RADIATION

SICKNESS

Compiled by

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WARNING

THIS MATERIAL CONTAINS DISTURBING IMAGES

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IMPORTANT

The health information contained herein is not meant as a substitute for advice from your physician, or other health professional. The following material is intended for general interest only; and it should not be used to diagnose, treat, or cure any condition whatever. If you are concerned about any health issue, symptom, or other indication, you should consult your regular physician, or other health professional. Consequently, the Author cannot accept responsibility for any individual who misuses the information contained in this material. Thus, the reader is solely responsible for all of the health information contained herein. However, every effort is made to ensure that the information in this material is accurate; but, the Author is not liable for any errors in content or presentation, which may appear herein.

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Part 1

What's It All About?

Introduction

In the history of warfare only two nuclear weapons have been detonated offensively on planet earth, both near the end of World War II. The first was detonated on the morning (08:15 am) of 6 August 1945, when the United States dropped a uranium gun-type device code-named "Little Boy" on the Japanese city of Hiroshima. The second was detonated three days later when the United States dropped a plutonium implosion-type device code-named "Fat Man" on the city of Nagasaki, Japan. These bombings resulted in the immediate deaths of around 120,000 people (mostly civilians) from injuries sustained from the explosion and acute radiation sickness, and even more deaths from long-term effects of (ionizing) radiation. In recent years, there has been increasing interest in the effects of radiation upon the human organism.

(Picture Right - Pocket watch found on the body of a victim of the Hiroshima bombing - August 1945. The watch stopped at 8:15 am - the time when the bomb exploded)

Following is a very brief overview of radiation sickness and symptoms.

What is a nuclear blast?

A nuclear blast, produced by explosion of a nuclear bomb (sometimes called a nuclear detonation), involves the joining or splitting of atoms (fusion or fission) to produce an intense pulse or wave of heat, light, air pressure, electromagnetic pulse (EMP), and radiation. The bombs dropped on Hiroshima and Nagasaki, Japan, at the end of World War 2 produced nuclear blasts.

When a nuclear device is exploded, a large fireball is created. Everything inside of this fireball vaporizes, including soil and water, and is carried upwards. This creates the mushroom cloud that we associate with a nuclear blast, detonation, or explosion. Radioactive material from the nuclear device mixes with the vaporized material in the mushroom cloud. As this vaporized radioactive material cools, it becomes condensed and forms particles, such as dust. The condensed radioactive material then falls back to the earth; this is what is known as fallout. Because fallout is in the form of particles, it can be carried long distances on wind currents and end up miles from the site of the explosion. Fallout is radioactive and can cause contamination of anything on which it lands, including food and water supplies.

Is a nuclear bomb the same as a suitcase bomb?

The "suitcase" bombs that have been described in recent years are small nuclear bombs. A suitcase bomb would produce a nuclear blast that is very destructive, but not as great as a nuclear weapon developed for strategic military purposes.

Is a nuclear bomb the same as a dirty bomb?

A nuclear blast is different from a dirty bomb. A dirty bomb, or radiological dispersion device, is a bomb that uses conventional explosives such as dynamite to spread radioactive materials in the form of powder or pellets. It does not involve the splitting of atoms to produce the tremendous force and destruction of a nuclear blast, but rather spreads smaller amounts radioactive material into the surrounding area. The main purpose of a dirty bomb is to frighten people and contaminate buildings or land with radioactive material.

There is an on-going debate about the damage that terrorists, using such a weapon, might inflict. Many experts believe that a dirty bomb, such that terrorists might reasonably be able to construct, would be unlikely to harm more than a few people. Consequently, in reality, it would be no more deadly than a "conventional bomb".

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Nuclear Fission and Fusion

Nuclear fission

For nuclei heavier than nickel-62 the binding energy per nucleon decreases with the mass number. It is therefore possible for energy to be released if a heavy nucleus breaks apart into two lighter ones. This splitting of atoms is known as nuclear fission.

The process of alpha decay may be thought of as a special type of spontaneous nuclear fission. This process produces a highly asymmetrical fission because the four particles which make up the alpha particle are especially tightly bound to each other, making production of this nucleus in fission particularly likely.

