DOWNLOAD PDF HEALTH EFFECTS OF RADIATION

Chapter 1 : Radiation Health Effects - Canadian Nuclear Safety Commission

Radiation Health Effects Ionizing radiation Ionizing radiation Radiation with so much energy it can knock electrons out of atoms. Ionizing radiation can affect the atoms in living things, so it poses a health risk by damaging tissue and DNA in genes. has sufficient energy to affect the atoms in living cells and thereby damage their genetic.

Radium is a radioactive substance found in nature that can have adverse health effects under certain conditions. How was Radium commonly used? At the beginning of the 20th century, Radium was thought to have beneficial health properties and was often added to consumer products such as toothpaste, hair creams, and even food. Radium was even used in medical applications during the 20th century. How can people be exposed to Radium? Everyone is exposed to low levels of Radium because it occurs naturally in the environment. It is present in soil, water, rocks, coal, plants, and even food. High levels of Radium are typically found in waste from former Radium processing and manufacturing facilities, or at former manufacturing facilities that used Radium and have been improperly cleaned. You may be exposed to higher levels of Radium if you work in a specific job using these materials. It is important to note that radon, a byproduct of Radium, can be present in buildings, particularly in basements. The majority of radon exposures in buildings are from radon coming up from the ground. How can Radium affect my health? The potential for health effects depends on the amount of radiation a person is exposed to. In general, the greater the total amount of your exposure to radiation from Radium, the more likely you are to develop an adverse health effect. Exposure to Radium over a period of many years may result in an increased risk of some types of cancer, particularly lung and bone cancer. Higher doses of Radium have been shown to cause effects on the blood anemia , eyes cataracts , teeth broken teeth , and bones reduced bone growth. The presence of Radium does not mean that adverse health effects are occurring or could occur. Low levels of exposure to Radium are normal, and there is no evidence that exposure to low levels is harmful. The potential for health effects depends on several factors including the amount of Radium present, amount of time spent near contamination, proximity to the source of radiation, and whether any shielding e. How does Radium get into the body? Radium can enter the body when it is inhaled or swallowed, and in rare cases through emitted radiation. It is not known if Radium can be absorbed through your skin. Radium dust or gas breathed into the lungs may remain there for months, but it will gradually enter the blood stream and will be carried to all parts of the body, with a portion accumulating in the bones. In Radium that is swallowed in water or with food, most of it will promptly leave the body in the feces. A small amount will enter the blood stream and will be carried to all parts of the body. Is there a medical test to determine exposure to Radium? T here is no medical test that can tell you how much Radium you were exposed to, or predict whether you will develop harmful health effects. Radon, a byproduct of Radium, can also be measured in air that is exhaled from the body. Both types of tests require special equipment and cannot be done by most medical offices. Who can I contact if I have additional questions or concerns about indoor air exposure and my health? Additional Resources for FAQ.

Chapter 2 : Health effects of Radium radiation exposure | blog.quintoapp.com

Long-Term Health Effects of Radiation Exposure and Contamination Cancer People who receive high doses of radiation could have a greater risk of developing cancer later in life, depending on the level of radiation exposure.

