a tiny sip every 10 minutes for the next 4 hours. Thereafter, take a sip every half hour for the next 4 hours, then every hour for the next 4 hours. You should try to do this even if you are being taken to a hospital for treatment and continue daily doses of the homeopathic remedy for two weeks.

If you have no radiation related symptoms but winds are blowing radiation into your neighborhood, then take one dose daily until the radiation drops to a safe level and continue taking the remedy on a daily basis for 2 weeks even after the radiation levels have dropped to acceptable.

Remember to take potassium iodide and the detox baths and algae diets as well. Basically, stay out of the way, take preventative measures and stay in tip-top shape.

URANIUM NITRICUM (nitrate of uranium) can be used in cases of uranium exposure, exposure to depleted uranium or uranium poisoning. Uranium miners and radiation workers may find it quite useful.

Usually people given this remedy experience symptoms of great emaciation with ravenous appetite, debility, weakness and general edema (swelling with fluid retention), excessive thirst and appetite.

Other keynote symptoms this remedy treats include burning gastric pain, flatulence and vomiting. There can be a feeling of general burning internally and a tearing away or ulcerations in the mouth; stomach and duodenal ulcers with indigestion.

If you remember, these were all the symptoms seen at Nagasaki. Cases of copious burning urination with incontinence, gland swelling, liver degeneration, heat flushes, dry mucous membranes and dry skin, nausea and vomiting are also indications for usage.

I once heard of the case of a child who fell into a uranium mining pit and survived, but later developed fibrosis all over his body. His buddy who fell in with him died a few days later after the exposure, and the man who pulled him out of the pit died from cancer five years later. This boy survived but developed scar tissue all over his body, inside and out, because radiation tends to cook you. A

doctor gave him the enzyme formula **Vitalzym**, containing a high concentration of serrapeptase fibrin-eating enzyme, and this seemed to help his fibrosis.

You probably aren't in this category, but I want you to store this "uranium fact" away for general purposes if someone needs it.

As to the use of **PLUTONIUM NITRICUM**, there is not much information available on this remedy but some of the preliminary provings are that individuals experiencing a polarity between feeling very light and elated and feeling heavy, desperate and isolated might benefit from the remedy. Naturally, exposure to plutonium is the number one reason for its usage.

ANACARDIUM is a remedy that can be used to help alleviate the effects of radiation exposure, and is especially appropriate when there are skin ulcerations, general weakness and debility, and when other symptoms match. You can check a homeopathy book for more detailed symptoms that match its usage. It has been useful in smallpox because its keynote symptoms for application include intense itching and swelling of skin that becomes worse with scratching; the individual is absent-minded and easily offended with contradictory impulses; special senses alternately acute or lost; there is nervous exhaustion; sensation of a plug in all effected parts. Eating temporarily relieves all discomforts.

The homeopathic remedy **X-RAY** can also be used in the event of radiation exposure when the other symptoms correlate. Like radium bromatum, this is a very good homeopathic remedy to keep in stock as well, and is recommended after X-ray exposure.

Low vitality is a major symptom calling for the usage of X-ray along with slow wound healing, decreased white blood or platelet count, anorexia with nausea, dry, itchy or scaly skin and redness around nail roots, aching pains, chills with night sweats, and sudden neck 'cricks' on alternating sides.

Patients who can benefit from the remedy usually feel better with hot applications and worse in bed, in the open air, in the cold, or in moving. The remedy tends to arouse the reactive vitality both mentally and physically.

PHOSPHORUS may be used for symptoms produced after radiation exposure that include degeneration of tissue and bleeding. You use it when it matches other symptoms such as there being sudden great weakness, oversensitivity to external impressions, ready bleeding from the skin and any orifice, tissue decay, exhausting diarrhea or vomiting, burning pains, the feeling of a tightened chest,

palpitations and trembling, an empty feeling. The individual may crave cold drinks and feel worse lying down on their left side.

CAUSTICUM can be used after acute radiation exposure when the radiation burns are slow to heal and other symptoms for the remedy's usage match. The keynote symptoms for using the remedy include burning, rawness or recurring soreness of burns, loss of muscular strength or paralysis of single parts, emaciation and weakness, unsteady walking where it's easy to fall down, incontinence. The individual feels better with cold drinks, bed warmth and gentle motion but feels worse during clear weather, dry cold air, and in the evening.

It's also been suggested that remedies like **Plumbum** (lead) can be taken after radiation exposure to help those who feel overwhelmed and in need of protection. **Belladonna** might also prevent and relieve radiation burns and pains -- even long after the immediate exposure, and **Granite** might prove to be a lifting remedy.

The number of possible remedies is endless and to properly pick the right homeopathic remedy for an individual requires much skill. These are just the general indications to follow, and you should always consult a homeopath for what to take.

There are more extensive selection criteria than these which you can use to select between one particular remedy or another, and you can find them in a homeopathic "repertoire" or on the internet.

The Homeopathic Schuessler Cell Salts

Another form of homeopathy concerns the **Schuessler cell salts**, invented in 1873 by W.H. Schuessler MD, that are readily available in health food stores as tiny tablets or pellets, and which contain the essence of minerals necessary for healthy cell growth. They are basically micro dose cell foods prepared homeopathically.

Dr. Schuessler found that when cells were deficient in these minerals, then an abnormal (diseased) condition was produced and so he developed these homeopathic substances to help a body heal itself.

The twelve cell salts, which some homeopaths claim are missing in people after nuclear exposure, include:

- Calcarea Phosphorica (Phosphate of Lime), abbreviated as Calc. Phos
- Kali Phosphoricum (Phosphate of Potash or Potassium) or Kali. Phos.

- Magnesia Phosphorica (Magnesium Phosphate) or Mag. Phos.
- Natrum Phosphoricum (Phosphate of Soda) or Nat. Phos.
- Ferrum Phosphoricum (Phosphate of Iron) or Fer. Phos.
- Natrum Sulphuricum (Sulphate of Soda) or Nat. Sulph.
- Kali Sulphuricum (Sulphate of Potash) or Kali. Sulph.
- Calcarea Sulphurica (Sulphate of Lime) or Calc. Sulph.
- Kali Muriaticum (Chloride of Potash) or Kali. Mur.
- Natrum Muriaticum (Sodium Chloride) or Nat. Mur.
- Calcium Fluorica (Fluoride of Lime) or Calc. Fluor.
- Silicea (Silica)

In particular, it is said that Kali. Phos., Nat. Sulph., Mag. Phos., Calc. Fluor., Silicea, Calc. Phos., Kali. Sulph. and Ferrum Phos. are deficient in the blood of those who suffer from radiation sickness.

You can order a full set of these 12 cell salts or take an all-in-one product called **Hyland's Bioplasma** as an overall corrective or preventative measure to maximize your healing forces.

The cell salts are not drugs, but usually take months to show results that can be quite subtle in nature. The tablets should *not* be washed down with water but dissolved dry on your tongue.

All in all, if you are just interested in a general radiation detox -- for instance because of X-ray exposure, high altitude living or extensive airplane flights -- I would use the Apex Energetics **Radiation Antitiox** formula along with the **Epson salt baths**.

Naturally, I would be adding chlorella and spirulina to my diet anyone because of all the health advantages they bring.

As to other foods to eat or supplements to take to help in DNA/RNA repair due to radiation exposure, that's the next topic for discussion.

References:

- Allen HC. Keynotes and Characteristics of the Materia Medica. New Delhi: B. Jain (reprint), 1988.
- Boericke W. Materia Medica with Repertory. Santa Rosa: Boericke and Tafel (reprint) 1988.
- Boyd H. Introduction to Homeopathic Medicine. Beaconsfield, England: Beaconsfield, 1981.
- Castro M. Complete Homeopathy Handbook. New York: St. Martin's, 1991.
- Cummings S, Ullman D. Everybody's Guide to Homeopathic Medicines. Los Angeles: Tarcher, 1991.
- Hering C. Guiding Symptoms of our Materia Medica. New Delhi: B. Jain (reprint), 1988, (Vol 1–10).
- Kent JT. Lectures on Homeopathic Materia Medica. New Delhi: B. Jain (reprint), 1980.
- Kent, JT. Repertory of Homeopathic Materia Medica. New Delhi: B. Jain (reprint), 1988.
- Lockie A. Family Guide to Homeopathy. New York: Fireside, 1993.
- Panos M, Heimlich J. Homeopathic Medicine at Home. Los Angeles: Tarcher, 1980.
- Ramakrishnan, A.U., and Catherine R. Coulter, Homeopathic Approaches to Cancer: 168.
- Schroyens F. Synthesis/Repertorium Homeopathicum Syntheticum. London: Homeopathic Book Publishers, 1993.
- Ullman D. Consumer's Guide to Homeopathy. New York: Tarcher/Putnam, 1995.
- Vithoukas G. Homeopathy: Medicine of the New Man. New York: Avon, 1971.
- Vithoukas G. Materia Medica Viva. London: Homeopathic Book Publishers, 1992, 1995.

Eat A “Nucleotide Rich” Diet to Maximize Cellular Repair

For over thirty years I have watched a variety of foods being praised by health advocates for their special health, anti-aging, and repair characteristics: **spirulina (blue-green algae), chlorella (a green algae), brewer's yeast, lentils, most beans, oysters** as well as animal **liver, sardines, anchovies** and **mackerel**.

The **juicing of fruits and vegetables** was another remedy often stressed when the body needed radical healing, and yet I could never make the connection between any of these foods.

I always thought their ability to help rebuild the body was based on independent factors ...

... until I read the June 2004 issue of the *Alternatives* newsletter published by Dr. David G. Williams!

The missing factor that “clicked” for me was the presence of a high concentration of **nucleotides** in these foods.

What are they?

Nucleotides are the building blocks or sub-unit molecules that make up RNA and DNA, which carry your genetic code. Nucleotides also carry out several essential functions needed for cell replication and perform the following functions in your body:

- Neutralize toxins
- Increase cellular metabolism
- Increase the production of cellular energy
- Improve the response and efficiency of the immune system
- Enhance the effects of antioxidants
- Increase the body's ability to heal and repair

I could never understand why some of the “miracle” foods I previously mentioned were so useful in treating cancer, anti-aging and cellular repair -- and why some of them had built such fantastic reputations over the years as cures in themselves (chlorella, spirulina, Brewer's yeast, and liver) -- until I made the nucleotide connection.

Think about it ...

If you want to help RNA/DNA repair (and post-radiation exposure would be one such instance where you want this), it makes sense to include foods in your diet that contain abundant levels -- and I mean *really abundant* levels -- of nucleotides since they are the building blocks from which your body builds DNA and RNA.

You want to repair cells that may have been damaged, or are cancer prone due to radiation?

Eat lots of nucleotides!

Basically, eat lots of foods that contain RNA and DNA nucleic acids because both have also shown radioprotective qualities (Ebel JP, Beck G, Keith G, et al. "Study of the therapeutic effect on irradiated mice of substances contained in RNA preparations," *Intl Jour Radiat Biol* 1969, no 16, 201-209). Various studies have born out that nucleic acids have prolonged the survival rate of animals exposed to radiation. All sorts of animals have shown these effects -- mice, rats, and dogs.

Now we have just uncovered another reason to consume spirulina and chlorella ... but consider yeast and sardines as well. As we get older it's harder to digest the foods we eat but these two foods are extremely easy to digest and offer lots of health benefits.

Most importantly, however, are the foods that contain large proportions of nucleic acids: sea algae (like chlorella and spirulina), liver, nutritional yeast, and even bee pollen, which we haven't yet mentioned.

Let's just talk about **yeast** as an example because it's one of these foods and is given to cancer patients undergoing radiation and chemotherapy treatment. That means it's given to people subject to radiation.

Yeast is extremely helpful for radiation from a preventative, detoxification and physical rebuilding aspect. It has been proven to help recovery from radiation damage and can be made quite palatable by mixing it with tomato juice or fermented beet juice (that also aids the body after radiation exposure) which creates, in effect, a drink with two benefits instead of one.

Russian researchers have reported that radiation damages could be influenced favorably by yeast, which they found could help build and regenerate cells damaged by radiation (*Dokl. Akad., Nauk S.S.D.R.*, BD. 126, p. 417). In Germany, researcher Holger Metz found that feeding patients certain types of

beer yeast -- while they underwent radiation therapy -- prevented an entire list of systems usually associated with acute radiation syndrome: skin redness, hair loss, depression, inflammation of the mucus membranes (in the throat and gullet), and other sorts of radiation damage.

A study performed at Montefiore Hospital in New York involved giving cancer patients heavy doses of yeast daily before undergoing radiation treatment, and those patients receiving the yeast remained free of radiation symptoms while similar patients, untreated, experienced anemia, a decrease in hemoglobin and vomiting (Samachson et al. *Arch Biochem Biophys* 1960, 88: 335).

So we have yeast preventing radiation syndrome as well.

Part of yeast's protective and cancer fighting effects come from its high vitamin content and sulfur content which is the key element found in glutathione, NAC and alpha lipoic acid, which are powerful body antioxidants. It also is a great provider of the mineral selenium, which seems to play an anti-cancer role in the body, and iron, which can help prevent anemia and inhibit the uptake of plutonium isotopes.

By the way, for cancer patients undergoing chemotherapy and radiation, I also often recommend the product **SeaCure**, which is a pre-digested protein supplement made from fish fillets. SeaCure is extremely easy to digest and absorb and helps reduce the side effects of chemotherapy like nausea and sickness. I'm mentioning it here because -- as with the nucleotide foods -- it is extremely easy to digest and helps rebuild the body.

In the case of radiation recovery, this is a perfect type of food.

Seacure also has a sister product, **SeaVive**, made especially for cancer patients because it contains Seacure along with immune boosting stimulants added in -- colostrum and beta-1,3- glucan -- which are known for immune enhancing properties.

In cases of severe radiation sickness where the immune system is at risk, this easy-to-digest and easy-to-assimilate food, with extra immune boosting and infection fighting factors, may be a life saver.

As stated, those foods with high nucleotide concentrations include breast milk (infant formula is now fortified with nucleotides because they substantially help the infant fight infection), sardines, brewer's yeast, anchovies, mackerel, lentils, most beans, animal liver, oysters, chlorella and spirulina.

A diet rich in nucleotides, meaning rich in these foods, is what I recommend for a radiation repair diet.

Animal studies show that when nucleotides are increased in the diet, there is a remarkable rise in the ability to fight infections.

Bingo!

Cancer patients who increase their consumption of nucleotides also show greater strength and ability to deal with the disease.

Bingo!

Hospital stays are reduced when you eat nucleotides and ill patients show stronger immune responses and quicker healing times.

Bingo!

Radiation causes cancer and when you are treating cancer, many current therapies try to deliver precursor compounds to the body that your cells can then use to "build" nucleotides. Why not just deliver the nucleotides in the diet, especially as these foods are healthy and easy to digest?

That's my feeling, especially when we can readily observe the effects of this strategy on health and anti-aging.

The high nucleotide content, combined with their easy-digestibility, is why these foods have developed near legendary reputations over the years. So after a radiation disaster, increase your diet of nucleotide containing foods, increase the juicing, and one more thing ...

It is necessary to remove excess acidity from your system so that your tissues become aerobic and the DNA self-repair mechanism can function. That means plenty more vegetables, less meat and increase your calcium intake after radiation exposure.

And as to the nucleotides, while they keep emphasizing the algae and yeast, consider sardines and mackerel for their fatty acid content. We haven't talked about fatty acids yet, but if you want radiation repair, you need the right type of fatty acids in the body, and these are two foods that can help you get them.

References:

Langendorgg H, "Der bisherige Beitrag der Radiobiologie zur Therapie von Strahlenschaden (The contribution to date of radiobiology to the therapy of radiation lesions), *Roentgenpraxis* 20, 1967, no. 1, pp. 3-8.