For certain of the heaviest nuclei which produce neutrons on fission, and which also easily absorb neutrons to initiate fission, a self-igniting type of neutron-initiated fission can be obtained, in a so-called chain reaction. (Chain reactions were known in chemistry before physics, and in fact many familiar processes like fires and chemical explosions are chemical chain reactions.) The fission or "nuclear" chain-reaction, using fission-produced neutrons, is the source of energy for nuclear power plants and fission type nuclear bombs such as the two that the United States used against Hiroshima and Nagasaki at the end of World War II. Heavy nuclei such as uranium and thorium may undergo spontaneous fission, but they are much more likely to undergo decay by alpha decay.

For a neutron-initiated chain-reaction to occur, there must be a critical mass of the element present in a certain space under certain conditions (these conditions slow and conserve neutrons for the reactions).

There is one known example of a natural nuclear fission reactor, which was active in two regions of Oklo, Gabon, Africa, over 1.5 billion years ago. Measurements of natural neutrino emission have demonstrated that around half of the heat emanating from the Earth's core results from radioactive decay. However, it is not known if any of this results from fission chain-reactions

Nuclear Fusion

When two light nuclei come into very close contact with each other it is possible for the strong force to fuse the two together. It takes a great deal of energy to push the nuclei close enough together for the strong or nuclear forces to have an effect, so the process of nuclear fusion can only take place at very high temperatures or high densities. Once the nuclei are close enough together the strong force overcomes their electromagnetic repulsion and squishes them into a new nucleus. A very large amount of energy is released when light nuclei fuse together because the binding energy per nucleon increases with mass number up until nickel-62. Stars like our sun are powered by the fusion of four protons into a helium nucleus, two positrons, and two neutrinos. The *uncontrolled* fusion of hydrogen into helium is known as thermonuclear runaway. Research to find an economically viable method of using energy from a *controlled* fusion reaction is currently being undertaken by various research establishments.

Nuclear Weapons

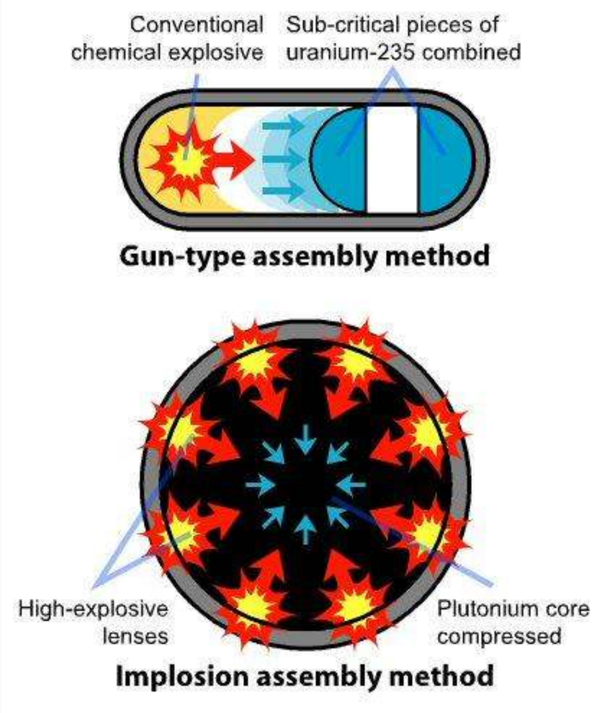
There are two basic types of nuclear weapon. The first type produces its explosive energy through nuclear fission reactions alone. Such fission weapons also commonly referred to as **atomic bombs** or **atom bombs** (abbreviated as **A-bombs**), though their energy comes specifically from the nucleus of the atom.

Fission Weapon

In fission weapons, a mass of fissile material (enriched uranium or plutonium) is assembled into a supercritical mass - the amount of material needed to start an exponentially growing nuclear chain reaction - either by shooting one piece of sub-critical material into another (the "gun" method), or by compressing a sub-critical sphere of material using chemical explosives to many times its original density (the "implosion" method). The latter approach is considered more sophisticated than the former, and only the latter approach can be used if plutonium is the fissile material.

A major challenge in all nuclear weapon designs is to ensure that a significant fraction of the fuel is consumed before the weapon destroys itself. The amount of energy released by fission bombs can range between the equivalent of less than a ton of TNT upwards to around 500,000 tons (500 kilotons) of TNT.