Internal[edit] Internal exposure occurs when the radioactive material enters the organism, and the radioactive atoms become incorporated into the organism. This can occur through inhalation, ingestion, or injection. Below are a series of examples of internal exposure. The exposure caused by potassium present within a normal person. A person who is being treated for cancer by means of a radiopharmaceutical where a radioisotope is used as a drug usually a liquid or pill. A review of this topic was published in While some very insoluble materials such as fission products within a uranium dioxide matrix might never be able to truly become part of an organism, it is normal to consider such particles in the lungs and digestive tract as a form of internal contamination which results in internal exposure. Boron neutron capture therapy BNCT involves injecting a boron tagged chemical that preferentially binds to tumor cells. Neutrons from a nuclear reactor are shaped by a neutron moderator to the neutron energy spectrum suitable for BNCT treatment. The tumor is selectively bombarded with these neutrons. The neutrons quickly slow down in the body to become low energy thermal neutrons. These thermal neutrons are captured by the injected boron, forming excited boron which breaks down into lithium-7 and a helium-4 alpha particle both of these produce closely spaced ionizing radiation. This concept is described as a binary system using two separate components for the therapy of cancer. Each component in itself is relatively harmless to the cells, but when combined together for treatment they produce a highly cytocidal cytotoxic effect which is lethal within a limited range of micrometers or approximately one cell diameter. Clinical trials, with promising results, are currently carried out in Finland and Japan. When radioactive compounds enter the human body, the effects are different from those resulting from exposure to an external radiation source. Especially in the case of alpha radiation, which normally does not penetrate the skin, the exposure can be much more damaging after ingestion or inhalation. The radiation exposure is normally expressed as a committed dose. History[edit] Although radiation was discovered in late 19th century, the dangers of radioactivity and of radiation were not immediately recognized. He published his observations concerning the burns that developed, though he misattributed them to ozone, a free radical produced in air by X-rays. Other free radicals produced within the body are now understood to be more important. His injuries healed later. After irradiating frogs and insects with X-rays in early , Ivan Romanovich Tarkhanov concluded that these newly discovered rays not only photograph, but also "affect the living function". The genetic effects of radiation, including the effects on cancer risk, were recognized much later. In Hermann Joseph Muller published research showing genetic effects, and in was awarded the Nobel prize for his findings. More generally, the s saw attempts to develop a general model for radiobiology. Notable here was Douglas Lea, [17] [18] whose presentation also included an exhaustive review of some supporting publications. Examples were radium enema treatments, and radium-containing waters to be drunk as tonics. Marie Curie spoke out against this sort of treatment, warning that the effects of radiation on the human body were not well understood. Curie later died of aplastic anemia caused by radiation poisoning. Eben Byers , a famous American socialite, died of multiple cancers but not acute radiation syndrome in after consuming large quantities of radium over several years; his death drew public attention to dangers of radiation. By the s, after a number of cases of bone necrosis and death in enthusiasts, radium-containing medical products had nearly vanished from the market. In the United States, the experience of the so-called Radium Girls , where thousands of radium-dial painters contracted oral cancers [21] but no cases of acute radiation syndrome [22] , popularized the warnings of occupational health associated with radiation hazards. Evans , at MIT , developed the first standard for permissible body burden of radium , a key step in the establishment of nuclear medicine as a field of study. With the development of nuclear reactors and nuclear weapons in the s, heightened scientific attention was given to the study of all manner of radiation effects. The atomic bombings of Hiroshima and Nagasaki resulted in a large number of incidents of radiation poisoning, allowing for greater insight into its symptoms and dangers. Red Cross Hospital Surgeon, Dr. Terufumi Sasaki led intensive

research into the Syndrome in the weeks and months following the Hiroshima bombings. Dr Sasaki and his team were able to monitor the effects of radiation in patients of varying proximities to the blast itself, leading to the establishment of three recorded stages of the syndrome. Within 25â€”30 days of the explosion, the Red Cross surgeon noticed a sharp drop in white blood cell count and established this drop, along with symptoms of fever, as prognostic standards for Acute Radiation Syndrome. Her death on August 24, was the first death ever to be officially certified as a result of radiation poisoning or "Atomic bomb disease". Areas of interest[edit] The interactions between organisms and electromagnetic fields EMF and ionizing radiation can be studied in a number of ways:

Chapter 3 : Radiation Effects on Humans

Health Effects of Radiation Recommend on Facebook Tweet Share Compartir Scientists have been studying the effects of radiation for over years; so we know quite a bit about how radiation interacts with living tissue, and its effect on the body.