Libinon RE et al, "Effectiveness of the High-molecular DNA in the treatment of acute radiation sickness," *Radiobiologiya*, 1963, 3: 111-116.

M. Suvrem. Med. 21, 1970, no. 6, pp. 12-18.

Marinescu C, Popla M and Covulea O, "Radioprotective Experiments with Nucleic Acids," *Rev Sanit Mil*, Jan-Feb 1969, 72; 61-64.

Metz Panaktiv, "Hefe - ein natürlicher Gegenspieler der Krebszelle," *Der Naturarzt*, No. 10, October, 1969.

Williams, David G. "Longevity is on the Menu," *Alternatives* Vol. 10, No. 12, June 2004.

Foods, Herbs and Supplements That Are Radioprotective

Miso Soup Several Times A Week

Remember the Nagasaki **Dr. Shinichiro Akizuki**, who saved his St. Francis hospital staff and patients from acute radiation sickness being only one mile from the atomic blast? Here's some further information about that story.

Another hospital that was farther away from the blast site (University Hospital) had 3,000 patients who suffered greatly from leukemia and disfiguring radiation burns while Dr. Akizuki's hospital, which was closer to the blast site, had almost no individuals who suffered from radiation poisoning.

The difference was that he fed his patients and workers brown rice, miso soup, vegetables and seaweed every day whereas University Hospital fed its patients sugar, white rice, and refined white flour products.

By 1972, Dr. Akizuki and his co-workers still had not experienced any side effects from the radiation exposure ... whereas others who had been farther away from the blast had the opposite experience.

Well, one food he relied upon was **miso broth**, which is the classic food for the prevention of radiation damage and which he maintains was key to helping his crew.

The evidence that miso soup is key to fighting radiation exposure also comes to use from the Soviet experience. For instance, since the 1950s the Soviet weapons factories had been dumping wastes into Karachar Lake in **Chelyabinsk**, which is an industrial city east of Moscow. Many of the local residents accordingly started suffering from radiation symptoms and cancer.

In 1985 the medical doctors changed their approach to patients suffering from leukemia and other disorders associated with exposure to nuclear radiation and began incorporating miso soup into their diet. Doctors Lidia Yamchuk and Hanif Sharimardanov wrote: "Miso is helping some of our patients with terminal cancer to survive. Their blood improved as soon as they began to use miso daily."

In another Japanese study that spanned a 25-year period, the Japanese Cancer Institute tracked 260,000 subjects and divided them into three groups. The first group ate miso soup daily, the second group consumed miso 2-3 times a week, the third group ate no miso at all. The results showed that those who had not

eaten any miso had a 50% higher incidence of cancer than those who had eaten miso.

Basically, the regular consumption of miso products helps protect the body from some of the toxic effects associated with radioactivity exposure due to the presence of an ingredient called **zybicolin**, discovered in 1972, which acts as a binding agent to detoxify and eliminate radioactive elements (such as strontium) and other pollutants from the body.

Because of the presence of zybicolin, miso has been found to counteract the adverse effects of radiotherapy, chemotherapy, and environmental pollution.

You can increase the protective qualities of miso soup even more if 1/4-ounce (5 grams) of dried kelp seaweed is added to the soup for as you know, scientific studies found that seaweed was able to neutralize radioactive isotopes in the human body because they bind to the brown seaweed sodium alginate and increase their excretion from the body by about 80%.

For patients receiving radiation treatment, you can even use an external plaster of miso mixed with aloe vera extract on the irradiated area being irradiated to help prevent or heal burns.

So now you know how to add several approaches together.

Another food to add to the diet for radiation effects is **tempeh**, which is a fermented soy bean product known to help build red blood cells. It also blocks the intake of radioactive cobalt-60 and zinc-65, and strengthens the immune system.

Of course the various seaweed products such as kelp and nori also offer protection against the effects of radiation and you should consider taking these items several days before and after any diagnostic x-rays.

A big point of this discussion is also the injunction to avoid sugar, wheat and milk after radiation exposure. If you want healing and protection against infection, avoid sugar and things that turn into sugar quickly in the body (wheat flour). Milk is primarily a sugar, and allergic causing foods should also be avoided since they usually put a burden on your immune system when it needs all the help it can get.

Black and Green Tea to Remove Radioisotopes and Protect Against Cancer

In Fighting Radiation and Chemical Pollutants with Foods, Herbs, and Vitamins (Vitality Inc, 1992), author Steven Schecter wrote that both **black and green tea**

showed "radioprotective effects" whether consumed either before or *after* exposure to radiation. This anti-radiation effect was observed in several Japanese studies, and studies from China also suggest that the ingredients in tea are radioactive antagonists.

One of the reasons that tea offers anti-radiation effects similar to seaweeds is that the tea catechins absorb radioactive isotopes and removes them from the body, just like the active ingredient *sodium alginate* in kelp seaweed. Epigallocatechin-gallate (EGCG), which is found in some green tea extracts, has also been shown to protect the body's cells against the free radical damage caused by radioactivity.

In other words, much like seaweed the ingredients in green tea absorb radioactive isotopes so that the body can excrete them, and it also contains the cancer fighting compound EGCG.

Rooibis tea, which contains the flavonoid compound **luteolin**, also helps the body withstand radiation ("Radioprotective effect of antioxidative flavonoids in gamma-ray irradiated mice," *Carcinogenesis* 1994 Nov;15). In particular, it protects DNA from radiation-induced free radicals.

When Japanese researchers gave mice pure luteolin, it dramatically protected their bone marrow and spleen against radiation damage, and this flavonoid's radioprotective properties were better than any other plant compound ever tested.

You might consider trying Rooibis. I was first introduced to it at a Chinese medicine training retreat I took some years ago and was surprised how tasty it was compared to green tea, and it doesn't give you the green tea "high." It's the only tea that doesn't have a high content of tannins which makes it safe to give to children to drink.

A High Fiber and Mineral Rich Diet

To deter the absorption of radioactive particles and improve its excretion, it makes sense that a high fiber diet of easily digested leafy vegetables is recommended (but not of produce exposed to fallout radiation). The purpose behind eating clay, kelp, and pectin is basically the idea of binding radionuclides in the gut, which you also accomplish through a high fiber diet.

The fibrous product chitosan, which is made from crab shells, can also be used to bind heavy metals and radioactive particles. Chernobyl victims given chitosan were also able to eliminate a large degree of radioactivity in only a few weeks. The problem with chitosan, however, is that it can also bind amino acids and

lipids which you might need to help repair your body after radiation exposure, so this is not a top recommendation.

Basically, after radioactive exposure you want to be eating almost any type of heavy metal chelating formula, and many nutritional supplements have been developed for this purpose, most of which contain the algae and plant fibers and other binding substances.

You also want to eat foods or supplements high in **calcium** and **potassium** because they also aid in the excretion of radioactive particles, particularly cesium-137.

Potassium has a chemical composition similar to Cesium-137 (a nuclear byproduct often ingested via fruits and vegetables grown in contaminated soil). Just as with iodine, because of this similarity, your body will tend to absorb any available Cesium-137 if there's a potassium shortage in the diet whereas when the body is fed a good supply of potassium, it will be much less likely to absorb the radioactive particles.

Strontium-90 also competes with calcium and lowers vitamin D, so taking extra calcium and vitamin D during radiation exposure can help prevent radioactive strontium from being stored in your bones. The calcium will help alkalize your body which will be useful for healing purposes.

Natural **iodine**, of course, helps prevent the uptake of iodine-131 while **iron** inhibits the absorption of plutonium-238 and plutonium-239, **vitamin B-12** inhibits cobalt-60 uptake (used in nuclear medicine), **sulfur** is preventative for sulfur-35 (a product of reactors) incorporation by the body, and **zinc** inhibits zinc-65 uptake.

Getting a ready supply of highly absorbable minerals is essential for radiation therapy, and is something the algae and yeasts supply perfectly. Sorenson (JRJ Sorenson, "Essential metalloelement metabolism and radiation protection and recovery," *Radiat. Res.*, 132, 19-29, 1992.) has reviewed the field of radioprotection by metals and minerals and states,

"Understanding the metabolism of essential metalloelements and its role in responding to radiation injury as mediated by immunomodulating cytokines offers a new approach to protection against hematopoietic and gastrointestinal syndromes and perhaps cardiovascular and central nervous system syndromes. Copper, iron, manganese, and zinc compounds have radioprotective activity..."

Hence, many minerals can help with radioprotection and they certainly help repair the body after radiation exposure. When your body is mineral deficient, the

absorption of these radioactive “sisters” becomes highly likely so it's best to have *absorbable* high mineral diets upon radioactive exposure. That's something achieved by eating the algae and sea vegetables. As to the higher sulfur intake required by nuclear workers, that is achieved by eating **thiol supplements** such as cysteine, lipoic acid and glutathione.

Basically, you need metals for the formation of various enzymes in your body and having the metal ions present assists the body in resisting and repairing radiation damage. Minerals, such as **selenium**, show radioprotective effects and eating foods that help us easily obtain minerals is key after radiation exposure.

Selenium (found in yeast), in particular, has been shown to protect human DNA from radiation damage and helps prevent skin damage, too. We could write a book just on the relationship between selenium and cancer and radiation alone, but why bother? Just know it's important.

Here's a key fact-- good sources of selenium include green and black teas, and garlic as well as many mushrooms while the best sources however are nettles (2200 mcg per 100 grams), kelp (1700 mcg/100 g), burdock (1400 mcg/100 g), catnip (*Nepeta cataria*), ginseng, Siberian ginseng, and astragalus.

Did you notice that we keep coming up with the same foods to concentrate on?

What foods supply an abundance of minerals in an easily digestible, absorbable form? The seaweeds along with spirulina and chlorella.

Do you see how everything keeps concentrating on the same remedies?

Consume More Lycopene and Foods Rich in Beta Carotene

What about vegetables?

After exposure to radiation, another product to add to the diet is cooked tomato sauce because it has a high lycopene content. **Lycopene**, which gives tomatoes their red color, has been shown to protect against cancer formation, prevents the destructive and mutagenic effects of gamma radiation, and protects against the effects of ultraviolet irradiation of the skin. It is a carotenoid and like other carotenoids, lycopene enhances your general immunity and may be particularly effective in improving the action of T-cells and inhibiting cancer.

From a number of studies, **beta carotene** has also been shown to be especially helpful for fighting radiation and studies have found that it definitely strengthens the immune system. For instance, researchers have reported the radio-protective effect of beta-carotene from a study conducted on over 700 children exposed to

the Chernobyl radiation. Japanese researchers found that diets high in carotenes significantly reduced DNA damage in humans exposed to radiation. Natural beta-carotene protects against the lipid oxidation and acts as a fatty acid antioxidant radioprotector.

To increase your natural consumption of carotenes after radiation exposure you can eat more yams, squash, carrots, swiss chard or spinach. Eating lots of orange and dark green foods (sweet potatoes, winter squash, beets, carrots, kale, collards, chard, and spinach, for example) is what protects you from radiation effects that might damage your DNA. While supplements of beta-carotene did not show this effect, you can consume products with mixed carotenoids to help increase your carotenoid consumption.

Eat More of the Cabbage family and Sulfur Containing Compounds

Foods from the **brassica (cabbage) family** daily — cabbage, broccoli, cauliflower, brussel sprouts, kale, collards, arugula, turnips, radishes, mustard greens, bok choy -- are particularly beneficial for their radioprotective effects and their abilities to help repair radiation damage.

We mentioned previously that guinea pigs bombarded with radiation lived a lot longer if they ate cabbage or broccoli. In fact, cancer researchers have found that all the brassica family plants protect your cells from the damaging effects of radiation. Of course, when guinea pigs were supplemented with high doses of **vitamin C with bioflavonoids** (like humans, guinea pigs cannot make vitamin C within their bodies), they were also able to withstand double the known lethal doses of radiation, too.

One of the benefits of the brassica plants is that they are rich in sulfur compounds, and it's the sulfur-bearing contents of **onions, garlic, and beans** which is part of the reason they are prescribed in various natural healing diets.

Three sulfur-rich anti-oxidant substances in particular are given to cancer patients and individuals exposed to high levels of radiation because they help quench the formation of free radicals in the body. Those supplements, which quench free radical damage and promote healing are **glutathione, NAC, and alpha lipoic acid**.

Whey and soy protein powder, which contain high amounts of cysteine, are also often given to cancer patients (one tablespoon daily) because of their high cysteine content which allows the body to make more glutathione.

Since we are talking about antioxidants a bit, here is the accepted scientific mechanism of radioprotection offered by antioxidants ...

When living cells are exposed to radiation this induces the production of free radicals, which leads to the breaking of chemical bonds and various forms of cellular damage. Radioprotectants -- of whatever type -- are substances that scavenge the free radicals before they can do much cellular or molecular damage, and allow repairs to take place to the original damaged molecules.

Antioxidants do just that.

There is a limit to the effectiveness of free radical scavengers as radioprotectors, however, so don't get carried away.

According to Hall (E. J. Hall, Radiobiology for the Radiologist, 4th Ed., J. B Lippincott Co., Philadelphia, 1994 , p. 185), "they are effective against the indirect action of x-rays and have little effect with high linear energy transfer radiations in which direct action is dominant. Since the indirect action accounts for about two thirds of the biological effect of x-rays, a perfect protector that scavenged all of the free radicals could have a dose reduction factor approaching 3 ... [Also] This simple description of the mechanism of action of sulfhydryl radioprotectors is intellectually satisfying, but it is clearly not the whole story since radioprotectors of this class have more effect with densely ionizing radiations (such as neutrons) than would be expected. Other factors must be involved that are not fully understood."

While we have been focusing on radioactivity, what this book is talking about is protection from or repair to the body necessitated by ionizing radiation such as X-rays, cosmic rays, background radiation and so forth. What this quote says is that while the sulfur containing antioxidants and radioprotectors are useful, we don't know the full reasons for their radioprotective mechanisms. But let's put that aside.

What we do know, aside from this, is that various studies show that **thiol** (a side-chain sulfur-containing component of the amino acid **cysteine**) compounds help stop free radicals caused by ionizing radiation, and thiol antioxidants (**NAC, SAME, glutathione**) should therefore be taken before and after radiation exposure, especially X-ray scans, to protect cells from antioxidant damage. Thus we find that the main antioxidants the body depends on -- NAC, alpha lipoic acid and glutathione -- can play a role in radiation protection and repair.

Cysteine itself, which contains the thiol side-chain has helped counteract the effects of several different types of radiation in animal studies. Japanese, Indonesia, Netherlands, Hungarian, German, Puerto Rican, Russian and American researchers, through numerous studies, have found that cysteine helps animals survive massive doses of radiation. In particular, the studies have shown that the sulfur component of cysteine provides part of its radioprotective effects.

Sulfur helps the mitochondria in cells resist radiation, helps repair DNA molecules, and prevents the absorption of radioactive sulfur-35. Most of the sulfur-containing vegetables contain cysteine and those with the highest sulfur contents are, of course, the members of the cabbage family. Here's a list of sulfur-rich vegetables in descending order: kale, watercress, brussels sprouts, cabbage, turnips, cauliflower, raspberries, spinach, and kelp.

The moral of this is that upon radiation exposure, one should increase their consumption of sulfur-containing vegetables, kelp, and cysteine (thiol) antioxidants.

Dried Beans or Lentils in the Diet

Do you remember that list of food rich in nucleotides ?

Dried beans, especially lentils, were in that short category and studies have indeed proved that they can reverse DNA damage done by radiation. Now there's yet another reason to include them as part of the anti-radiation diet.

Three members of the legume (bean) family in particular -- **lentils**, **red clover** (*Trifolium pratense*) and **astragalus** (*Astragalus membranaceus*) -- are particularly known for their anti-radiation and cancer-fighting effects and help reverse the damaging effects of radiation. Astragalus, in particular, is an ingredient in most Chinese strengthening formulas.