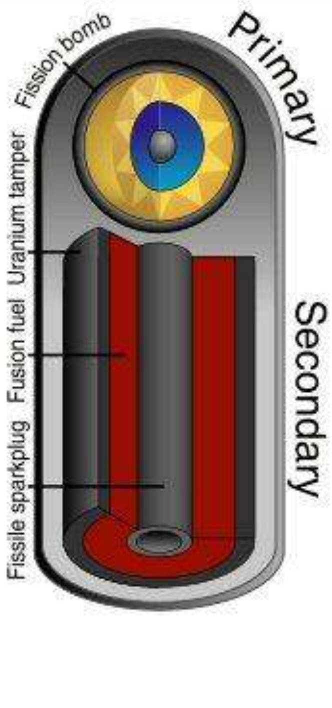
(Picture Below - Fission Type Nuclear Weapon)



Fusion Weapon

The second basic type of nuclear weapon produces a large amount of its energy through nuclear fusion reactions. Such fusion weapons are generally referred to as **thermonuclear weapons** or more colloquially as **hydrogen bombs** (abbreviated as **H-bombs**), as they rely on fusion reactions between isotopes of hydrogen (deuterium and tritium). However, all such weapons derive a significant portion - and sometimes a majority - of their energy from fission (including fission induced by neutrons from fusion reactions). Unlike fission weapons, there are no inherent limits on the energy released by fusion devices.

(Picture Below - Teller–Ulam Fusion Device)



The basics of the Teller–Ulam design for a hydrogen (fusion) bomb:
a fission bomb uses radiation to compress and heat
a separate section of fusion fuel.

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Plutonium-239

Plutonium-239 is an isotope of plutonium, and is the primary fissile isotope used for the production of nuclear weapons; although uranium-235 has also been used and is currently the secondary isotope.

Nuclear Powers

Currently, only six countries - United States, United Kingdom, Russia, France, People's Republic of China, and India - have conducted thermonuclear weapon tests.

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Measuring Radiation

The Rad

The rad is a unit of absorbed radiation dose defined in terms of the energy actually deposited in the tissue. One rad is an absorbed dose of 0.01 joules of energy per kilogram of tissue. The more recent SI unit is the gray (Gy), which is defined as 1 joule of deposited energy per kilogram of tissue. Thus one gray is equal to 100 rad.

To accurately assess the risk of radiation, the absorbed dose energy in rad is multiplied by the relative biological effectiveness (RBE) of the radiation to get the biological dose equivalent in rems. Rem stands for "Röntgen equivalent in man." In SI units, the absorbed dose energy in grays is multiplied by the same RBE to get a biological dose equivalent in sieverts (Sv). The sievert is equal to 100 rem.

The RBE is a "quality factor," often denoted by the letter *Q*, which assesses the damage to tissue caused by a particular type and energy of radiation. For alpha particles *Q* may be as high as 20, so that one rad of alpha radiation is equivalent to 20 rem. The *Q* of neutron radiation depends on their energy. However, for beta particles, x-rays, and gamma rays, *Q* is taken as one, so that the rad and rem are equivalent for those radiation sources, as are the gray and sievert.

The Roentgen

The röntgen (roentgen) equivalent in man or rem (symbol rem) is a unit of radiation dose. It is the product of the absorbed dose in röntgens (R) and the biological efficiency of the radiation.

More precisely, assuming a radiation weighting factor *rW*=1, 1 rem equals 1.07185 röntgen. The conversion factor has been readjusted from 1 to 1.07185 so that 100 rem equal 1 sievert (Sv); the sievert is the recommended SI derived unit, and in many cases is the legally prescribed unit.

A rem is a large amount of radiation, so the millirem (mrem), which is one thousandth of a rem, is often used for the dosages commonly encountered, such as the amount of radiation received from medical x-rays and background sources.

Continued use of the rem is "strongly discouraged" by the style guide of the US National Institute of Standards and Technology for authors of its publications.

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Part 2

Radiation Sickness

Symptoms of Radiation Sickness

Symptoms of Radiation Sickness may include:

- Nausea and vomiting within 24 to 48 hours
- Headache
- Fatigue
- Weakness

Moderate radiation sickness

With an acute absorbed dose of 2 to 3.5 Gy, a person may experience:

- Nausea and vomiting within 12 to 24 hours
- Fever
- Hair loss
- Infections
- Vomiting blood
- Bloody stool
- Poor wound healing

Moderate radiation sickness can be fatal to those most sensitive to radiation exposure.