The symptoms and treatment of radiation sickness from nuclear accidents. Mar 15, March 25, Officials in protective gear check for signs of radiation on children from the evacuation area near the Fukushima Daiichi nuclear plant in northest Japan on March Symptoms of radiation sickness occur when the body is damaged by a very large dose of radiation over a short period of time. Workers at a nuclear power plant or emergency responders on site of a nuclear disaster are at greatest risk of exposure to high levels of radiation. The compound prevents or reduces absorption of radioactive iodine, a byproduct of nuclear fission, through the thyroid gland, which uses iodine to produce thyroid hormones. But potassium iodide cannot prevent radioactive iodine from entering elsewhere in the body and does not affect the absorption of other radioactive elements, such as cesium, which stays in organs, tissue and the environment much longer than iodine. Health officials advise people against taking potassium iodide unnecessarily since it may cause allergic reactions and side-effects such as nausea and vomiting. If taken in pregnancy, the fetus runs a higher risk of developing goiter or abnormal thyroid function. Radiation sickness Radiation sickness, also called radiation poisoning, is serious but rare. Radiation dosage is measured in sieverts Sv. Short-term exposure of the whole body to about 10, mSv or 10 Sv would cause immediate illness, such as nausea and decreased white blood cell count, and subsequent death within a few weeks, according to the World Nuclear Association. Comparing radiation levels Airline crew flying from Tokyo to New York by polar route: Death within a month for about half exposed to a single dose: Short-term, whole body exposure resulting in immediate illness and death within a few weeks: The average cumulative exposure for the general population in various affected regions of Belarus, Russia and Ukraine over a year period after the accident is estimated to be between 10 and 30 mSv, according to the Merck Manuals reference publication for health professionals. Symptoms The strength of the radiation itself and distance from it are key factors in the severity of radiation sickness. Nausea and vomiting often begin within hours of exposure, followed by diarrhea, headaches and fever. Health impacts Our bodies are able to repair effects of radiation on tissues, said Dr. Cells lining the intestine and stomach. Miriam Diamond, an environmental chemist at the University of Toronto. Treatment Drugs can stimulate the growth of white blood cells and help people fight off infections.

Chapter 4 : Cellular Phone Towers

For low levels of radiation exposure, these biological effects are so small that they may not even be detectable. In addition, the human body has defense mechanisms against many types of damage induced by radiation.

March 15, Nevada Division of Environmental Protection The amount of radioactive material being released from the damaged nuclear reactors in Japan, and the eventual impact it will have on human health, are still being determined. How does nuclear radiation harm the body, and what are the risks from long-term exposure to low levels after an accident? MyHealthNewsDaily spoke with experts about these questions. How does radiation harm the body? As radioactive material decays, or breaks down, the energy released into the environment has two ways of harming a body that is exposed to it, Higley said. It can directly kill cells, or it can cause mutations to DNA. If those mutations are not repaired, the cell may turn cancerous. Radioactive iodine tends to be absorbed by the thyroid gland and can cause thyroid cancer , said Dr. Lydia Zablotska, an assistant professor in the department of epidemiology and biostatistics at the University of California, San Francisco. Children are most at risk for thyroid cancer, since their thyroid glands are 10 times smaller than those of adults, he said. The radioactive iodine would be more concentrated in them. Radioactive cesium, on the other hand, can stay in the environment for more than a century. But it does not concentrate in one part of the body the way radioactive iodine does. The Chernobyl accident released a plume of radioactive materials into the atmosphere in a fraction of a second. In the following years, the incidence of thyroid cancer among those exposed as children increased in Ukraine and nearby countries, Zablotska said. The cancer showed up between four and 10 years after the accident, Bouville said. Children were exposed to radioactive material mainly from eating contaminated leafy vegetables and dairy. There have been no detectable health effects from exposure to radioactive cesium after the accident. In general, it takes a pretty high dose of radiation to increase cancer risk, Higley said. For instance, there were reports that one Japanese worker was exposed to 10 rem millisievert, mSV , a measurement of radiation dose. From that exposure, his lifetime cancer risk would go up about half a percent, Higley said. According to Higley, the dose is the equivalent of about five CT scans. Americans are exposed to about 0. Potentially, exposure to any type of radiation can increase cancer risk, with higher exposure increasing the risk, Bouville said. No increases in cancer rates were observed after the release of radioactive from a power plant on Three Mile Island, Pa. Those exposed to high levels of radiation, about rem, millisievert could develop radiation sickness, Bouville said. A chest X-ray is about 0. People are exposed to about 0. Radiation sickness is often fatal and can produce such symptoms as bleeding and shedding of the lining on the gastrointestinal tract, Zablotska said. About people suffered from it as a result of the Chernobyl accident, Zablotska said. A radiation dose of 40 rem, mSv per hour was reported at one of the Japanese power plants at one point following the March 11 earthquakes and tsunami that damaged their cooling systems, according to the IAEA. This is a high dose but was isolated to a single location, the IAEA says. But the radiation levels have been decreasing after the observed spike, she said. She speculates the spike may have been due to the release of a puff of radioactive material when pressure dropped at the facility.