Cancer patients are usually advised by nutritionists to drink red clover tea and commonly take astragalus supplements, but their exact use is outside the scope of this discussion. It's the beans in general I want you to concentrate on, yet I want you to know of these other two members of the bean family used for anti-cancer purposes.

Eat Red Beets, Alkylglycerols, Liver and Spleen Extract to Rebuild the Blood

When you are exposed to radiation, it can affect your body's ability to produce red blood cells. A well known American holistic remedy for quickly rebuilding the blood and fighting anemia, which Europeans also use, is the consumption of either raw or fermented **beet juice** which helps build blood hemoglobin. Beet root is also consumed as a natural remedy for nerve cell inflammation which is another bonus since severe radiation exposure affects the nervous system.

What do most naturopaths recommend when presented with the challenge of rebuild your blood counts quickly? Juice beets and carrots and drink the combination -- it tastes great!

Spleen extract, which naturopaths says can help regenerate the spleen that builds our blood, also counteracts the damage to the immune system caused by exposure to radioactivity, and can help regenerate the blood. Organic **liver extract** or eating liver (remember it's a high nucleotide content food) can also help build the blood as well as eating bone marrow soup, such as you find in Korean restaurants.

You already know about shark oil, which contains **alkylglycerols**. Any pure alkylglycerol combination can cause platelet counts to jump dramatically within two weeks, which always shocks the heck out of oncologists who could not think it possible.

Reishi Mushrooms, Glucans and Polysaccharides to Bolster Immune Health

Time for mushrooms.

Eating Reishi mushrooms is a proven way to reduce the damage from radiation and to bolster your immune system after radiation exposure. It's been used to decrease radiation sickness in animals and help them recover faster (Hsu HY et al, "Radioprotective effects of Ganoderma lucidum (Leyss. Ex. Fr.) Karst after X-ray irradiation in mice," *Am J Chin Med* 18 (1-2):61-69, 1990), and human patients have experienced similar results. Cancer therapists commonly know about this, so you'll often find cancer patients on various types of mushroom supplements.

After extensive research, the *only* mushroom brand I recommend, however, is from **JHS Naturals** (particularly their **Reishi capsules**) because of the manufacturing process of the product that are guaranteed to capture and concentrate the active ingredients. If you buy mushrooms manufactured from any other company -- and especially if you take liquid extracts (which always should be avoided) -- then you're probably wasting your money. You can reach JHS at 888-330-691 (www.jhsnp.com).

Taking mushrooms *slowly* boosts the immune system, and this is one of the wisest things you can do after radiation exposure. Reishi and Coriolus mushrooms (which fight cancer) would be the mushrooms of choice, though I would also consider eating **Cat's Claw** (from **Phytotherapy Research Laboratories** in Lobelville, Tennessee 800-274-3727) because it's known to help

prevent damage to DNA and repair damaged DNA as well. **Thymus extract** is also a well known immunological stimulant.

The **beta glucan** polysaccharide, which is manufactured from yeast, has also shown post-radiation protective effects on mice. Mice injected with the glucans before radiation had a 100% survival rate compared to a 100% lethal rate for mice without treatment. As with the mushrooms, it is suspected that the glucans stimulate the immune system and protect the blood-forming cells that are otherwise very susceptible to radiation damage.

Acemannan, which is an **aloe vera extract**, has shown a similar radioprotective effect when ingested and another polysaccharide similar to acemannan, **mannuronan**, increased the survival rates of irradiated mice also because of the immune system and repair system factors that repair the damage from radiation.

The firm **Mannatech** is one of the acknowledged leaders in producing polysaccharide compounds and glyconutrients as immune boosting nutritional supplements. They have one product **Ambrotose** -- which contains arabinogalactan, Manapol, aloe vera gel extract and other glyconutrients -- and is popular as an immune stimulant.

There are quite a few reports of the radioprotection abilities of polysaccharides and also of the radioprotective effect of **cytokines**, which we'll get into. However, the use of polysaccharides instead of the pharmacological cytokine drugs is likely to be a more economic and safer method of radioprotection because the cytokines are both costly and toxic at radioprotective doses.

The aloe vera extract acemannan does not show such toxicity and is often discussed as a possibility for radioprotection usage for humans in space travel. In short, aloe vera is something you want on hand if you are expecting radiation exposure.

Lastly, Russian researchers -- due to orders by the Russian military to develop protection against biological warfare agents -- discovered a lactobacillus bacteria that has immune-stimulating properties. The cell walls and cell wall fractions of *Lactobacillus bulgaricus* have been developed into a product called **Del-Immune**, available from **Allergy Research**. Known as Blastolen in Russia, the product has demonstrated antiradiation and antitumoral properties: "Clinical results shows the stimulation effect of hemopoiesis and immunity system, increase of white cells, decrease the anemia and stabilization of immunity factors." The product can be used for cancer patients and patients suffering from radiation exposure.

[Ginseng for Energy and Strength](#)

People who receiving cancer radiation treatment often benefit greatly from taking **Siberian ginseng**, also known as Eleuthero.

Though the full dimensions of the protective mechanism is still unknown, Siberian Ginseng also exerts a definite radioprotective effect and has been demonstrated to lessen the side effects of radiation. In fact, it was widely distributed by the Soviet Union to those exposed to radiation during the Chernobyl accident to counteract the effects of radiation and is commonly used to help cancer patients undergoing radiation therapy.

In The Road to Immunity (Pocket Books, 1997), Kenneth Block quotes cancer doctor Dharmananda as saying, "cancer patients undergoing radiation therapy who receive ginseng have higher recovery rates and report a greater sense of well-being than patients who receive radiation alone."

In The Healing Power of Ginseng, The Enlightened Person's Guide (Prima, 1996), Paul Bergner states that in human clinical trials, people who took American ginseng extract (*Panax quinquefolium*) for 30 days following radiation exposure had a quicker recovery from injuries to their bone marrow, organs, skin, and blood cells. Bergner quotes Japanese researcher Dr M. Yonezawa as saying that "ginseng appears to be the most useful agent available for protection against radiation damage."

Another Japanese researcher, K. Hirashima, has been quoted in Fighting Radiation & Chemical Pollutants, by Steven Schechter, as saying, "Since recovering of blood-forming stem cells is a fundamental requirement for a radioprotective substance, this result would confirm the efficacy of ginseng extract as a radioprotective substance."

In animal studies, when ginseng was given to radiation exposed animals a far greater proportion survived in the ginseng-supplemented group compared with the control group exposed to radiation without ginseng (Yonezawa et al. 1981; Rhee et al. 1991; Kim et al. 1993, 1996).

In one study, it doubled the life span of rats exposed to prolonged radiation and when it was combined with antibiotics, the life span of irradiated rats increased threefold (Ben Hur E. and Fulder S. "Effects of *Panax ginseng* saponins and *Eleuthrococcus senticosus* on the survival of cultured mammalian cells after ionising radiation." *Am J Clin Med* Vol 9. pp 48-56, 1981). Ginseng provided a definite protection against damage to healthy cells, which suggests its value during radiation therapy.

Panax ginseng, in particular, has been known to accelerate the recovery of red and white blood cells after radiation injury, help prevent hemorrhaging during post-radiation exposure, prevent bone marrow death and stimulate bone marrow growth -- all of which protect against hematopoietic syndrome.

Siberian ginseng, also known as **eleuthero**, has been used for well over 2,000 years in China, particularly to prevent respiratory tract infections as well as colds and flu. It was also believed to provide energy and vitality. In Russia, eleuthero was originally used to increase stamina, endurance, performance to decrease infections and to prevent stress-related illness.

The short of it is that ginseng can not only help give you energy, but can revive blood cells damaged by radiation exposure and minimize cell damage to the bone marrow, skin and internal organs from radiation. It's an adaptogen, which means it increases the general resistance of an individual and helps increase your body's ability to adapt to internal or external stresses. It is well known for inhibiting the metastasis of cancer and the growth of new tumors so it's something I recommend after heavy radiation exposure.

With over 1,000 studies behind it, Siberian ginseng can definitely help you protect your body from the various stresses caused by radiation exposure.

Aloe Vera for Radiation Burns and Healing

Aloe Vera has a long history for treating serious radiation burns and offering radioprotective effects.

In 1953, Lushbaugh and co-workers at the Los Alamos Scientific Laboratory (C. C. Lushbaugh, J. B. Storer, and D. B. Hale, "Experimental acute radiodermatitis following beta radiation. I. Its pathogenesis and repair," *Cancer*, 6 (4), 671-7, 1953; C. C. Lushbaugh and D. B. Hale, "Experimental Acute Radiodermatitis following Beta Radiation. V. Histopathological Study of the Mode of Action of Therapy with *Aloe Vera*," *Cancer*, 6, 690-9, 1953) found that fresh aloe vera gel was very effective in helping to heal beta radiation-induced skin burns on rabbits exposed to radioactive strontium, and cut healing times to less than half.

This government discovery has led to the isolation of the active component of aloe vera gel, **acemannan**, which we previously mentioned. In more recent years studies have shown that acemannan has strong radioprotective effects in rats subjected to sublethal doses of radiation (S. F. Egger, G. S. Brown, L. S. Kelsey, K. M. Yates, L. J. Rosenberg, and J. E. Talmadge, "Hematopoietic augmentation by a beta-1,4-linked mannan," *Cancer Immunol. Immunother.*, 43, 195-205, 1996; R. W. Fogelman, J. M. Chapdelaine, R. H. Carpenter, B. H. McAnalley, "Toxicologic evaluation of injectable acemannan in the mouse, rat and dog," *Veterinary and Human Toxicology*, 34, 201-5, 1992).

Roberts and Travis ("Acemannan-containing wound dressing gel reduces radiation-induced skin reactions in C3H mice," *International Journal of Radiation*

Oncology Biology Physics, 32 (4), 1047-1052, 1995) have also found that an aloe vera wound dressing gel reduces acute radiation-induced skin reactions in mice if applied daily for at least 2 weeks beginning immediately after irradiation.”

The authors noted that “acemannan ... induces secretion of several cytokines, including tumor necrosis factor and interleukin-1. Some of these cytokines are thought to regulate wound healing and might also affect acute radiation injury.”

Another theory, however, is that chlorophyll will promote radiation wounds as well. Since radiation burns have been repaired by quite a few plants that contain a significant amount of chlorophyll, scientists wonder whether this could be the active ingredient in some cases (Holmes GW and Mueller HP, “Treatment of post-irradiation erythema with chlorophyll ointment,” *Am J Roentgenol Rad Ther*, 50 210-213, 1943). Strange how the importance of chlorophyll content keeps popping up in radiation repair (ex. Spirulina, chlorella, etc.).

Without making a long story of it, the various aloe vera results ... and others still... show that acemannan has a strong post-irradiation radioprotective effect. Radiation tends to cook your tissues, and people often drink aloe vera gels by mixing it into drinks or eat various aloe vera supplements to help heal internal injuries.

For radiation burns, aloe vera gel (which you squeeze out of the cut plant onto the skin) is a definite recommendation though it doesn't work for all types of radiation injuries and should be used within 5 days of the appearance of burns.

R Pur Aloe International (800-888-2563) is one of the few aloe companies I can recommend because its products are extremely pure, non-contaminated and absent of fillers. I recommend them. When purchasing aloe supplements, be careful of buying highly diluted aloe products because in many cases the actual aloe content of what you buy is near zero despite “aloe vera” on the label.

Because they are so handy, you can also buy a few aloe plants and keep them around the house for when you ever need them. Another plant, the **spiderwort**, is so sensitive to changes in radiation levels that you can also plant it and use it as a natural radiation detector (dosimeter), just as they use canaries in mines as detectors of poisonous gas.

Whenever the spiderwort plant is exposed to even low levels of radiation, its normally blue petals start to turn pink and the greater the radiation exposure, the greater the mutation. That's cool -- a silent warning system!

Since 1974, the Spiderwort plant has been successfully tested in Japan as a reliable indicator of radiation and the Biology Department of Brookhaven National Laboratory (in Upton, New York) has also shown that it can detect low levels of radiation in the environment.

Various Herbs

Mint extract has protected mice against the gastrointestinal death and bone marrow deaths caused by radiation sickness ("Influence of the leaf extract of *Mentha arvensis* Linn. (mint) on the survival of mice exposed to different doses of gamma radiation," Jagetia GC, Baliga MS, *Strahlenther Onkol.* 2002 Feb;178(2):91-8).

Chaparral, which can be highly toxic, chelates heavy metals in the body and also protects against the harmful effects of radiation and the formation of tumors and cancer cells. In folk medicine, chaparral has been used to treat leukemia and many different types of cancers. Many people with cancer have claimed tumor shrinkage or complete remission using only chaparral capsules or tea. The plant contains immune stimulating polysaccharides and a key that has strong antitumor properties.

Burdock root, which has been used as a blood purifier for centuries, and which is also included in the famous Hoxsey formula and Rene Caisse's Essiac cancer formulas, is said to remove radioactive isotopes from the body as part of its ability to neutralize and eliminate poisons from the body. Essiac tea, by the way, is a famous cancer preventative whose constituents (burdock root, sheep sorrel, slippery elm bark, turkey rhubarb root) tend to clean the body and help dissolve tumors.

Burdock also supports the bladder, kidney and liver, contains niacin and an abundance of minerals, particularly iron. Hungarian studies have shown considerable antitumor activity in burdock and Japanese scientists at Nagoya University have isolated an anti-mutation property in burdock, which they call the "B factor," that is uniquely capable of reducing cell mutation in either the absence or the presence of metabolic activation.

Turmeric, which contains the ingredient **curcumin** that makes curry and mustard yellow, is said to substantially decrease the damaging effects of radiation. While the herb has low toxicity and strong antioxidant activity, the verdict is still out on whether curcumin does or does not protect against cellular damage from radiation, for the effect may be dose dependent.

Animal tests by Paul Okunieff and Ivan Ding at the University of Rochester's Wilmot Cancer Center have shown that curcumin protects the skin during radiotherapy. Administering turmeric prior to a dose of radiation led to far fewer radiation burns than occurred among laboratory mice which didn't get turmeric.

Other herbs have been known to treat radiation, or cancer (leukemia) or protect against radiation as well. The list is so extensive it can make your head spin.

Red clover, **Periwinkle** (*Vinca rosea*) and **autumn primrose** (*Colchicum officinale*) are used in leukemia treatment as examples.

Basil, which contains two water soluble flavonoids called **orientin** and **vicenin**, has also been proven to protect the white blood cells, chromosomes and bone marrow from radiation poisoning ("Protection against radiation-induced chromosome damage in mouse bone marrow by *Ocimum sanctum*," *Mutat Res.* 1997 Feb 3;373(2):271-6; "Enhancement of bone marrow radioprotection and reduction of WR-2721 toxicity by *Ocimum sanctum*," *Mutat Res.* 1998 Feb 2;397(2):303-12).

Frankly, there are just too many herbs with reported radioprotective effects and to make such a list would be to create a "worthless cookbook" of this and that without any order to it.

If you have radiation exposure, you need to go to an herbalist, Chinese doctor, nutritionist or naturopath with lots of herbal experience to know which herbs to take for whatever are your specific symptoms. The ones I've mentioned are just to give you a sample of the findings out there.

What I would do, however, is eat the miso soup, the brassica vegetables, and the mushrooms as an immune stimulant. As to various supplements, they're next ...

Various Supplements

The medical literature has an incredible number of reports on the radioprotective effects of nutritional substances and their abilities to repair RNA and DNA damage caused by radiation.

In short, commercially available nutritional supplements that remarkable health benefits and definite radioprotective effects.

But which ones?

The studies suggest that there is a synergistic radioprotective effect from taking a variety of these supplements together because the combined effects of these supplements will exceed the radioprotective effect of any single individual supplement alone.