Severe radiation sickness

An absorbed dose of 3.5 to 5.5 Gy can result in the following signs and symptoms:

- Nausea and vomiting less than one hour after exposure to radiation
- Diarrhea
- High fever

Severe radiation sickness is fatal about half the time.

Very severe radiation sickness

A person with an absorbed dose greater than 5.5 to 8 Gy can have the following signs and symptoms:

- Nausea and vomiting less than 30 minutes after exposure to radiation
- Dizziness
- Disorientation
- Low blood pressure (hypotension)

Very severe radiation sickness is often fatal.

Causes

Radiation is the energy released from atoms as either a wave or a tiny particle of matter. Radiation sickness is caused by exposure to a high dose of radiation, such as a high dose of radiation received during an industrial accident. Common exposures to low-dose radiation, such as X-ray examinations, do not cause radiation sickness.

Sources of high-dose radiation

Possible sources of high-dose radiation include the following:

- An accident at a nuclear industrial facility
- An attack on a nuclear industrial facility
- Detonation of a small radioactive device
- Detonation of a conventional explosive device that disperses radioactive material (dirty bomb)
- Detonation of a standard nuclear weapon

Radiation sickness occurs when high-energy radiation damages or destroys certain cells in the body. Regions of the body most vulnerable to high-energy radiation are cells in the lining of the stomach and intestinal tract and the blood cell producing cells of bone marrow.

Tests and diagnosis

When a person has experienced known or probable exposure to high-energy radiation from an accident or attack, medical personnel will take a number of steps to determine the absorbed radiation dose. This information is essential for determining how severe the illness is likely to be, which treatments to use and whether a person is likely to survive. Information important for determining an absorbed dose includes:

- **Known exposure.** Details about distance from the source of radiation and duration of exposure can help provide a rough estimate of the severity of radiation sickness.
- **Vomiting and other symptoms.** The time between radiation exposure and the onset of vomiting is a fairly accurate screening tool to estimate absorbed radiation dose. The shorter the time before the onset of this sign, the higher the dose is. The severity and timing of other signs and symptoms may also help medical personnel determine the absorbed dose.
- **Blood tests.** Frequent blood tests over several days enable medical personnel to look for drops in disease-fighting white blood cells and abnormal changes in the DNA of blood cells. These factors indicate the degree of bone marrow damage, which is determined by the level of an absorbed dose.
- **Dosimeter.** A device called a dosimeter can measure the absorbed dose of radiation but only if it was exposed to radiation at the same time as the person was exposed.
- **Survey meter.** A device such as a Geiger counter can be used to survey people to determine the body location of radioactive particles.
- **Type of radiation.** A part of the larger emergency response to a

Complications

Radiation sickness itself wouldn't cause long-term medical problems for those who survive the illness. However, the radiation exposure that caused the immediate radiation sickness would significantly increase a person's risk of developing cancer later in life.

Having radiation sickness could also contribute to both short-term and long-term psychological disorders, such as generalized anxiety disorder, major depression or post-traumatic stress disorder. Mental health problems may stem from the fear and anxiety of:

- Experiencing a radioactive accident or attack
- Grieving friends or family who haven't survived
- Dealing with the uncertainty of a mysterious and potentially fatal illness
- Worrying about the eventual risk of cancer due to radiation exposure

Treatments and drugs

In reality, treatment to reverse the effects of irradiation is not currently possible. However, anesthetics and antiemetics are administered to counter the symptoms of exposure, as well as antibiotics for countering secondary infections due to the resulting immune system deficiency.

There are also a number of substances used to mitigate the prolonged effects of radiation poisoning, by eliminating the remaining radioactive materials, post exposure.

The treatment goals for radiation sickness are to prevent further radioactive contamination, treat damaged organs, reduce symptoms, and manage pain.

In the case of a person who has had only part of their body irradiated then the treatment is easier, as the human body can tolerate very large exposures to the non-vital parts such as hands and feet, without having a global effect on the entire body. For instance, if the hands get a 100 Gy dose which results in the body receiving a dose (averaged over the entire body of 5 Gy) then the hands may be lost but radiation poisoning would not occur. The resulting injury would be described as localized radiation burn.