Chapter 5 : Radiation Studies - CDC: Health Effects of Radiation

Concern remains over the potential effect on human health from radiation leaks at the stricken Fukushima Daiichi nuclear plant. A 20km (12 mile) evacuation zone affecting about 70, people has.

Scientific and policy developments regarding the health effects of electromagnetic radiation exposure from cell phones, cell towers, Wi-Fi, Smart Meters, and other wireless technology Monday, July 23, International Perspective on Health Effects of Low Intensity Non-Ionizing Radiation Thermal and non-thermal health effects of low intensity non-ionizing radiation: Thermal and non-thermal health effects of low intensity non-ionizing radiation: Abstract Exposure to low frequency and radiofrequency electromagnetic fields at low intensities poses a significant health hazard that has not been adequately addressed by national and international organizations such as the World Health Organization. There is strong evidence that excessive exposure to mobile phone-frequencies over long periods of time increases the risk of brain cancer both in humans and animals. The mechanism s responsible include induction of reactive oxygen species, gene expression alteration and DNA damage through both epigenetic and genetic processes. In vivo and in vitro studies demonstrate adverse effects on male and female reproduction, almost certainly due to generation of reactive oxygen species. There is increasing evidence the exposures can result in neurobehavioral decrements and that some individuals develop a syndrome of "electro-hypersensitivity" or "microwave illness", which is one of several syndromes commonly categorized as "idiopathic environmental intolerance". While the symptoms are non-specific, new biochemical indicators and imaging techniques allow diagnosis that excludes the symptoms as being only psychosomatic. Unfortunately standards set by most national and international bodies are not protective of human health. This is a particular concern in children, given the rapid expansion of use of wireless technologies, the greater susceptibility of the developing nervous system, the hyperconductivity of their brain tissue, the greater penetration of radiofrequency radiation relative to head size and their potential for a longer lifetime exposure. The US National Toxicology Program has released preliminary results of a study of long term exposure of rats to cell phone radiation which resulted in a statistically significant increase in brain gliomas, the same cancer found in people after long-term cell phone use, and schwannomas, a tumor similar to the acoustic neuroma also seen after intensive mobile phone use Wyde et al. Similar results in rats have been reported in an independent study at the Ramazzini Institute with exposures similar to those from a mobile phone base station Falcioni et al. This evidence, in conjunction with the human studies, demonstrates conclusively that excessive exposure to RF-EMF results in an increased risk of cancer. In this regard WHO has failed to provide an accurate and human health-protective analysis of the dangers posed to health, especially to the health of children, resulting from exposure to non-thermal levels of electromagnetic fields. In spite of recent efforts to control for conflicts of interest, ICNIRP has a long record of close associations with industry Maisch, Why this should exclude other scientific research groups and public health professionals is unclear, particularly since most members of ICNIRP are not active researchers in this field. We have definitive evidence that use of a mobile phone results in changes in brain metabolism Volkow et al. We do not know the mechanisms behind many known human carcinogens, dioxins and arsenic being two examples. Given the strength of the evidence for harm to humans it is imperative to reduce human exposure to EMFs. Similar results were found for cordless phones in the Hardell group studies, although such use was not reported by the other study groups. The findings are less consistent for meningioma although somewhat increased risk was seen in the meta-analysis of ipsilateral mobile phone use. A longer follow-up time is necessary for this type of slow growing tumor. This finding was confirmed in a second replicative study involving different participants Divan et al. A meta-analysis involving , children mean age These assumptions are not valid for two reasons. Not only do they fail to consider the specific morphological and bioclinical vulnerabilities of children, but also they ignore the effects known to occur at non-thermal intensitiesâ€¦. In summary it is the strong opinion of the authors that there is presently sufficient clinical, biological and radiological data emanating from different independent international scientific research groups for EHS, whatever its causal origin, to be acknowledged as a well-defined, objectively characterized