That's a key finding that has come out of several studies -- A. I. Gaziev, A. J. Podlutsy, B. M. Panfilov, and R. Bradbury, "Dietary-supplements of antioxidants reduce HPRT mutant frequency in splenocytes of aging mice," *Mutation Res. - DNAging Genetic Instability and Aging*, 338 (1-6), 77-86, 1995; F. Fedorocko, P. Brezani, and N. Mackova, "The invivo effects of culture-medium— 1. Radioprotective effects of vitamins, amino-acids and inorganic salts of culture-medium in mice," *Physiol. Res.*, 40 (5), 493-502, 1991; J. R. Maisin, "Protection against ionizing-radiation by combinations of radioprotectors," *Pharmacol. Therap.*, 39 (1-3), 189-193, 1988.

Actually, what this suggests is that taking a good multivitamin-multimineral supplement like **Supernutrition Perfect Blend** or Patrick Quillin's **Immunopower** is the way to go to maximize your health, immunity, radioprotective and healing abilities rather than pick specific individual supplements.

I could cite study after study championing the benefits of cysteine, SOD (superoxide dismutase, which has been studied as a radioprotector), vitamin E, vitamin C, carnosine, lecithin, thymus extract, melatonin, silymarin (milk thistle), ginkgo, abana, beta carotene, lycopene, EGCG and other factors with proven radioprotective effects, immune stimulating properties or proven abilities to help repair damaged RNA/DNA.

You can read a study by Weiss and Landower ("Protection against ionizing radiation by antioxidant nutrients and phytochemicals," *Toxicology* 189, 1-20, 2003) for just a short review of relevant findings.

I could tell you that a deficiency of vitamins and minerals can mimic radiation exposure because the deficiencies can damage DNA via the same mechanism as radiation (Ames BN. "DNA damage from micronutrient deficiencies is likely to be a major cause of cancer," *Mut Res* 2001;475:7-20).

I could also list minerals and supplements like zinc, magnesium, the B-vitamins and so on that are necessary for cellular repair and countering RNA/DNA damage. Boy that list would be long!

I could make list after list until you are confused and don't know what to take, but what's the point when you get all of them in a good multivitamin-mineral, as recommended, and in foods such as chlorella, spirulina, seaweeds, brassica, and so forth.

The key after radiation exposure is to eat easily digestible, high quality foods that can supply you with these nutrients ... or to take green powder mixtures of foods (like **ProGreens**, **Emerald Greens**, **Living Fuel Rx**) that can supply you with these nutrients in an easily absorbable form.

Incidentally, that's why people do juicing, which helps after healing, and while no studies have been done it may help for healing after radiation exposure. Why? Simply because by juicing you are making the feed easy to digest and absorb,

and that's the key to repairing the body. After radiation you want to be supplying your body with immune-stimulating and repair supplements, and whether that's by spirulina, chlorella, seaweeds, miso soup, sardines, or juicing, that's exactly what you want to be doing.

With this whole list of foods, you now know what to concentrate on and most of all, you know to stay away from sweets, wheats and sugars.

That's a key part of the anti-radiation diet.

References:

"American Nutraceutical Association's Symposium on Glyconutritionals," *Journal of the American Nutraceutical Association*, Supplement No. 1, 8-32, 1997.

"Free Radical Scavenger Effects of Lycopene," *Cancer Epidemiology: Biomarkers and Prevention* 10 (July 2001).

"Lycopene and Its Association with Alpha-Tocopherol," *Biochemical and Biophysical Research Communications* (1998).

Agarwal OP, and A. Nagaratnam, "Radioprotective property of flavonoids in mice," *Toxicol.*, 19 (2), 201-204, 1981.

Ainsworth E. J., "From endotoxins to newer immunomodulators: survival-promoting effects of microbial polysaccharide complexes in irradiated animals," *Pharmacol. Therap.*, 39 (1-3), 233-241, 1988.

Alton, G., Kjaergaard S., Etchison, J. R., Skovby, F., Freeze, H. H., "Oral injection of mannose elevates blood mannose levels: A first step toward a potential therapy for carbohydrate-deficient glycoprotein syndrome type-I," *Biochemical and Molecular Medicine*, 60 (2), 127-133, 1997.

Anderson JJB and S. C. Garner, "The effects of phytoestrogens on bone," *Nutrition Res.*, 17 (10), 1617-1632, 1997.

Axford J, "Glycobiology and medicine: an introduction," *J. Royal Soc. Med.*, 90, 260-264, 1997.

Bejan A, A. Maican, and G. Turcu, "Comparison between radioimmunoanalysis and Mancini methods for a case of ascorbic-acid radioprotection on rats contaminated with tritiated-water," *J. Radioanal. Nuc. Chem. Lett.*, 201 (3), 199-204, 1995.

Bertell, Rosalie. "Gulf war syndrome, depleted uranium and the dangers of low-level radiation." www.ccnr.org/bertell_book.html

Boik, John, *Natural Compounds in Cancer Therapy: Promising Nontoxic Antitumor Agents from Plants and Other Natural Sources*, Princeton: Oregon Medical Press, 2001: 302-4.

Boiko VN, O. V. Shadrin, I. G. Derevyanchenko, A. M Buntsevich, and S. N. Bykovshaya, "Radioprotectorant effects of lymphokinin, a combined cytokine preparation," *Byull. Eks. Biol. Med.*, 118 (7), 38-40, 1994.

Brown KS, "Functional foods, a fruitful research field, but various regulatory obstacles persist," *Scientist*, 10 (5), 1, 1996.

- Campbell B, D. Busbee, and R. McDaniel, "Enhancement of immune function in rodents using a proprietary complex mixture of glyconutritionals," *Proceedings of the Fisher Institute for Medical Research*, 1 (1), 34-37, 1997.
- Carter, James P., MD, DrPh, Saxe, Gordon P., MPH, PhD, Newbold, Vivian, MD, Peres, Charles E., MD, Campeau, Richard J., MD, and Bernal-Green, Lynn, MD, "Hypothesis: Dietary Management May Improve Survival from Nutritionally Linked Cancers Based on Analysis of Representative Cases," *Journal of the American College of Nutrition* 12.3 (1993): 209-26.
- Chertkov KS, N. I. Gvozdeva, B. S. Fedorenko, and Yu. Yu. Preobrazhenskii, "Radioprotective and therapeutic efficacy of carrageenan during proton radiation," *Kosmicheskaya Biologiya I Aviakosmicheskaya Meditsina*, 20 (20), 84-86, 1986.
- Chiu SM and N. L. Oleinick, "Radioprotection against the formation of DNA double-strand breaks in cellular DNA but not native cellular chromatin by the polyamine spermine," *Radiat. Res.*, 148 (2), 188-192, 1997.
- Chiu SM and N. L. Oleinick, "Radioprotection of cellular chromatin by the polyamines spermine and putrescine: preferential action against formation of DNA-protein cross-links," *Radiat. Res.*, 149 (6), 543-549, 1998.
- Coleman M, J. L. Redpath, and E. Zabilansky, "Radioprotection of mouse gut bone marrow and skin by vitamin C," *Radiat. Res.*, 83 (2), 450, 1980.
- Craig WJ, "Phytochemicals: Guardians of our health," *J. Am. Dietet. Assn.*, 97, S199-S204, 1997.
- Danhof IE, "Potential reversal of chronological and photo-aging of the skin by topical application of natural substances," *Phytotherapy Research*, 7, S53-S56, 1993.
- Davis, Devra Lee, "Natural Anticarcinogens, Carcinogens, and Changing Patterns in Cancer: Some Speculation," *Environmental Research* 50 (1989): 322-40.
- Delanian S, S. Balla-Mekias and J. L. Lefaix, Striking regression of chronic radiotherapy damage in a clinical trial of combined pentoxifylline and tocopherol. *J. Clin. Oncol.* **17**, 3283-3290 (1999).
- Devasagayam, T. P. A. , and P. C. Kesavan, "Radioprotective and antioxidant action of caffeine: Mechanistic considerations," *Indian J. Exp. Biol.*, 34 (4), 291-297, 1996.
- Devi PU and A. Ganasoundari, "Radioprotective effect of leaf extract of Indian medicinal plant *Ocimum sanctum*," *Indian J. Exp. Biol.*, 33 (3), 205-208, 1995.
- Dorai, T., Cao, YC, Dorai, B., Buttyan, R., and Katz, A.E., "Therapeutic Potential of Curcumin in Human Prostate Cancer III: Curcumin Inhibits Proliferation, Induces Apoptosis, and Inhibits Angiogenesis of LNCaP Prostate Cancer Cells in Vivo," *Prostate* 47.4 (June 1, 2001): 293-303.
- Dorai, T., Gehani, N., and Katz, A., "Therapeutic Potential of Curcumin in Human Prostate Cancer II: Curcumin Inhibits Tyrosine Kinase Activity of Epidermal Growth Factor Receptor and Depletes the Protein," *Molecular Urology* 4.1 (Spring 2000): 1-6.
- Dykman KD, C. Tone, C. Ford, and R. A. Dykman, "The effects of nutritional supplements on the symptoms of fibromyalgia and chronic-fatigue-syndrome," *Integrative Physiological and Behavioral Science*, 33 (1), 61-71, 1998.
- Egger S. F., G. S. Brown, L. S. Kelsey, K. M. Yates, L. J. Rosenberg, and J. E. Talmadge, "Hematopoietic augmentation by a beta-1,4-linked mannan," *Cancer Immunol. Immunother.*, 43, 195-205, 1996.
- El-Sayed, M. M. , A. M. Mahdy, Z. S. Nadia, H. S. El Kashef, and K. S. Mahmoud, "Radioprotective role of vitamin E and testosterone against radiation effects on serum cholesterol and free fatty acid of irradiated rats," *J. Med. Res. Inst.*, 17 (1), 149-156, 1996.

Ember LR, "Surviving stress—NASA uses land model to test stress of space flight on immune system," *Chemical and Engineering News*, 76 (21), 16-17, 1998.

Farooqi Z and P. C. Kesavan, "Radioprotection by caffeine pre and post-treatment in the bone marrow chromosomes of mice given whole-body gamma-irradiation," *Mutation Res.*, 269 (2), 225-230, 1992.

Fedorocko F, P. Brezani, and N. Mackova, "The invivo effects of culture-medium— 1. Radioprotective effects of vitamins, amino-acids and inorganic salts of culture-medium in mice," *Physiol. Res.*, 40 (5), 493-502, 1991.

Felemovicius I, M. E. Bonsack, M. L. Baptista, and J. P. Delaney, "Intestinal radioprotection by vitamin E (alpha-tocopherol)," *Annals of Surgury*, 222 (4), 504, 1995.

Fogelman R. W., J. M. Chapdelaine, R. H. Carpenter, B. H. McAnalley, "Toxicologic evaluation of injectable acemannan in the mouse, rat and dog," *Veterinary and Human Toxicology*, 34, 201-5, 1992.

Galligan ES, S. F. Seetman, S. R. McKeown, and J. J. Stain, "The radioprotective effect of dietary antioxidants on murine haematopoietic cells," *Proc. Nutrition Soc.*, 56 (1A), 109A, 1997.

Gaziev AI, A. J. Podlutsy, B. M. Panfilov, and R. Bradbury, "Dietary-supplements of antioxidants reduce HPRT mutant frequency in splenocytes of aging mice," *Mutation Res.-DNAging Genetic Instability and Aging*, 338 (1-6), 77-86, 1995.

Goddu SM, V. R. Narra, R. S. Harapanhalli, R. W. Howell, and D. V. Rao, "Radioprotection by DMSO against the biological effects of incorporated radionucleides in vivo. Comparison with other radioprotectors and evidence for indirect action of Auger electrons," *Acta Oncol.* (Stockholm), 35 (7), 901-907, 1996.

Goncharenko EN and Yu. B. Kudrjashov, "Problem of the chemical protection under action of the chronic x-radiation," *Radiats. Biol., Radioekol.*, 36 (4), 573-586, (Russian), 1996. Chem. Abstr. 126:28575.

Gong, Y.F. et al. "Suppression of radioactive strontium absorption by sodium alginate in animals and human subjects." *Biomed Environ Sci.* 1991 Sep; 4(3):273-282.

Kapitanov, A.B., et al. "Radiation-protective effectiveness of lycopene." *Radiats Biol Radioecol*

Gorshkov, A.I., "Comparative evaluation of radiation protective efficiency of regimens with various contents of calcium, potassium and iron." *Gig Sanit*, 1994 Jun; (6):18-20.

Gratwohl A., L. John, H. Baldomero, and A. Wodnar-Filipowicz, "Radioprotection by combining early (FLT3 ligand) and late (G-CSF) acting cytokines for total body irradiation in rabbits," *Blood*, 90 (10 Suppl. 1, Part 1), 360A, 1997.

Greenwald, P., Clifford, C.K., and Milner, J.A., "Diet and Cancer Prevention," *European Journal of Cancer* 37 (2001): 948-965: 949; Wynder, Ernst L., Rose, David P., and Cohen, Leonard A., "Nutrition and Prostate Cancer: A Proposal for Dietary Intervention," *Nutrition and Cancer* 22.1 (1994): 1-7.

Guenechea G., A. Real, J. A. Bueren, and G. Maganto, "Radioprotection conferred by AM5 a protein complexed polysaccharide," *Exp. Hematol.*, 19 (6), 490, 1991.

Guenechea G., B. Albella, J. A. Bueren, and G. Magnato, "AM218, a new polyanionic polysaccharide, induces radioprotection in mice when administered shortly before irradiation," *Int. J. Rad. Biol.*, 71 (1), 101, 1997.

Hachiya M., H. P. Koeffler, G. Suzuki, and M. Akashi, "Tumor-necrosis-factor and interleukin-1 synergize with irradiation in expression of GM-CSF gene in human fibroblasts," *Leukemia*, 9 (7), 1276-1281, 1995.

Halaas O., W. M. Olsen, O. P. Veiby, D. Lovhaug, G. Skajakbraek, R. Vik, and T. Espevik, "Mannuronan enhances survival of lethally irradiated mice and stimulates murine hematopoiesis in-vitro," *Scand. J. Immun.*, 46 (4), 358-365, 1997.