One of the primary dangers of whole-body exposure is immunodeficiency due to the destruction of bone marrow and consequent shortage of white blood cells. It is treated by maintaining a sterile environment, bone marrow transplants (hematopoietic stem cell transplantation), and blood transfusions.

Chelation therapy can be useful to an extent if radiation poisoning is caused by the presence of heavy fissionable materials (e.g. radium or plutonium) in the bloodstream.

Decontamination

Decontamination is the removal of as much external radioactive particles as possible. Removing clothing and shoes eliminates about 90 per cent of external contamination. Gently washing with water and soap removes additional radiation particles from the skin. Decontamination prevents further distribution of radioactive materials and lowers the risk of internal contamination from inhalation, ingestion or open wounds.

Treatment for damaged bone marrow

A protein called granulocyte colony-stimulating factor, which promotes the growth of white blood cells, may counter the effect of radiation sickness on bone marrow. Treatment with this protein-based medication, which includes filgrastim (Neupogen) and pegfilgrastim (Neulasta), may increase white blood cell production and help prevent subsequent infections.

If you have severe damage to bone marrow, you may also receive transfusions of red blood cells or blood platelets.

Treatment for internal contamination

Some treatments may reduce damage to internal organs caused by radioactive particles. Medical personnel would use these treatments only if you've been exposed to a specific type of radiation. These treatments include the following:

- **Potassium iodide** is a nonradioactive form of iodine. Because iodine is essential for proper thyroid function, the thyroid becomes a "destination" for iodine in the body. If you have internal contamination with radioactive iodine (radioiodine), your thyroid will absorb radioiodine just as it would other forms of iodine. Treatment with potassium iodide may fill "vacancies" in the thyroid and prevent absorption of radioiodine. The radioiodine is eventually cleared from the body in urine.
- **Prussian blue,** a type of dye, binds to particles of radioactive elements known as cesium and thallium. The radioactive particles are then excreted in feces. This treatment speeds up the elimination of the radioactive particles and reduces the amount of radiation cells may absorb.
- **Diethylenetriamine pentaacetic acid (DTPA)** is a substance that binds to metals. DTPA binds to particles of the radioactive elements plutonium, americium and curium. The radioactive particles pass out of the body in urine, thereby reducing the amount of radiation absorbed.

Supportive treatment

If you have radiation sickness, you may receive additional medications or interventions to treat:

- Bacterial infections
- Headache
- Fever
- Diarrhea
- Nausea and vomiting
- Dehydration

Terminal Care

A person who has absorbed large doses of radiation (8 Gy or greater) has little chance of recovery. Depending of the severity of illness, death can occur within two days or two to three weeks. People with a lethal radiation dose will receive medications to control pain, nausea, vomiting and diarrhoea. They may also benefit from psychological or pastoral care.

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Radiation Exposure Levels and Symptoms

Radiation Exposure Level	Symptoms
0.05-0.2 Sv (5-20 REM)	No symptoms. Potential for cancer and mutation of genetic material, according to the LNT model: this is disputed (Note: see hormesis). A few researchers contend that low dose radiation may be beneficial. 50 mSv is the yearly federal limit for radiation workers in the United States. In the UK the yearly limit for a classified radiation worker is 20 mSv. In Canada and Brazil, the single-year maximum is 50 mSv, but the maximum 5-year dose is only 100 mSv. Company limits are usually stricter so as not to violate federal limits.