pathological disorder. This is no longer the case. There are a number of well-documented effects of low intensity EMFs that are the mechanistic basis behind the biological effects documented above www. These include induction of oxidative stress, DNA damage, epigenetic changes, altered gene expression and induction including inhibition of DNA repair and changes in intracelluar calcium metabolism â€¦. Another example is the synergistic of exposure to lead and EMFs on cognitive function in children described above Choi et al. These co-exposure factors should be considered when assessment of detrimental effects, including carcinogenicity, is performed. Gliomas are increasing in the Netherlands Ho et al. The latency period between initial exposure and clinical occurrence of brain cancer is not known but is estimated to be long. While not all reports of brain cancer rates show an increase, some do. The continually increasing exposure to EMFs from all sources may contribute to these increases. Male fertility has been declining Geoffroy-Siraudin et al. EMFs increase the risk of each of these diseases and others. A recent meta-analysis Huss et al. Each of these diseases is associated with decrements in health and quality of life. Brain cancer patients often die is spite of some improvement in treatment, while EHS patients present with increased levels of distress, inability to work, and progressive social withdrawal. The ability for humans to reproduce is fundamental for the maintenance of our species. The scientific evidence for harm from EMFs is increasingly strong. We do not advocate going back to the age before electricity or wireless communication, but we deplore the present failure of public health international bodies to recognize the scientific data showing the adverse effects of EMFs on human health. It is encouraging that some governments are taking action. France has removed WiFi from pre-schools and ordered Wi-Fi to be shut off in elementary schools when not in use http: The State of California Department of Public Health has issued a warning on use of mobile phones and offered advice on how to reduce exposure State of California, There are many steps that are neither difficult nor expensive that can be taken to use modern technology but in a manner that significantly reduces threats to human health. It is urgent that national and international bodies, particularly the WHO, take this significant public health hazard seriously and make appropriate recommendations for protective measures to reduce exposures. This is especially urgently needed for children and adolescents. It is also important that all parts of society, especially the medical community, educators, and the general public, become informed about the hazards associated with exposure to EMFs and of the steps that can be easily taken to reduce exposure and risk of associated disease.

Chapter 6 : How Does Nuclear Radiation Harm the Body?

Nuclear Radiation and Health Effects (Updated June)Natural sources account for most of the radiation we all receive each year. The nuclear fuel cycle does not give rise to significant radiation exposure for members of the public, and even in two major nuclear accidents - Three Mile Island and Fukushima - exposure to radiation has caused no harm to the public.

Protecting Canadians What is safe? For many, the idea of being safe is the absence of risk or harm. However, the reality is that there is a level of risk in almost everything we do. For example, speed limits on roads are set to maximize safety. Nevertheless, accidents occur even when drivers are obeying the speed limit. Despite the risks, we make a conscious decision to drive. Similar conscious decisions are made when radiation is used. Radiation exposure carries a health risk. Knowing what the risks are helps the CNSC and other regulatory bodies set dose limits and regulations that limit exposure to an acceptable or tolerable risk some may even say a safe limit. One significant advantage with radiation is that more is known about the health risks associated with it than with any other chemical or otherwise toxic agent. Since the early twentieth century, radiation effects have been studied in depth in both the laboratory and among human populations. Since the establishment of the United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR in , the mandate of the Committee has been to undertake broad assessments of the sources of ionizing radiation and its effects on human health and the environment. Those assessments provide the scientific foundation used in formulating international standards for the protection of the general public and workers against ionizing radiation. DNA consists of two long chains of nucleotides twisted together into a double helix; it is the molecular compound in the nucleus of a cell that forms the blueprint for the structure and function of the cell. Radiation is able to break these chains. DNA breakage occurs normally every second of the day and cells have a natural ability to repair that damage. If this happens to a large number of cells in a tissue or organ, early radiation effects may occur. These are called deterministic effects and the severity of the effects varies according to the radiation dose received. They can include burns, cataracts, and in extreme cases, death. Site of the Chernobyl nuclear power plant accident Ukraine The first evidence of deterministic effects became apparent with early experimenters and users of radiation. They suffered severe skin and hand damage due to excessive radiation dose. More recently, this relationship was observed at the Chernobyl nuclear plant accident where more than workers and firefighters received high radiation doses to 16, mSv , and suffered severe radiation sickness. Two of the people exposed died within days of exposure. Close to 30 more workers and firefighters died within the first three months. The CNSC and other international regulators put measures in place, including stringent dose limits and radioactive source tracking databases, to mitigate the chances of the public or workers receiving doses of radiation high enough to cause deterministic effects. The CNSC also has strict regulations on how nuclear substances and devices must be handled in Canada. The cell may continue to live and even reproduce itself, but the cell and its descendents may no longer function properly and may disrupt the function of other cells. In such cases, the likelihood of the effects increases as the dose increases. However, the timing of the effects or their severity does not depend on the dose. This process happens all the time in everyone. In fact, people are exposed to about 15, such events every second of every day. Sometimes, the cell structure changes because it repairs itself improperly. This alteration could have no further effect, or the effect could show up later in life. Cancer and hereditary effects may or may not take place. Top of page Epidemiological evidence Studies on survivors of the atomic bombings of the cities of Hiroshima and Nagasaki in indicate that the principal long-term effects of radiation exposure have been an increase in the frequency of cancer and leukemia. Similar results have been found in: Studies have shown that radiation will increase the frequency of some cancers that already occur naturally and that this increase is proportionate to the radiation dose â€” i. However, studies to date have not been able to show any excess cancers or other diseases in people chronically exposed to radiation at doses lower than about mSv. The lowest dose for excess cancers in atomic bomb survivors was about 80 mSv.