- Hall E. J., *Radiobiology for the Radiologist*, 4th Ed., J. B Lippincott Co., Philadelphia, PA (1994), p. 186.
- Hanson WR, W. N. Zhen, L. Geng, N. Hunter, and L. Milas, "The prostaglandin E(1) analog, misoprostol, a normal tissue protector, does not protect 4 murine tumors in-vivo from radiation injury," *Radiat. Res.*, 142 (3), 281-287, 1995.
- Harapanhalli RS, V. R. Narra, V. Yaghmai, and M. T. Azure, "Vitamins as radioprotectors in vivo. II. Protection by vitamin A and soybean oil against radiation damage caused by internal radionuclides," *Radiat. Res.*, 139, 115-122, 1994.
- Henderson TD, R. L. Burt, S. E. Kaufman, W. M. Willingham, and J. R. J. Sorenson, "Radiorecover activity of manganese(III)2(II)(mu(3)-O)-mu-3,5-diisopropylsalicylate(6)," *Radiat. Res.*, 136, 126-129, 1993.
- Hosokawa Y, M. Yonezawa, and A. Takeda, "Radioprotective effect of an oriental medical drug on mice—determination of hemoglobin content in feces after whole-body gamma irradiation," *J. Rad. Res.*, 34 (4), 358, 1993.
- Inano, H., M. Onoda. "Radioprotective action of curcumin extracted from *Curcuma longa* LINN:inhibitory effect on formation of urinary 8-hydroxy-2-deoxyguanosine, tumorigenesis, but not mortality, induced by gamma-ray irradiation." *Int J Radiat Oncol Biol Phys*, 2002 Jul 1; 53(3):735-743.
- Institute for Medical Research*, 1 (1), 6-37, 1997.
- Izumo Y and H. Ogata, "Radioprotective effects in mice by a single dose of subcutaneous administration of cobaltous chloride post gamma-rays irradiation with a sublethal dose," *Radioisotopes*, 42 (3), 164-168, 1993.
- Kalechman Y., A. Zullof, M. Albeck, and G. Strassman, "Role of endogenous cytokines secretion in radioprotection conferred by the immunomodulator ammonium trichloro (dioxethylene-O-O') tellurate," *Blood*, 85 (6), 1555, 1995.
- Kanwar KC, A. Verma, and R. C. Sobti, "Radioprotective effect of Venoruton: the micronuclei assay on bone marrow polychromatic erythrocytes," *Med. Sci. Res.*, 18 (16), 643-644, 1990.
- Katoh N and M. Yonezawa, "Radioprotective activity in some medicinal herbs," *Bulletin of the University of Osaka Prefecture Series B—Agriculture and Life Sciences*, 43, 109-114, 1991 and *Shoyakugaku Zasshi*, 47 (3), 338-341, 1993.
- King G. K., K. M. Yates, P. G. Greenlee, K. R. Pierce, C. R. Ford, B. H. McAnalley, and I. R. Tizard, "The Effect of Acemannan Immunostimulant in Combination with Surgery and Radiation-Therapy on Spontaneous Canine and Feline Fibrosarcoma," *Journal of the American Animal Hospital Association*, 31 (5), 439-447, 1995.
- Kumar KS, Y. N. Vaishnav, and J. F. Weiss, "Radioprotection by antioxidant enzymes and enzyme mimetics," *Pharmacol. Therap.*, 39 (1-3), 301-310, 1988.
- Kumar KS, V. Srinivasan, R. Toles, L. Jobe and T. M. Seed, Nutritional approaches to radioprotection: Vitamin E. *Mil. Med.* **167**, 57-59 (2002).
- Lett J. T., "Experimental models for cellular radiation targets: LET, RBE and radioprotectors," *Advances in Space Research*, 18, (1-2), 31-40, 1996.
- Livesey J. C. and D. J. Reed, "Chemical protection against ionizing radiation," in *Advances in Radiation Biology*, 13, 285, 1987.

- Londer HN, and C. E. Myers, "Radioprotective effect of vitamin E," *Am J. Clin. Nutrition*, 31 (4), 705, 1978 and *Clin. Res.*, 261 (3), 284A, 1978.
- Lushbaugh C. C. and D. B. Hale, "Experimental Acute Radiodermatitis following Beta Radiation. V. Histopathological Study of the Mode of Action of Therapy with Aloe Vera," *Cancer*, 6, 690-9 (1953).
- Lushbaugh C. C., J. B Storer, and D. B. Hale, "Experimental acute radiodermatitis following beta radiation. I. Its pathogenesis and repair," *Cancer*, 6 (4), 671-7 (1953).
- M. R. Landauer, H. D. Davis, K. S. Kumar, and J. F. Weiss, "Behavioral toxicity of selected radioprotectors," *Adv. Space Res.*, 12 (2-3), 1992.
- Mahdy AM, "Vitamin E as a chemical radioprotector from controlling the radiation induced changes in the level of protein and urea in the serum of irradiated rats," *Isot. Rad. Res.*, 23 (2), 117-123, 1991.
- Maisin J. R., A. Kondi-Tamba, and G. Mattelin, "Polysaccharides induce radioprotection of murine hematopoietic stem-cells and increase the LD50/30 days," *Radiat. Res.*, 105 (2), 276-281, 1986.
- Maisin J. R., S. Topalova, A. Kondi-Tamba, and G. Mattelin, "Radioprotection by polysaccharides," *Pharmacol. Therap.*, 39 (1-3), 255-260, 1988.
- Maisin JR, "Protection against ionizing-radiation by combinations of radioprotectors," *Pharmacol. Therap.*, 39 (1-3), 189-193, 1988.
- Malhotra N, K. Rana, and R. K. Malhotra, "Vitamin E as a radioprotector of bursa of Fabricius in chicks," *Indian J. Exp. Biol.*, 31 (5), 490, 1993.
- Marwick C, "Learning how phytochemicals help fight disease," *J. Am. Med. Assn.*, 274 (17), 1328-1330, 1995.
- McAnalley B. H., "Acemannan as interleukin 1 and prostaglandin E2 formation stimulation," *International Patent Application WO 9001253 A1 22 Feb. 1990, 141 pp.* (Chem. Abstr. 114:55783).
- McAnalley BH and E. P. Vennum, "The potential significance of dietary sugars in management of osteoarthritis and rheumatoid arthritis: A review," *Proceedings of the Fisher Institute for Medical Research*, 1 (1), 6-10, 1997.
- Messina M and V. Messina, "The 2nd golden-age of nutrition: Phytochemicals and disease prevention," *ACS Symp. Ser.*, 546, 382-387, 1994.
- Metodiewa D, A. Kochman, and S. Karolczak, "Evidence for antiradical and antioxidant properties of four biologically active N,N-diethylaminoethyl ethers of flavanone oximes: a comparison with natural polyphenolic flavonoid (rutin) action," *Biochem. Mol. Biol. Int.*, 41 (5), 1067-1075, 1997.
- Milas L, I. Nishiguchi, N. Hunter, D. Murray, R. Fleck, H. Ito, and E. Travis, "Radiation protection against early and late effects of ionizing irradiation by the prostaglandin inhibitor indomethacin," *Adv. Space Res.*, 12 (2-3), (2)265-(2)271, 1992.
- Mitchell, Terri, "A Report on Cucurmin's Anti-Cancer Effects," *Life Extension*, July 2002: 26-30.
- Murray RK, *Harper's Biochemistry: A Lange Medical Book*, 24th Edition Appleton and Lange, Stamford Connecticut, 1996.
- Mondoa, Emil, and Mindy Kitei, Sugars That Heal, (Ballantine Books, New York, 2001).
- Nakamura, K., Yasunaga, Y., Segawa, T., Ko, D., Moul, JW, Srivastava, S., and Rhim, J.S., "Curcumin Down-Regulates AR Gene Expression and Activation in Prostate Cancer Cell Lines," *International Journal of Oncology* 21.4 (October 2002): 825-30.

- Narra VR, R. S. Harapanhalli, R. W. Howell, K. S. R. Sastry, and D. V. Rao, "Vitamins as radioprotectors in vivo. I. Protection by vitamin C against internal radionuclides in mouse testes: implications to the mechanism of damage caused by the Auger effect," *Radiat. Res.*, 137, 394-399, 1994.
- Narra VR, R. W. Howell, K. S. R. Sastry, and D. V. Rao, "Vitamin C as a radioprotector against iodine-131 in vivo," *Radiat. Res.*, 137, 394-399, 1994.
- Nemoto K, H. Ishihara, I. Tanaka, G. Suzuki, K. Tsuneoka, K. Yoshida, and H. Ohtusu, "Expression of IL-1 messenger-RNA in mice after whole-body x-irradiation," *J. Radiat. Res.*, 36 (2), 125-133, 1995.
- Net R. a, "Radioprotection and therapy of radiation injury with cytokines," *Prog. Clin. Biol. Res.*, 352, 471-478, 1990.
- Neta R., J. J. Oppenheim, R. D. Schreiber, R. Chizzonite, G. D. Ledney, and T. J. MacVittie, "Role of cytokines (interleukin-1, tumor-necrosis-factor, and transforming growth-factor-beta) in natural and lipopolysaccharide-enhanced radioresistance," *J. Exp. Med.*, 173 (5), 1177-1182, 1991.
- Neta R., S. D. Douches, and J. J. Oppenheim, "Radioprotection by interleukin-1," *J. Cell. Biochem. Suppl.*, (10, Part A), 103, 1986.
- Neth R., O. Gan, E. Sadovnikova, S. H. Gohla, E. Gumz, S. Schrum, and N Drize, "Radioprotection of hematopoietic and stromal precursors by polysaccharide fractions isolated from the cupressaceae thuja-occidentale L. TPSG," *AIDS Res. Human Retrov.*, 8 (5), 911, 1992.
- Nomoto K, T. Yokokura, K. Tsuneoka, and M. Shikita, "Radioprotection of mice by a single subcutaneous injection of heat-killed Lactobacillus casei after irradiation," *Radiat. Res.*, 125 (3), 293-297, 1991.
- O'Connor MK, J. F. Malone, M. Moriarty, and S. Mulgrew, "A radioprotective effect of vitamin C observed in Chinese hamster ovary cells," *Br. J. Radiol.*, 50 (596), 587-591, 1977.
- Omoto R, P. E. Dorlhiacclacer, D. A. F., and D. S. Abdalla, "The radioprotective effects of trolox and ascorbic-acid on irradiated red-cells," *Blood*, 88 (10 Suppl. 1, Part 2), 2753, 1996.
- Pang Q, B. Guo, and A. Kolman, "Radioprotective effect of extract from Spirulina platensis in mouse bone marrow cells studied by using the micronucleus test," *Tox. Lett. (Shannon)*, 48 (2), 165-170, 1989.
- Patchen M. L., T. J. MacVittie, B. D. Solberg, M. M. D'Alesandro, and I. Brook, "Radioprotection by polysaccharides alone and in combination with amino thiols," *Adv. Space Res.*, 12 (2-3), (2)233-(2)248, 1992.
- Pereira, M.A., et al, "Effects of the Phytochemicals Curcumin and Quercetin Upon Azoxymethane-Induced Colon Cancer," *Carcinogenesis* 17.6 (1996): 1305-11. Sreejayan and Rao, M.N., "Nitric Oxide Scavenging by Curcuminoids," *Journal of Pharmacy and Pharmacology* 49.1 (1997): 105-57.
- Perepelkin, S.R., N.D. Egorova. "Prophylactic and therapeutic role of the B group vitamin, mesoinositol, in radiation sickness against a background of the use of a milk and egg diet." *Radiobiologiya*, 1980 Jan-Feb; 20(1):137-139
- Peterson M, J. J. Adamaovicz, T. B. Elliott, M. M. Moore, G. S. Madonna, W. E. Jackson, G. D. Ledney, and W. C. Gause, "Gene-expression of hematoregulatory cytokines is elevated endogenously after sublethal gamma-irradiation and is differentially enhanced by therapeutic administration of biologic response modifiers," *J. Immunol.*, 153 (5), 2321-2330, 1994.
- Rana K, A. Sood, and N. Malhotra, "Radioprotection of chick thymus by Vitamin E," *Indian J. Exp. Biol.*, 31 (10), 847-849, 1993.
- Real A., G. Guenechea, J. A. Bueren, and G. Maganto, "Radioprotection mediated by the haemopoietic stimulation conferred by AM5: a protein complexed polysaccharide," *Int. J. Rad. Biol.*, 62 (1), 65-72, 1992.

- Riklis E., I. Emerit, and R. B. Setlow, "New approaches to biochemical radioprotection: antioxidants and DNA repair enhancement," *Advances in Space Research*, 18 (1-2), 51-54 1996.
- Roberts D. B. and E. L. Travis, "Acemannan-containing wound dressing gel reduces radiation-induced skin reactions in C3H mice," *International Journal of Radiation Oncology Biology Physics*, 32 (4), 1047-1052, 1995.
- Rogozkin V. D., I. E. Andrianova, V. A. Razorenova, G. A. Vitovskaya, and N. P. Elinov, "Radioprotective properties of yeast poly saccharides," *Radiobiologiya*, 14 (5), 773-776, 1974.
- Salvadori, D. M. F., L. R. Ribeiro, Y. Xiao, J. J. Boei, and A. T. Natarajan, "Radioprotection of Beta-Carotene Evaluated on Mouse Somatic and Germ-Cells," *Mutation Research-Fundamental and Molecular Mechanism of Mutagenesis*, 356 (2), 163-170, 1996.
- Senior K, "How can components of common foods affect cancer risk," *Molecular Medicine Today*, 3 (3), 103-107, 1997.
- Shaheen AA, and S. M. Hassan, "Radioprotection of mouse gut bone marrow and skin by vitamin C," *Radiat. Res.*, 83 (2), 450, 1980.
- Shaheen AA, and S. M. Hassan, "Radioprotection of whole body gamma -irradiation-induced alteration in some hematological parameters by cysteine, vitamin E and their combination in rats," *Strahlentherapie und Onkologie*, 167 (8), 498-501, 1991.
- Shimoi K, S. Masuda, B. Shen, M. Furugori, and N. Kinae, "Radioprotective effects of antioxidative plant flavonoids in mice," *Mutation Res.*, 350, 153-161, 1996.
- Shimoi K, S. Masuda, M. Furugori, and S. Esaki, "Radioprotective effect of antioxidative flavonoids in gamma ray irradiated mice," *Carcinogenesis*, 15 (11), 2669-2672, 1994.
- Srinivasan V and J. F. Weiss, Radioprotection by vitamin E: Injectable vitamin E administered alone or with WR-3689 enhances survival of irradiated mice. *Int. J. Radiat. Oncol. Biol. Phys.* **23**, 841-845 (1992).
- Singh AP, R. Varshney, and R. K. Kale, "Radioprotective effect of divalent calcium against peroxidative damage in murine hepatic microsomal system," *Indian J. Exp. Biol.*, 33 (12), 935-939, 1995.
- Singh SP, S. K. Abraham, and P. C. Kesavan, "Radioprotection of mice following garlic pretreatment," *Brit. J. Cancer*, 74 (Suppl. 27), S102-S104, 1996.
- Slordal L., M. O. Muench, D. J. Warren, and M. A. S. Moore, "Radioprotection by murine and human tumor-necrosis factor: Dose-dependent effects on hematopoiesis in the mouse," *Eur. J. Haematol.*, 43 (5), 428-434, 1989.
- Sorenson J. R. J., L. S. F. Soderberg, and L. W. Chang, "Radiation protection and radiation recovery with essential metalloelement chelates," *Proc. Soc. Exp. Biol. Med.*, 210 (3), 191-204, 1995.
- Sorenson J. R. J., L. S. F. Soderberg, L. W. Chang, W. M. Willingham, M. L. Baker, J. B. Barnett, H. Salari, and K. Bond, "Copper-3,5-diisopropylsalicylate, iron-3,5-diisopropylsalicylate, manganese-3,5-diisopropylsalicylate, and zinc-3,5-diisopropylsalicylate complexes increase survival of gamma-irradiated mice," *Eur. J. Med. Chem.*, 28 (3), 221-229, 1993.
- Sorenson JRJ, "Essential metalloelement metabolism and radiation protection and recovery," *Radiat. Res.*, 132, 19-29, 1992.
- Spotheim-Maurizot M, S. Ruiz, R. Sabattier, and M. Charlier, "Radioprotection of DNA by polyamines," *Int. J. Rad. Biol.*, 68 (5), 571-577, 1995.

Srinivasan V. and J. F. Weiss, "Radioprotection by vitamin E: injectable vitamin E administered alone or with WR-3689 enhances survival of irradiated mice," *Int. J. Rad. Oncol. Biol. Phys.*, 23 (4), 841-845, 1992.

Stevenson A. F. G., H. Moenig, and J. Weckesser, "Radioprotective and hemopoietic effects of some lipopolysaccharides from Rhodospirillaceae species in mice," *Experientia (Basel)*, 37 (12), 1331-1332, 1981.

Stevenson, A.F. "Low level radiation exposure the radiobiologists's challenge in the next millennium." *Indian J Exp Biol* 2002 Jan;40(1):12-24.

Storm HM, S. Y. Oh, B. F. Kimler, and S. Norton, "Radioprotection of mice by dietary squalene," *Lipids*, 28 (6), 555-559, 1993.

Stuart, R. W., Lefkowitz, D. L., Lincoln, J. A., Howard, K., Gelderman, M. P., and Lefkowitz, S. S., "Up-Regulation of Phagocytosis and Candidicidal Activity of Macrophages Exposed to the Immunostimulant, Acemannan," *International Journal of Immunopharmacology*, 19 (2), 75-82, 1997.