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Chapter 7 : Radiation | Nuclear Radiation | Ionizing Radiation | Health Effects - World Nuclear Association

Health effects of ionizing radiation Radiation damage to tissue and/or organs depends on the dose of radiation received, or the absorbed dose which is expressed in a unit called the gray (Gy). The potential damage from an absorbed dose depends on the type of radiation and the sensitivity of different tissues and organs.

Top of Page Radiation Exposure and Cancer Risk Exposure to low-levels of radiation does not cause immediate health effects, but can increase the risk of cancer over a lifetime. There have been studies that kept track of large numbers of people who were exposed to radiation, including atomic bomb survivors and radiation industry workers. These studies show that radiation exposure increases the chance of getting cancer, and the risk increases as the dose increases: Conversely, cancer risk declines as the dose falls: According to radiation safety experts, radiation exposures of 5â€”10 rem remThe U. The international unit is sieverts Sv. Learn about sources and doses. Limiting Cancer Risk from Radiation in the Environment EPA bases its regulatory limits and nonregulatory guidelines for public exposure to low level ionizing radiation on the linear no-threshold LNT model. The LNT model assumes that the risk of cancer due to a low-dose exposure is proportional to dose, with no threshold. In other words, cutting the dose in half cuts the risk in half. There is evidence to support LNT from laboratory data and from studies of cancer in people exposed to radiation. Top of Page Exposure Pathways Understanding the type of radiation received, the way a person is exposed external vs. The risk from exposure to a particular radionuclide depends on: The energy of the radiation it emits. The type of radiation alpha, beta, gamma, x-rays. Its activity how often it emits radiation. The rate at which the body metabolizes and eliminates the radionuclide following ingestion or inhalation. Where the radionuclide concentrates in the body and how long it stays there. Whether exposure is external or internal: External exposure is when the radioactive source is outside of your body. X-rays and gamma rays can pass through your body, depositing energy as they go. Internal exposure is when radioactive material gets inside the body by eating, drinking, breathing or injection from certain medical procedures. Radionuclides may pose a serious health threat if significant quantities are inhaled or ingested. Top of Page Sensitive Populations Children and fetuses are especially sensitive to radiation exposure. The cells in children and fetuses divide rapidly, providing more opportunity for radiation to disrupt the process and cause cell damage. EPA considers these differences in sensitivity due to age and sex when revising radiation protection standards. Contact Us to ask a question, provide feedback, or report a problem.

Chapter 8 : Ionizing radiation, health effects and protective measures

Radiobiology (also known as radiation biology) is a field of clinical and basic medical sciences that involves the study of the action of ionizing radiation on living things, especially health effects of radiation.

People are exposed to natural sources of ionizing radiation, such as in soil, water, and vegetation, as well as in human-made sources, such as x-rays and medical devices. Ionizing radiation has many beneficial applications, including uses in medicine, industry, agriculture and research. As the use of ionizing radiation increases, so does the potential for health hazards if not properly used or contained. Acute health effects such as skin burns or acute radiation syndrome can occur when doses of radiation exceed certain levels. Low doses of ionizing radiation can increase the risk of longer term effects such as cancer. What is ionizing radiation? Ionizing radiation is a type of energy released by atoms that travels in the form of electromagnetic waves gamma or X-rays or particles neutrons, beta or alpha. The spontaneous disintegration of atoms is called radioactivity, and the excess energy emitted is a form of ionizing radiation. Unstable elements which disintegrate and emit ionizing radiation are called radionuclides. All radionuclides are uniquely identified by the type of radiation they emit, the energy of the radiation, and their half-life. The activity â€" used as a measure of the amount of a radionuclide present â€" is expressed in a unit called the becquerel Bq: The half-life is the time required for the activity of a radionuclide to decrease by decay to half of its initial value. The half-life of a radioactive element is the time that it takes for one half of its atoms to disintegrate. This can range from a mere fraction of a second to millions of years e. Radiation sources People are exposed to natural radiation sources as well as human-made sources on a daily basis. Natural radiation comes from many sources including more than 60 naturally-occurring radioactive materials found in soil, water and air. Radon, a naturally-occurring gas, emanates from rock and soil and is the main source of natural radiation. Every day, people inhale and ingest radionuclides from air, food and water. People are also exposed to natural radiation from cosmic rays, particularly at high altitude. Background radiation levels vary geographically due to geological differences. Exposure in certain areas can be more than times higher than the global average. Human exposure to radiation also comes from human-made sources ranging from nuclear power generation to medical uses of radiation for diagnosis or treatment. Today, the most common human-made sources of ionizing radiation are medical devices, including X-ray machines. Exposure to ionizing radiation Radiation exposure may be internal or external, and can be acquired through various exposure pathways. Internal exposure to ionizing radiation occurs when a radionuclide is inhaled, ingested or otherwise enters into the bloodstream for example, by injection or through wounds. Internal exposure stops when the radionuclide is eliminated from the body, either spontaneously such as through excreta or as a result of a treatment. External exposure may occur when airborne radioactive material such as dust, liquid, or aerosols is deposited on skin or clothes. This type of radioactive material can often be removed from the body by simply washing. Exposure to ionizing radiation can also result from irradiation from an external source, such as medical radiation exposure from X-rays. External irradiation stops when the radiation source is shielded or when the person moves outside the radiation field. People can be exposed to ionizing radiation under different circumstances, at home or in public places public exposures , at their workplaces occupational exposures , or in a medical setting as are patients, caregivers, and volunteers. Exposure to ionizing radiation can be classified into 3 exposure situations. The first, planned exposure situations, result from the deliberate introduction and operation of radiation sources with specific purposes, as is the case with the medical use of radiation for diagnosis or treatment of patients, or the use of radiation in industry or research. The second type of situation, existing exposures, is where exposure to radiation already exists, and a decision on control must be taken â€" for example, exposure to radon in homes or workplaces or exposure to natural background radiation from the environment. The last type, emergency exposure situations, result from unexpected events requiring prompt response such as nuclear accidents or malicious acts. Annually worldwide, more than million diagnostic radiology examinations are performed, 37 million nuclear medicine procedures are carried out, and 7. The potential damage from an absorbed dose depends on the type of radiation and the sensitivity of different tissues and organs. The