Stutte GW, "Phytochemicals: Potential impacts on long-duration space missions," *Abstr. Pap. Am. Chem. Soc.*, 214 (pt. 1), 96, 1997.

Sukhanov, B.P., et al. "Medical and biological evaluation of new food products for children exposed to excessive radiation." *Gig Sanit*, 1994 Sept-Oct; (8):24-26.

Szolgay E, M. Talas, and L. Batkai, "Radioprotective activity of interferon inducers," *Acta Microbiolog. Acad. Sci. Hung.*, 25 (2), 136, 1978.

Tanaka, Y. et al. "Application of algal polysaccharides as in vivo binders of metal pollutants." *Proc Seventh Int Seaweed Symp*, 602-607, Wiley and sons, 1972.

Tanaka, Y. et al. "Studies on inhibition of intestinal absorption of radioactive strontium." *Can Med Assoc J* 1968, 99:169-75.

Tarbell, N.J., M. Rosenblatt, et al. "The effect of N-acetylcysteine inhalation on the tolerance to thoracic irradiation in mice." *Radiother Oncol*, 1986 Sept; 7(1): 77-80.

Tizard I., D. Busbee, B. Maxwell, and M. C. Kemp, "Effects of Acemannan, a Complex Carbohydrate, on Wound-Healing in Young and Aged Rats," *Wounds-A Compendium of Clinical Research and Practice*, 6 (6), 201-209, 1994.

Tsuneoka K, H. Ishihara, A. B. Dimchev, K. Nomoto, T. Yokokura, and M. Shikita, "Timing in administration of a heat-killed *Lactobacillus casei* preparation for radioprotection in mice," *J. Radiat. Res.*, 35 (3), 147-156, 1994.

Uma Devi P. and P. G. S. Prasanna, "Comparative radioprotection of mouse hemopoietic system by some thiols and a polysaccharide," *Proc. Nat. Acad. Sci., India*, B, 65 (1), 89, 1995.

Uma Devi P., A. Ganasoundari, B. Vrinda, K. K. Srinivasan and M. K. Unnikrishnan, Radiation protection by the ocimum flavonoids orientin and vicenin: Mechanisms of action. *Radiat. Res.* **154**, 455-460 (2000).

US Dept Health and Human Services. "Dietary aspects of carcinogenesis," Nov. 1981.

Vacek A, D. Rotkowska, and A. A. Bartonikova, "Radioprotection of hemopoiesis conferred by aqueous extract from chlorococcal algae (*Ivastimul*) administered to mice before irradiation," *Exp. Hematol.* (New York), 18 (3), 234-237, 1990.

- Van Os, R., C. Lamont, A. Witsell, and P. M. Mauch, "Radioprotection of bone marrow stem cell subsets by interleukin-1 and kit-ligand: Implications for CFU-S as the responsible target cell population," *Exp. Hematol. (Charlottesville)*, 25 (3), 205-210, 1997.
- Varanda EA and D. C. Tavares, "Radioprotection: Mechanisms and radioprotective agents including honeybee venom," *J. Venomous Animals and Toxins*, 4 (1), 5-21, 1998.
- Vassili N et al, "Use of a new hematopoietic preparation in oncology," *2002 ASCO Annual Meeting*, abstract 1851.
- Walden Jr., T. L. and J. F. Kalinich, "Radioprotection by leukotrienes—is there a receptor mechanism?," *Pharmacol. Therap.*, 39 (1-3), 379-384, 1988.
- Walden TL., "Radioprotection of mouse hematopoietic stem cells by leukotriene A4 and lipoxin B4," *J. Radiat. Res.*, 39 (4), 255-260, 1988.
- Walkiw, O., Douglas, D.E. "Health food supplements prepared from kelp – a source of elevated urinary arsenic." *Can Med Assoc J* 1974;111:1301-2 (letter).
- Weisburger, John H., "Nutritional Approach to Cancer Prevention, With Emphasis on Vitamins, Antioxidants, and Carotenoids," *American Journal of Clinical Nutrition* 53 (1991): 2265-75.
- Weiss JF, V. Srinivasan, K. S. Kumar, and M. R. Landauer, "Radioprotection by metal: selenium," *Adv. Space Res.*, 12 (2-3), (2)223-(2)231, 1992.
- Wierowski JV and A. K. Bruce, "Radioprotection by manganese II in micrococcus-radiodurans," *Radiat. Res.*, 74 (3), 574-575, 1978.
- Williams, M. S., Burk, M., Loprinzi, C. L., Schomberg, P. J., Nearhood, K., and Ofallon, J. R., "Phase-III double blind evaluation of an aloe vera gel as a prophylactic agent for radiation-induced skin toxicity," *International Journal of Radiation Oncology Biology Physics*, 36 (2), 345-349, 1996.
- Womble D. and J. H. Kelderman, "Enhancement of allo-responsiveness of human lymphocytes by acemannan (Carrisin)," *Int. J. Immunopharmacol.*, 10 (8), 967-974, 1988.
- Wu SG, A. Tuboi, and T. Miyamoto, "Radioprotection of C3H mice by recombinant human interleukin-1alpha," *Int. J. Rad. Biol.*, 56 (4), 485-492, 1989.
- Yamazaki J, M. Yonezawa, S. Takahashi, H. Ishizone, Y. Ina, and J. Matsubara, "Radioprotection and activation of biodefense system by Tu-Chung extract," *J. Rad. Res.*, 34 (4), 358, 1993.
- Yang JJ, C.-C. Lin, and H.-Y. Hsu, "The possible use of Peh-Hue-Juwa-Chi-Cao as an antitumor agent and radioprotector after therapeutic irradiation," *Phytother. Res.*, 11 (1), 6-10, 1997.
- Yang JJ, H.-Y. Hsu, Y.-H. Ho, and C.-C. Lin, "Comparative study on the immunocompetent activity of three different kinds of Peh-Hue-Juwa-Chi-Cao, *Hedyotis diffusa*, *H. corymbosa* and *Mollugo pentaphylla* after sublethal whole body irradiation," *Phytother. Res.*, 11 (6), 428-432, 1997.
- Yonezawa M, N. Katoh, and A. Takeda, "Radioprotective activity of various portions of raw ginseng roots from the 3 habitats in Japan," *Annual Report of the Radiation Center of Osaka Prefecture*, 25, 55-58, 1984.
- Zhukova N. A., G. F. Palyga, A. A. Maximenko, S. A. Filippova, A. Vatssek, and D. Rotkowska, "Radioprotective properties of the polysaccharide dextran sulfate," *Farmakologiya i Toksikologiya*, 47 (6), 90-93, 1984.

Revici and Fatty Acids

In the field of radiation therapy, there is a man whose work is hardly known, famous cancer doctor Emanuel Revici, MD.

In a lecture entitled "The Influence of Irradiation Upon Unsaturated Fatty Acids," presented in London in 1950 to the Sixth Annual Congress of Radiology, Dr. Revici went over the fact that the effects of severe radiation poisoning tend to increase over time due to a cascading effect of more and more fatty acids becoming abnormal. His paper shows that abnormally-conjugated trienic fatty acids (leukotrienes) induce radiation illness.

Revici was one of the first ones to do substantial research in this area, concentrating on the study of lipids and radiation. It's a topic we barely touched upon so far but in this particular lecture and in his monographs, Revici correctly described the inflammatory effects of leukotrienes (trienic conjugated fatty acids) and their derivation from arachidonic acid, research that was paralleled decades later by Bengt Samuelsson, who won a Nobel Prize for the discovery.

What happens is that if there is a fatty acid imbalance, a small bit of radiation damage will actually grow worse over time until the effects are unstoppable. Revici developed a **oxalic acid index** to measure abnormal fatty acids in the body, and determined that once this index reached a critical level, death was certain.

When the USSR suffered the Chernobyl accident and many doctors were volunteering their services to perform bone marrow transplants for the radiation victims, Revici felt that the approach of using bone marrow transplants to save Soviet radiation victims would not work but was actually doomed to failure because, "So long as (abnormal fatty acids) are in the body, they will act against transplanted bone marrow cells."

In other words, for the acute radiation sickness *hematopoietic syndrome* where bone marrow transplants are considered, Revici basically said you have to check fatty acid conditions to see whether that approach would be successful.

Research on animals have suggested that a variety of cytokines might be useful for the hematopoietic syndrome that often requires this bone marrow therapy, but most of them are not currently available or yet approved for human use. We'll get to them soon.

Anyway, Revici believed that the best antidote for the radiation poisoning was a fatty acid antagonist and he developed a product, **n-butanol**, which has been proved particularly useful in treating radiation burns.

Here's the point of this whole short chapter, however, which is why I wrote this up.

If you suffer from radiation poisoning and you don't do anything to correct the fatty acid imbalance in your body, then even if you take neutropenia (white blood cell) stimulating growth factors, as just discussed, you may still die because you are not treating a crucial part of the equation. You need to work on your fatty acid imbalance.

I only wish to point out this major area of concern because further research should be done in this area that I believe has been greatly overlooked.

Furthermore, I'm mentioning this because it would be beneficial if we all saw more research done on n-butanol and its uses in radiation detoxification as well as on Perse and Bionar, two drugs Revici developed that can detoxify drug addicts without any side-effects whatsoever!

Despite fruitless requests to contact the Revici Foundation, very little information has been available to me on the fatty acid antagonists that Revici developed for radiation injury, or the specifics of his testing mechanism. So while we've talked of seaweeds, miso, clays and baths, etc. I don't want you to overlook this topic of fatty acids and the need for clean sources of fatty acids in the diet after the free radical damage of radiation exposure.

In the literature, there is very little information on fatty acid rancidity due to radiation exposure and how to counter it other than through the use of antioxidants (such as vitamin E, the thiol antioxidants, vitamin C, etc.), many of which you will naturally get through the radiation diet. We do know that **natural beta-carotene** protects against the lipid oxidation and acts as a fatty acid antioxidant radioprotector, but the big thing is the fatty acid imbalance itself.

There's one more big thing of interest along these lines.

Dr. Revici's, years ago, stated that **cod liver oil fatty acids** had a high anticancer value and this received corroboration at the 1987 American Cancer Society Science Writers Seminar, where Dr. Otto Plescia (Professor of Immunochemistry at Rutgers University) concluded that a diet with "inclusion of omega-3 fatty acids abundant in certain fish oils, reduces the risk of breast cancer." In terms of radiation, mice exposed to large doses of radiation survived 50-100% longer than normal if fed cod liver oil.

When you follow the writings of modern complementary physicians such as Julian Whitaker, David William or Joseph Mercola (www.Mercola.com) and others, you will find a consistent recommendation to eat cod liver fish oil and flax seed oil, evening primrose, borage, olive and other similar oils to help restore proper fatty acid balance in the body.

Just as Revici predicted, **cod liver oil** is one of the most often recommended oils for the purposes of rebuilding one's health. Another often cited oil is **olive oil**, and two sets of experiment in Spain (Ilbanes and Castellanos) showed that olive oil fully protected rats against increasing doses of damaging X-ray irradiation. **Carlson's** and **Nordic Naturals** are trustworthy brands for cod liver oil. Olive oil has many producers, but the Omega brands of cold pressed oils are particularly good for vegetable oils. For olive oil, you want the virgin cold pressed oil.

Like Revici, Hopewell has also studied polyunsaturated fatty acids as a means of treating chronic radiation injuries (Hopewell, JW. 1999 "Modifying radiation injury to normal tissues: new opportunities," *Frontiers of Radiation Therapy and Oncology*, 32, 9-20) but perhaps the most interesting work in this area has been performed by the German biochemist, Dr. Johanna Budwig, who was an expert on fats and oils.

Dr. Johanna Budwig worked for 30 years to discover the importance of fatty acids in the diet and is world famous for the development of a diet that uses organic, raw, cold-pressed **flaxseed oil** and **low-fat cottage cheese** to treat cancer.

The Budwig diet formula uses a ratio of two tablespoons of flaxseed oil mixed with one-quarter cup of low-fat cottage cheese over approximately a three-month period to reduce tumors, fight weakness and treat the anemia that often appeared in cancer patients. Therefore it treats symptoms similar to those who suffer from radiation injury.

Whatever you do -- whether it's cod liver oil or flax seed oil -- remember that you can also get fish oils through the nucleotide rich sardines, mackerel, and anchovies that are rich in nucleotides that we previously recommended, but for an even stronger detox and rebuilding potential the supplementation of cod liver oil to your diet is most likely merited after radiation exposure.

In any case, you now know what oils to be consuming for an anti-radiation diet. The right oils will help you build strong cells and fight infection, so they are merited for the diet in general.

References:

Butrum, Ritva R. and Messina, Mark J. "Cancer." In Simopoulos, A.P., Kifer, R.R., et al, Health Effects of Omega-3 Polyunsaturated Fatty Acids in Seafoods: World Review of Nutrition and Diet 66, Karger, 1991: 48-50. "Omega-3 Fatty Acids: Research Advances and Support in the Field Since June 1985," Simopoulos and Kifer 51-71.

Congress of the United States Office of Technology Assessment, Unconventional Cancer Treatments (Washington, D.C.: U.S. Government Printing Office, September 1990), 115 p. 6.

"Dietary eicosapentaenoic acid prevents systemic immunosuppression in mice induced by UVB radiation." *Radiat Res.* 2001 Jul;156(1):36-44;

"Dietary polyunsaturated fatty acids: impact on cancer chemotherapy and radiation." *Altern Med Rev.* 2002 Feb;7(1):4-21)

Eiden, William Kelley, The Doctor Who Cures Cancer, (Sullivan & Foster Publishing, New York, 1997).

Hughes-Fulford, Millie, Chen, Yunfei, and Tjandrawinata, Raymond R., "Fatty Acid Regulates Gene Expression and Growth of Human Prostate Cancer PC-3 Cells," *Carcinogenesis* 22.5 (2001): 701-7.

Ibanez J and Castellanos A, "Efecto de la Protecteccion del Aceite de Oliva Virgin en Dosis Multiples Subletals de X-Irradidacion en la Rata," *Revista Clinica Espanola*, April 15, 1963, no. 1, pp. 14-20.

Joshi SD et al. "Effect of ground nut oil on radiation injury in mice," *Indian Jr Exper Biology*, May 1967, vol 14, no. 3, pp. 263-267.

"Polyunsaturated fatty acids increase the sensitivity of 36B10 rat astrocytoma cells to radiation-induced cell kill." *Lipids.* 1997 Mar;32(3):283-92;

Revic, Emanuel, Research in Physiopathology as a Basis of Guided Chemotherapy with Special Application to Cancer (American Foundation for Cancer Research, New York, 1961).

Royal, Gladys, *Modern Nutrition*, (Pasadena, California), November 1960, p. 11.

Prussian Blue, DTPA and Neupogen

If someone is a victim of radiation exposure, they require prompt medical attention. Patients should be stabilized and then assessed for radiation injury on the basis of dose, isotope, and whether there is internal contamination by radioactive substances.

The medical management of patients with moderate to severe radiation exposure should emphasize treatment of radiation-induced neutropenia and the prevention of infections. The term “**neutropenia**” describes the situation where the number of neutrophils in the blood is too low.

Neutrophils are the most common type of white blood cell (comprising 50-70% of circulating white blood cells) that are very important in defending the body against bacterial infections, and therefore, a patient with too few neutrophils is more susceptible to infections, which is one of the big worries after radiation exposure.

In fact, infection is one of the leading causes of mortality after whole body radiation exposure. This suggests one avoid sugars and sweets in the diet, which depress the immune system, and take immune boosting supplements after radiation exposure. To bolster the immune system, you can take mushroom products or beta-glucans.