effective dose is used to measure ionizing radiation in terms of the potential for causing harm. The sievert Sv is the unit of effective dose that takes into account the type of radiation and sensitivity of tissues and organs. It is a way to measure ionizing radiation in terms of the potential for causing harm. The Sv takes into account the type of radiation and sensitivity of tissues and organs. These effects are more severe at higher doses and higher dose rates. For instance, the dose threshold for acute radiation syndrome is about 1 Sv mSv. There is still a risk of long-term effects such as cancer, however, that may appear years or even decades later. Effects of this type will not always occur, but their likelihood is proportional to the radiation dose. This risk is higher for children and adolescents, as they are significantly more sensitive to radiation exposure than adults. Epidemiological studies on populations exposed to radiation, such as atomic bomb survivors or radiotherapy patients, showed a significant increase of cancer risk at doses above mSv. More recently, some epidemiological studies in individuals exposed to medical exposures during childhood paediatric CT suggested that cancer risk may increase even at lower doses between mSv. Prenatal exposure to ionizing radiation may induce brain damage in foetuses following an acute dose exceeding mSv between weeks of pregnancy and mSv between weeks of pregnancy. Before week 8 or after week 25 of pregnancy human studies have not shown radiation risk to fetal brain development. Epidemiological studies indicate that the cancer risk after fetal exposure to radiation is similar to the risk after exposure in early childhood. WHO response WHO has established a radiation program to protect patients, workers, and the public against the health risks of radiation exposure under planned, existing and emergency exposure situations. Focusing on public health aspects of radiation protection, this programme covers activities related to radiation risk assessment, management and communication.

Chapter 9 : Radiobiology - Wikipedia

Symptoms of radiation sickness occur when the body is damaged by a very large dose of radiation over a short period of time. Workers at a nuclear power plant or emergency responders on site of a.

Electrical hazards[edit] Very strong radiation can induce current capable of delivering an electric shock to persons or animals. The induction of currents by oscillating magnetic fields is also the way in which solar storms disrupt the operation of electrical and electronic systems, causing damage to and even the explosion of power distribution transformers, [2] blackouts as occurred in , and interference with electromagnetic signals e. These sparks can then ignite flammable materials or gases, possibly leading to an explosion. This can be a particular hazard in the vicinity of explosives or pyrotechnics , since an electrical overload might ignite them. For example, touching or standing around an antenna while a high-power transmitter is in operation can cause severe burns. These are exactly the kind of burns that would be caused inside a microwave oven. There are publications which support the existence of complex biological and neurological effects of weaker non-thermal electromagnetic fields see Bioelectromagnetics , including weak ELF magnetic fields [7] [8] and modulated RF and microwave fields. Normally this is converted to visible light by the phosphor film inside a protective coating. When the film is cracked by mishandling or faulty manufacturing then UV may escape at levels that could cause sunburn or even skin cancer. These currents will typically flow to ground through a body contact surface such as the feet, or arc to ground where the body is well insulated. Adipose tissue fat receives little heating by induction fields because an electrical current is not actually going through the tissues. Mobile phone radiation and health This designation of mobile phone signals as "possibly carcinogenic to humans" by the World Health Organization WHO e. That means that there "could be some risk" of carcinogenicity, so additional research into the long-term, heavy use of mobile phones needs to be conducted. To date, no adverse health effects have been established as being caused by mobile phone use. Previously, microwave applications in these bands were for point-to-point satellite communication with minimal human exposure. Radiation levels in the millimeter wavelength represent the high microwave band or close to Infrared wavelengths. Cataract-like changes can occur in workers who observe glowing masses of glass or iron without protective eyewear for many hours a day. In the case of arc welding , infrared radiation decreases rapidly as a function of distance, so that farther than three feet away from where welding takes place, it does not pose an ocular hazard anymore but, ultraviolet radiation still does. This is why welders wear tinted glasses and surrounding workers only have to wear clear ones that filter UV. To control the risk of injury, various specifications â€” for example ANSI Z in the US, and IEC internationally â€” define "classes" of lasers depending on their power and wavelength. As with its infrared and ultraviolet radiation dangers, welding creates an intense brightness in the visible light spectrum, which may cause temporary flash blindness. Some sources state that there is no minimum safe distance for exposure to these radiation emissions without adequate eye protection. Ultraviolet light, specifically UV-B , has been shown to cause cataracts and there is some evidence that sunglasses worn at an early age can slow its development in later life. In addition to sunlight, other sources include tanning beds , and bright desk lights. This is most commonly the result of exposure to the sun at high altitude, and in areas where shorter wavelengths are readily reflected from bright surfaces, such as snow, water, and sand. UV generated by a welding arc can similarly cause damage to the cornea, known as "arc eye" or welding flash burn, a form of photokeratitis.