The level of neutropenia may vary considerably. In general, the blood of healthy adults contains about 1500 to 7000 neutrophils per mm³. In children under 6 years of age the neutrophil count may be lower. The severity of neutropenia generally depends on the absolute neutrophil count (ANC) and is described as follows:

- Mild neutropenia, when the ANC falls below a lower limit of 1500 per mm³ but remains higher than 1000 per mm³
- Moderate neutropenia, when the ANC falls between 500 per mm³ and 1000 per mm³ (which suggests moderate radiation exposure)
- Severe neutropenia, when the ANC falls below 500 per mm³ (which suggests severe radiation exposure)

Upon severe radiation exposure, the initial care should focus on reducing the chances of infection through isolation and provision of low-microbial-content food and water, selective use of GI decontamination, and prevention of opportunistic viral and fungal infections.

An infection in the neutropenic patient, which can develop when not enough white blood cells are available to fight bacteria, is managed in the same manner as for chemotherapy patients. These patients who develop febrile neutropenia (neutropenia plus a fever) must then be hospitalized and treated with intravenous antibiotics in an effort to eliminate the infection.

Since folic acid and vitamin B-12 deficiencies can cause neutropenia, their supplementation after radiation exposure is warranted along with vitamin B-6 as well.

A new drug, **HE2100** (Hollis-Eden Pharmaceuticals), is under development in conjunction with the US Department of Defense for neutropenia and while there have not yet been human trials, it shows promise in treating whole body radiation exposure.

In animal studies, HE2100 speeds up the body's ability to produce new white blood cells and lowers the risk of neutropenia. The company's pilot study indicated that when HE2100 was given 24 hours before or 2-4 hours after radiation exposure, there was a statistically significant reduction in neutropenia in test animals compared to controls.

If internal contamination is suspected, the medically stabilized patient should be evaluated for internal contamination through a history of the event, 24 hours urine/fecal bioassay, and/or *in vivo* counting. Suspected isotopes should be identified, if possible.

Prussian Blue

If there is evidence for significant intake of radioactive isotopes, the most appropriate means for minimizing the impact of contamination is determined on the basis of the isotope's chemical properties.

After a significant review of cases in the published literature, the FDA issued a news release on January 31, 2003 (P03-06) where it stated that 500-mg Prussian blue capsules would be a safe and effective treatment for treating patients with internal contamination of radioactive thallium, non-radioactive thallium, or radioactive cesium.

Prussian Blue, which has been used as an industrial pigment since the 1700's, is not routinely available for radioactive detoxification. People should not take Prussian Blue artist's dye in an attempt to treat themselves. This type of Prussian blue is not designed to treat radioactive contamination and is not manufactured in a germ-free area. People who are concerned about the possibility of being

contaminated with radioactive cesium or thallium should go to their doctors for advice and treatment.

When approved for medical use, Prussian Blue is supplied in 500-milligram capsules that are manufactured by HEYL Chemisch-pharmazeutische Fabrik GmbH & Co. KG (HEYL). HEYL uses the trade name **Radiogardase-Cs** for its 500-mg capsules of Prussian Blue, which can be swallowed whole or mixed in liquid for children to drink. It is only approved for limited use. The amount to be taken depends on how badly a person is contaminated.

Prussian Blue must be taken 3-4 times a day for up to 150 days, depending on the extent of the contamination, under the supervision of a doctor. The drug is safe for all adults, children, and infants, including pregnant women and women who are breast-feeding their babies. Prussian Blue may not be recommended for people who have had constipation or blockages in the intestines.

The main effects of Prussian Blue are constipation and upset stomach. People will have blue feces during the time that they are taking Prussian Blue.

Prussian Blue is probably the first internal therapy that would be useful in reducing the body's exposure to radioactive particles by removing the contaminants from the body. Radioactive cesium and thallium, whether ingested or inhaled, end up in the intestines and Prussian Blue works by binding the particles in the gut -- trapping these materials in the intestines -- and keeps them from being absorbed by the body. The radioactive materials then move through the intestines and are excreted in bowel movements so that they are eliminated from the body.

Prussian Blue reduces the biological half-life of cesium in the body from about 115 days to about 40 days. Prussian Blue reduces the biological half-life of thallium from about 8 days to about 3 days. Because Prussian Blue reduces the time that radioactive cesium and thallium stay in the body, it helps limit the amount of time the body is exposed to radiation.

Prussian Blue has been long used since the 1960s as an orally ingested drug to increase fecal excretion of cesium and thallium from the body without itself being absorbed by the intestines in the process. People are therefore commonly prescribed Prussian Blue during an emergency when cesium or thallium has entered their bodies.

Thallium, which occurs naturally, is very toxic and used in rat poisons, ant poisons, and in manufacturing semiconductors, photocells and optical glass. Thallium-201, a radioactive isotope, is used in small doses as a radio-imaging agent in clinical diagnostic procedures. Exposure to high doses of radioactive or

non-radioactive thallium causes severe gastrointestinal symptoms followed by neurological symptoms, which may cause death.

Cesium-137 is a radioactive product found in the fallout of nuclear weapons and in the waste discharge of nuclear power plants. It is sometimes used as a source of radiation for cancer treatment and is a worrisome isotope in the sense that it could be a potential component of "dirty bombs" designed to spread radioactive contamination.

For Cesium-137 contamination, the most effective detoxification ("decorporation") therapy is oral administration of Prussian Blue (PB), which enhances excretion of cesium by means of ion exchange and reduces the biological half-life to approximately one-third of its normal value. The FDA reports,

In reaching our determination on the effectiveness of Prussian blue, we evaluated published reports of a 1987 incident in Goi[acirc]nia, Brazil, where approximately 250 people were contaminated with cesium-137 that had been abandoned after use in a cancer clinic (see International Atomic Energy Agency, 1998). Forty-six patients with heavy internal contamination were treated with Prussian blue. Data on the whole-body effective half-life of cesium-137 during treatment and after treatment with Prussian blue was completed on 33 of the 46 patients. The untreated mean whole-body effective half-life of cesium-137 is 80 days in adults, 62 days in adolescents, and 42 days in children. Prussian blue reduced the mean whole-body effective half-life of cesium-137 by 69 per cent in adults, by 46 per cent in adolescents, and by 43 per cent in children (see International Atomic Energy Agency, 1998). Data from additional literature articles, including a study of 7 human volunteers contaminated with trace doses of cesium-137 and reports on 19 patients contaminated with cesium-137 in other incidents, show a similar reduction in whole-body effective half-life after administration of Prussian blue (see Madhus, 1968 and National Council on Radiation Protection and Measurement, 1979).

We also evaluated reports in the literature that describe 33 patients who were treated with Prussian blue for nonradioactive thallium poisoning. Prussian blue treatment reduced the mean serum biologic half-life of thallium from 8 days to 3 days (see Barbier, 1974; De Groot, 1985; Van Kesteren, 1980; and Vrij, 1995).

PB now has new drug status with the FDA and is to be included in the National Strategic Stockpile.

Sodium Bicarbonate

With uranium exposure, the kidney is usually the first organ to show chemical damage. Oral doses or infusions of sodium bicarbonate help alkalize urine, makes the uranyl ion less nephrotoxic and thereby promotes excretion of the nontoxic uranium carbonate complex.

DTPA Chelation

For inhalation of actinides, the treatment of choice is chelation therapy using calcium trisodium **Ca-DTPA** and zinc trisodium **Zn-DTPA**, preferably within six hours of exposure.

Since the 1960s, doctors have successfully used DTPA to treat people who have been internally contaminated with certain radioactive materials, such as **americium, plutonium, californium, curium, and berkelium**. With special permission from the U.S. Food and Drug Administration (FDA), DTPA also may be used to treat people who have been internally contaminated with the following radioactive materials: **cerium, yttrium, lanthanum, promethium, scandium, zirconium, and niobium**.

Basically, DTPA is a calcium (Ca) or zinc (Zn) salt that has been used for more than 40 years to perform medical imaging of the brain, kidneys, and lungs. Both forms of DTPA -- calcium (Ca-DTPA) and zinc (Zn-DTPA) -- are capable of binding to certain radioactive materials and accelerating the release of these materials in the urine, thus reducing the amount of internal radioactive contamination.

Ca-DTPA is safe for most adults, but it should not be taken by people who have kidney disease or bone marrow depression. Also, Ca-DTPA should not be taken by children younger than 18 years of age, by pregnant women, or by people who have bone marrow problems.

Children and pregnant women who are under a doctor's care can take small doses of Zn-DTPA. DTPA should **not** be used to treat people who are internally contaminated with the radioactive materials uranium or neptunium.

Most DTPA is excreted (released) in the urine within 12 hours after it is given, so it does not build up in the body or cause long-term health effects. Side effects of treatment with DTPA can include nausea, vomiting, diarrhea, chills, fever, itching skin, and muscle cramps, but these symptoms decrease between treatments. Also, although DTPA increases the loss of the mineral zinc from the body, zinc supplements can be taken to offset this loss.

As an intravenous chelation therapy, DTPA is injected into a vein in the arm over a 2-hour period in a slow drip of liquid from a bag, or over a 3- to 5-minute period using a syringe. DTPA can also be injected into the muscle, however, injecting DTPA directly into muscle causes significant pain in the area of the injection.

EDTA chelation has often been utilized in the past on various medical emergencies where nuclear workers were exposed to radiation materials, so this is a tried and tested procedure.

The intravenous chelation fluid usually contains not only DTPA but 25-50 grams of vitamin C along with calcium gluconate to prevent excess calcium loss. A number of other antioxidants, such as glutathione or alpha lipoic acid, may also be warranted in the mixture to help with healing and free radical damage.

Because Ca-DTPA causes the body to lose some necessary minerals, such as zinc and magnesium, people usually are given Ca-DTPA only during the first several days of the treatment. During these first several days, doctors collect urine and blood samples from the people who are undergoing treatment because they provide information about levels of radioactive materials in the body. Zn-DTPA is used after the first several days, because it does not cause the body to lose minerals as quickly.

DTPA may need to be administered as often as 5 days a week for a period of several years to ensure that the body excretes as much radioactive material as possible.

Neupogen

We have previously mentioned the use of **cytokines** for radiation treatment, but now we've finally reached the point where we are going to discuss them in detail.

When a person has received a very high dose of radiation, destruction of the bone marrow, which can potentially result in uncontrolled bleeding and infection, is a major medical concern. To help the recovery of the bone marrow, doctors can administer growth factors to a patient in order to stimulate the blood cells to multiply faster.

Filgrastim (trade name **Neupogen**®) is a drug that was approved for use by the FDA in 1991 for cancer patients with bone marrow damage due to chemotherapy or radiotherapy, and it fits this bill. It is a specific type of **cytokine** -- a hormone-like protein that acts as a communicator between immune system cells relaying messages, telling them to grow or stop growing or move to a trouble spot -- that stimulates the growth of white blood cells.

Clinical experience shows that cancer patients treated with Neupogen have had fewer infections, less need for intravenous antibiotics, and shortened hospital stays than those who did not receive the drug. Neupogen may also be useful for patients who have bone marrow damage from accidental exposures to high doses of radiation and it is expected to provide similar benefits.

Just like a cancer patient who has received radiation therapy, a person who has been exposed to a high dose of radiation may experience bone marrow destruction, which can possibly result in uncontrolled bleeding and infection. They are often left with very few white blood cells because of the radiation damage. The patient's own bone marrow will eventually create new blood cells, but this is a slow process and until the white blood cell counts rise sufficiently, in the meantime patients are at a high risk of death from infection.

Since Neupogen has been used successfully on cancer patients to stimulate the growth of the white blood cells, making them less vulnerable to infections, it is expected to help patients who have bone marrow damage from very high doses of radiation in much the same way. Neupogen can speed up the process of white blood cell creation, reducing the time that the patient is vulnerable to infection.

Neupogen is safe for most adults, but should not be taken by people who have known hypersensitivity to *E. coli*-derived proteins, filgrastim, or any component of filgrastim. Children and pregnant women should take Neupogen with caution. It is not known if Neupogen is excreted in human milk, so breastfeeding women should take Neupogen with caution as well.

The possible side effects of Neupogen include fever, diarrhea, skin rash and weakness. The most common side effect is mild to moderate bone pain.

Neupogen is given by injection under the skin or through intravenous infusion. The treatment plan is to give 5 micrograms per kilogram of patient weight (mcg/kg) of G-CSF filgrastim (Neupogen) daily for up to 2 weeks, either by injection or intravenous infusion.

While filgrastim (Neupogen), a granulocyte colony stimulating factor (G-CSF) is probably the most cited hematopoietic growth factor for radiation damage, there is also sargramostim **Leukine®**, a granulocytemacrophage colony-stimulating factor (GM-CSF) and the long-acting cytokine **Neulasta®**.

All of these drugs are based on cytokine research and stimulate the production of T-lymphocytes, macrophages, and other immune system cells and shorten the time to recovery of neutrophils. In other words, they shorten neutropenia caused by radiation exposure and thereby help bolster the immune system. They are readily used on cancer patients undergoing chemotherapy because they prevent or reduce the number of severe infections.

In addition, the **yeast glucan** natural supplements (such as beta-1,3-D-glucan) also have well documented bone marrow protective effects and hematopoietic recovery abilities.

For maximum clinical response in the case of radiation exposure, it's reported that the various pharmaceutical growth factors should be started 24 to 72 hours after radiation exposure. Moreover, irradiated animal tests have demonstrated a survival advantage when animals are given early cytokine treatments (<24 hours) as compared to those receiving delayed therapy or no treatment at all.

A Summary of Therapeutic Possibilities

We've just gone over a few of the post-radiation therapeutic possibilities, but there are many more options that belong totally in the hands of medical professions. The gamut of possibilities includes:

- ACE inhibitors for the kidney, lung and CNS)
- Growth factors (G-CSF, GM-CSF, KGF, EPO) to treat the bone marrow, whole body
- Chelating and isotope-competing agents (Prussian Blue, ⁶⁷ DTPA, EDTA, potassium iodide, penicillamine, alginates) for the thyroid and bone marrow
- Pentoxifylline, Vitamin E and SOD to treat fibrosis
- Antiemetics to target the GI tract and CNS
- Pentoxifylline for fibrosis
- Amifostine (anticarcinogenic effects) for mutagenesis carcinogenesis (given within 3 hours of exposure).
- Tempol and other nitroxides for the whole body and fibrosis
- Stem cell transplants (bone marrow, umbilical cord blood, peripheral blood, liver, CNS) for the bone marrow, CNS, liver.

You'll note that rather than emphasize radioprotectors in this manual, I've spent much time talking about specific mechanisms of radiation detoxification and radiation treatment *after* radiation exposure.

There are a number of reasons for this emphasis, primary of which is the fact that you probably obtained this manual for detox purposes rather than for the purposes of prevention or even emergency care. In a wide scale radiation emergency, the emergency care will probably be done at the hospital.

The problem with developing chemical radioprotectors in the past (that might be taken prior to entering a radioactive area) is that nothing has yet been found that produce long lasting protective results, and any substances that were discovered were usually toxic at doses that were truly radioprotective.

That's why the cytokines and growth factors are especially valuable for their ability to prevent radiation damage and to help accelerate the recovery of damaged tissues. We've mentioned Neupogen as one such substance, but there are a whole list of other inspiring candidates including G-SCF, GM-SCF, SCF, IL11, MGF, Flt-3 ligand, IL7, and new epithelial cell specific growth factors, such as KGF (keratinocyte growth factor).

These offer promising areas of research for pharmaceutical drugs though by now you can see that the natural detoxification and rebuilding protocols also hold much promise, and are often extremely accessible and much cheaper than pharmaceutical options.

As we improve our skills to treat acute radiation syndrome, we will also in time develop better means to treat the long term consequences of radiation injury which will have ramifications for various forms of cancer treatments. Until then, you are once again advised to seek a physician's help for any of the short term and long term protocols necessary to handle acute radiation exposure and chronic radiation induced illness.

I've tried my best to piece together whatever can be found on the topic of radiation detoxification, but as a journalist must stress once again that none of this information is to be construed as medical diagnosis or advice or a prescription for medical treatment.

References:

"Facts About DTPA," CDC, <http://www.bt.cdc.gov/radiation/dtpa.asp>

"Facts About Neupogen," CDC, <http://www.bt.cdc.gov/radiation/neupogenfacts.asp>

"FDA Approves First New Drug Application for Treatment of Radiation Contamination due to Cesium or Thallium," FDA Press Release, Oct 2, 2003.

"Prussian Blue," CDC, <http://www.bt.cdc.gov/radiation/prussianblue.asp>
2003.

Coleman CN, William F. Blakely, John R. Fike, Thomas J. MacVittie, Noelle F. Metting, James B. Mitchell, John E. Moulder, R. Julian Preston, Thomas M. Seed, Helen B. Stone, Philip J. Tofilon, and Rosemary S. L. Wong, "MEETING REPORT Molecular and Cellular Biology of Moderate-Dose (1–10 Gy) Radiation and Potential Mechanisms of Radiation Protection: Report of a Workshop at Bethesda, Maryland, December 17–18, 2001," *Radiation Research* **159**, 812–834 (2003).

Coleman CN, Moulder J, et al. "Modulation of Radiation Injury," *Science*, vol. 304, Apr 30, 2004, pp.693–694.

Moulder, JE. "Post-irradiation approaches to the treatment of radiation injuries in the context of radiological terrorism and radiation accidents: a review," *Int J Rad Biology*, Jan 2004, vol. 80, no. 1, 3-10.

Voelz GL, "Assessment and treatment of internal contamination: General principles." In Medical Management of Radiation Accidents, 2nd ed. (I. A. Gusev, A. K. Guskova and F. A. Mettler, Eds.), pp.319–336. CRC Press, Boca Raton, FL, 2001.

Voelz GL, "Current approaches to the management of internally contaminated persons." In The Medical Basis for Radiation Accident Preparedness (K. F. Hubner and S. A. Fry, Eds.), pp. 311–325. Elsevier/North Holland, New York, 1980.

Ward, Joyce, "Radiation Protection for the 21st Century," *Advance Newsmagazines for Imaging and Oncology Administrators*, Aug 1, 2003.

Summary

That completes this short manual on radiation and radioactivity detoxification procedures.

I wish it was longer with more information, but very little information is actually available on this topic. What you're reading right now is the largest compilation to date on natural and medical detoxification procedures for radiation exposures.

As I started previously, most of the research is focused on the fact that radiation is bad for you, and there's little on how to detox from its effects and save yourself. I hope this manual has helped fill some of those gaps. The information on Dr. Akizuki alone, along with the references, may help save some lives.

The amazing thing is that what you must do always usually comes back to the same supplements, foods or procedures. For instance, to bind radioactive particles and excrete them out of your body, you are advised to eat chlorella and spirulina as two options. For a high nucleotide diet you're also advised to consume to eat chlorella and spirulina again. To rebuild your blood quickly, give yourself energy and boost your immunity, once again we find chlorella and spirulina can help.

The same goes for miso soup, eating kelp and other seaweeds, fatty acids, ...

Having worked in the nutritional field for ages, I was amazed to discover the same basic strategies performing all the functions we want, which is probably why Dr. Akizuki was able to save all of his staff and patients while only one mile away from an atomic bomb detonation.

Perhaps the shortness of the text is best since it therefore makes the following recommendations simple.

Here's the final summary of well-known radiation detox procedures:

For External Contamination:

If the radioactive exposure just happened, doctors will flush the exposed areas with copious amounts of water and clipping the hair may be warranted if there is radioactive contamination (such as a bomb blast). In emergencies like this, you have to wash wounds vigorously (scrub them) to make sure no radioactive contaminants can enter the body, and sometimes this is done with special chelation solutions.

Later at home, clay baths may pull out radioactive heavy metals from the skin and Epsom/Clorox baths are possible for this type of heavy metal detox as well. They are used at home for general detoxification purposes and tend to energize the body.

Internal Contamination:

If you've been exposed to radioactive particles, the emergency procedures can include EDTA chelation therapy, Prussian Blue or the use of other binding agents. Potassium iodide is taken at the first warning to block the thyroid from radioiodide uptake, but the big worry is detoxification of internal contamination.

Appendix 1 reviews the military detox emergency procedures for radiation exposure, and dietwise, at home people can help bind and eliminate radioactive particles using products such as the following:

- Spirulina, chlorella and the seaweeds
- Charcoal or clay
- Green and black teas
- A high fiber diet, or chelating substances (pectin, alginates, ...)

To Rebuild Immunity:

- Yeast and yeast beta glucans
- Mushrooms
- Ginseng (for energy as well) and Bee Pollen
- SeaVive
- Rebuilding the blood strategies
- A good multivitamin/multimineral supplement
- Avoid sweets and sugars, and high glycemic foods like wheat

To Rebuild the Blood (Combat Anemia):

To build the blood for the hematopoietic syndrome, beet juice, liver extract, spleen extract, alkylglycerols and cytokine factors, like Neupogen, are warranted. You'll also need a good multivitamin/mineral supplement as you need trace minerals and adequate supplies of folic acid, B-12, B-6 and other ingredients to combat anemia and create strong blood cells.

Fish oils (cod liver oil) can help suppress levels of proinflammatory cytokines which might cause systemic inflammation and may damage red blood cell-forming proteins. Nettle leaf extract can be helpful.

Here's something you probably did not know. Melatonin deficiency has been linked to anemia, it is a well-known radioprotector and cancer fighting agent, and can help you sleep at night. Considering that a radioactive emergency will produce lots of stress where you cannot sleep, and factoring in all its radioprotective and anti-cancer benefits, its use is probably highly warranted after a radiation emergency.

Nettles leaf and yellow dock (and in some case red root) are herbs specific to anemia as well.

We have not gone into the many naturopathic community protocols available for quickly rebuilding the blood, but the foremost strategy is to basically to supply the body with all the ingredients necessary to build blood cells including vitamins and minerals and fatty acids.

You can do this through vegetable juicing, green powders, spirulina, chlorella, seaweeds and other easily digestible foods, especially those containing large sources of chlorophyll which can help build the blood (the chlorophyll molecule looks extremely similar to the heme molecule of red blood cells).

As to specific herbs and formulations you can use, just as with homeopathy you should go by the advice of a skilled practitioner.

These are the various factors that may help with hematopoietic syndrome, and for the gastrointestinal syndrome you need to look into glutamine usage as well.

The Anti-radiation Diet:

An anti-radiation diet will focus on the following food factors:

- Avoid sugars and sweets and wheat!
- Miso soup
- Spirulina, chlorella and the algae (kelp, etc.)
- Brassica vegetables and high beta carotene vegetables
- Beans and lentils
- A potassium, calcium and mineral rich diet
- High nucleotide content foods for repair including spirulina, chlorella, algae, yeast, sardines, liver, anchovies and mackerel
- Cod liver oil and olive oil
- A good multivitamin/multimineral supplement; thiol antioxidants
- SeaCure or SeaVive

For Radiation Burns:

- Homeopathy
- Aloe vera
- Hyperbaric oxygen chambers
- Increase your intake of chlorophyll
- Clay plasters or wraps on the area
- Serrapeptase (Vitalzym) for fibrosis

Special Herbs and Supplements:

- A good multivitamin/multimineral supplement
- Thiol containing antioxidants (NAC, glutathione, alpha lipoic acid)
- Homeopathic remedies
- Special herbs, chosen by professionals, based on your individual condition

Appendix 1: Emergency Procedures for Isotope Exposure

The following information is summarized from the Armed Forces Radiobiology Research Institute's (<http://www.afrrri.usuhs.mil>) "Medical Management of Radiological Casualties Handbook," and describes the emergency treatment for various radiation exposure scenarios:

AMERICIUM-241

- Used in smoke detectors
- In large quantities can cause whole body radiation
- When inhaled, 75% is absorbed into the bloodstream, 10% retained as particles in the lung
- Treat using DTPA or EDTA chelation in the first 24-48 hours after respiratory exposure

CESIUM-137

- Used in medical radiotherapy equipment
- Completely absorbed by the lungs, GI tract and by wounds
- A potassium analog
- Can be excreted in the urine
- Can cause death due to acute radiation syndrome
- Treat using Prussian blue and ion exchange resins; if early after ingestion, induce vomiting and copious washing with water

COBALT-60

- Used in medical radiotherapy equipment and commercial food irradiators
- Can be found after improper disposal, or in abandoned hospitals
- Rapidly absorbed by the lungs, <5% absorbed in the GI tract
- Can cause whole body irradiation and acute radiation syndrome

- Treat by gastric lavage and purgatives; chelation using penicillamine for severe cases

DEPLETED URANIUM (DU)

- Found in armor-piercing munitions, armor, and aircraft counterweights
- Inhaled compounds may be excreted through the urine
- DU fragments in wounds result in gradual whole body irradiation, especially to the bone and kidney
- Treat with sodium bicarbonate; clean wounds to remove any particles; laboratory analysis should monitor urinalysis, serum BUN, creatinine, 24-hour uranium bioassay in urine, beta-2-microglobulin, creatinine clearance, and liver function studies.

IODINE-131, 132, 134, 135

- Found after nuclear reactor accidents; a normal fission product in nuclear fuel rods
- Thyroid uptake concentrates toxicity in the thyroid gland
- Treat expected exposure with daily administration of 130 mg of sodium or potassium iodide (NaI, KI) will prevent uptake; Post-exposure, 300 mg NaI or KI daily x 7 -10 days will prevent thyroid uptake. Oral propylthiouracil 100 mg q8 hours x 8 days or oral methimazole 10 mg q8 hours x 2 days, then 5 mg q8 hours x 6 days, may also be used.

PHOSPHORUS-32

- Found in research and medical labs as a tracer
- Completely absorbed from all entry sites
- Deposited in the bone marrow and in rapidly replicating cells
- Local irradiation causes cellular damage
- Treat with copious washing, aluminum hydroxide and oral phosphates

PLUTONIUM-239, 238

- Produced by uranium used in nuclear reactors, and the primary material in nuclear weapons and nuclear weapon accidents
- Always contaminated with americium

- Easily inhaled which produces toxicity
- Stool specimens will show “positive” after 24 hours, urine specimens “positive” after 2 weeks
- Treat by washing from the skin; Nebulized or IV: 1 g CaDTPA within 24 hours of exposure; follow by 1 g ZnDTPA qd monitoring urine levels (IND).

RADIUM-226

- Found in former Soviet Union equipment as instrument illumination, used in industrial applications and in older medical equipment
- Exposure by ingestion with 30% absorption rate
- Will become deposited in bone calcium
- Produces leukemia, aplastic anemia, sarcomas
- Treat by inducing immediate washing with 10% magnesium sulfate followed by saline and magnesium purgatives after ingestion. Ammonium chloride may increase fecal elimination.

STRONTIUM-90

- A fission product of uranium
- Readily absorbed by lungs and GI tract
- Up to 50% of dosage will be absorbed into calcium matrix of the bone
- Immediately after ingestion, the oral administration of aluminum phosphate can decrease its absorption by as much as 85%. Administration of stable strontium can competitively inhibit the metabolism and increase the excretion of radiostrontium-90. Also, large doses of calcium and acidification of the urine using ammonium chloride will additionally increase excretion.

TRITIUM (Hydrogen-3 or 3H)

- Used in nuclear weapons, luminescent gun sights and muzzle velocity detectors
- As a gas, it rapidly diffuses into the atmosphere
- Tritium water is excreted in urine
- Urine sample test “positive” 1 hour after exposure
- Because the half-life is 10-12 days, increasing the oral fluid intake can reduce this by 50%, though care must be taken not to overhydrate the individual

URANIUM-238, 235, 239

- Found in depleted uranium, natural uranium, fuel rods, weapons grade material
- In critical mass, can produce lethal radiation levels
- After absorptions, can be excreted in the urine but cause renal failure
- Same treatment as for depleted uranium: Sodium bicarbonate makes the uranyl ion less nephrotoxic. Tubular diuretics may be beneficial. Laboratory evaluation should include urinalysis, 24-hour urine for uranium bioassay, serum BUN creatinine, beta-2-microglobulin, creatinine clearance, and liver function studies.

Appendix 2: Tasty Sea Vegetable Recipes

The following recipes have been reprinted through the kind permission of Shep Erhart, owner of Maine Coast Sea Vegetables (www.seaveg.com) and author of the Sea Vegetable Celebration cookbook.

As you know, a key factor to survival and recovery from radiation exposure is to eat foods high in natural iodine, calcium and potassium. You optimally want foods rich in minerals and vitamins that are easily absorbed, and which can bind radioactive wastes and wash them out of the body.

Seaweeds fit this bill, with kelp in particular.

One of the ways to incorporate the sea vegetables into your diet is through miso soup. Here are two miso recipes, as well as a recipe for kelp potatoes:

Basic Miso Soup with Alaria

One 12-inch section **alaria**, soaked
1 medium onion, sliced or diced
1 teaspoon sesame oil
4 cups water
scallions or chives, chopped, for garnish
1 ½ to 2 ½ teaspoons hacho or mugi miso

Soap the alaria for 10 minutes. Chop it into bite-size pieces and saute with the onion in the sesame oil until the fronds turn bright green.

Add the water and simmer for 30 minutes, or pressure cook for 20 minutes (cut these times in half if the midribs have been removed).

Ladle out some soup into a bowl, stir in the miso. Pour and stir the miso mixture back into the pot. Turn off the heat. Taste and add more miso, as desired.

Garnish with scallions or chives, and serve.

Kelp Dashi Miso Soup

2 ½ ounces **kelp** (2 ½ cups)
4-5 dried black mushrooms
5 quarts cold water
2 1.2 ounces sake or Xiao Xing wine
3 tablespoons tamari or soy sauce
2 tablespoons sugar
One 8-ounce package somen noodles
1 bunch greens (mizuna, mustard greens, spinach, chard)
6 tablespoons barley or rice miso
2 large scallions, sliced
8 ounces silken tofu, cut into bite-size cubes
1 sheet **toasted nori**, cut into thin strips (optional)

Soak the kelp and mushrooms in the water for 6 hours in a 6- to 8-quart stockpot. You can do this in the morning and finish the dashi later that day.

With a strainer spoon or tongs, take out the mushrooms. Discard the tough stems, cut the mushroom caps into thin julienne strips, and put them back into the pot.

Bring the kelp, mushrooms and water to a boil. Turn the heat off and let it steep for 10 minutes. Then strain the kelp out of the stock.

Add the wine, soy sauce and sugar. Bring the dashi back to a boil and add the somen noodles. Stir the noodles for about 2-5 minutes until they are tender. Turn off the heat and add the greens. Ladle out some broth into a soup bowl, and mash in the miso, then stir the miso broth back into the pot.

Serve garnished with the tofu and scallions. Floating some strips of nori on top adds extra beauty.

Kelp Hot Potatoes

3 tablespoons soy sauce
1 tablespoon honey
6 potatoes (white or sweet)
2 ½ to 3 tablespoons olive oil
1 cup tightly packed **kelp** (about 1 ounce), lightly rinsed
1 cup water

Combine the soy sauce and honey in a small bowl. Mix well and set aside.

Cut the potatoes into bite-size pieces, and saute in the oil until golden, stirring often.

Cut the kelp into pieces approximately 1 inch long, and add to potatoes. Add the soy-honey mixture and stir thoroughly. Add the water, cover and simmer for 15-20 minutes.

Anti-Radiation Soup

A recipe for miso “anti-radiation soup” that serves two, by Bethany Arglsle, can also be found in an article by Elson M. Haas (“Nutritional Program for Environmental Pollution and Radiation” excerpted from Staying Healthy With Nutrition).

It can be found at <http://www.healthy.net/scr/article.asp?id=1276&action=print> .