Radiation Exposure Level	Symptoms
0.2-0.5 Sv (20-50 REM)	No noticeable symptoms. White blood cell count decreases temporarily.
0.5-1 Sv (50-100 REM)	Mild radiation sickness with headache and increased risk of infection due to disruption of immunity cells. Temporary male sterility is possible.
1-2 Sv (100-200 REM)	*Light radiation poisoning, 10% fatality after 30 days (LD 10/30).* Typical symptoms include mild to moderate nausea (50% probability at 2 Sv), with occasional vomiting, beginning 3 to 6 hours after irradiation and lasting for up to one day. This is followed by a 10 to 14 day latent phase, after which light symptoms like general illness and fatigue appear (50% probability at 2 Sv). The immune system is depressed, with convalescence extended and increased risk of infection. Temporary male sterility is common. Spontaneous abortion or stillbirth will occur in pregnant women.
2-3 Sv (200-300 REM)	*Moderate radiation poisoning, 35% fatality after 30 days (LD 35/30)*. Nausea is common (100% at 3 Sv), with 50% risk of vomiting at 2.8 Sv. Symptoms onset at 1 to 6 hours after irradiation and last for 1 to 2 days. After that, there is a 7 to 14 day latent phase, after which the following symptoms appear: loss of hair all over the body (50% probability at 3 Sv), fatigue and general illness. There is a massive loss of leukocytes (white blood cells), greatly increasing the risk of infection. Permanent female sterility is possible. Convalescence takes one to several months.
3-4 Sv (300-400 REM)	*Severe radiation poisoning, 50% fatality after 30 days (LD 50/30)*. Other symptoms are similar to the 2-3 Sv dose, with uncontrollable bleeding in the mouth, under the skin and in the kidneys (50% probability at 4 Sv) after the latent phase.
4-6 Sv (400-600 REM)	*Acute radiation poisoning, 60% fatality after 30 days (LD 60/30)*. Fatality increases from 60% at 4.5 Sv to 90% at 6 Sv (unless there is intense medical care). Symptoms start half an hour to two hours after irradiation and last for up to 2 days. After that, there is a 7 to 14 day latent phase, after which generally the same symptoms appear as with 3-4 Sv irradiation, with increased intensity. Female sterility is common at this point. Convalescence takes several months to a year. The primary causes of death (in general 2 to 12 weeks after irradiation) are infections and internal bleeding.
6-10 Sv (600-1,000 REM)	*Acute radiation poisoning, near 100% fatality after 14 days (LD 100/14).* Survival depends on intense medical care. Bone marrow is nearly or completely destroyed, so a bone marrow transplant is required. Gastric and intestinal tissue are severely damaged. Symptoms start 15 to 30 minutes after irradiation and last for up to 2 days. Subsequently, there is a 5 to 10 day latent phase, after which the person dies of infection or internal bleeding. Recovery would take several years and probably would never be complete. Devair Alves Ferreira received a dose of approximately 7.0 Sv (700 REM) during the Goiânia accident and survived, partially due to his fractionated exposure.

Radiation Exposure Level	Symptoms
10-50 Sv (1,000-5,000 REM)	*Acute radiation poisoning, 100% fatality after 7 days (LD 100/7).* An exposure this high leads to spontaneous symptoms after 5 to 30 minutes. After powerful fatigue and immediate nausea caused by direct activation of chemical receptors in the brain by the irradiation, there is a period of several days of comparative well-being, called the latent (or "walking ghost") phase. After that, cell death in the gastric and intestinal tissue, causing massive diarrhea, intestinal bleeding and loss of water, leads to water-electrolyte imbalance. Death sets in with delirium and coma due to breakdown of circulation. Death is currently inevitable; the only treatment that can be offered is pain therapy. Louis Slotin was exposed to approximately 21 Sv in a criticality accident on 21 May 1946, and died nine days later on 30 May.
More than 50 Sv (>5,000 REM)	A worker receiving 100 Sv (10,000 REM) in an accident at Wood River, Rhode Island, USA on 24 July 1964 survived for 49 hours after exposure. An operator named Cecil Kelley who received between 60 and 180 Sv (18,000 REM) to his upper body in an accident at Los Alamos, New Mexico, USA on 30 December 1958, survived for 36 hours; details of this accident can be found in the journal "Los Alamos Science", Number 23 (1995).

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Probable Health Effects Resulting From Exposure to Ionising Radiation

Dose in Rems (whole body)	Health Effects Immediate	Delayed
1,000 or more	Immediate death. \`Frying of the brain'.	None
600-1,000	Weakness, nausea, vomiting and diarrhoea followed by apparent improvement. After several days: fever, diarrhoea, blood discharge from the bowels, haemorrhage of the larynx, trachea, bronchi or lungs, vomiting of blood and blood in the urine.	Death in about 10 days. Autopsy shows destruction of hematopoietic tissues, including bone marrow, lymph nodes and spleen; swelling and degeneration of epithelial cells of the intestines, genital organs and endocrine glands.
250-600	Nausea, vomiting, diarrhoea, epilation (loss of hair), weakness, malaise, vomiting of blood, bloody discharge from the bowels or kidneys, nose bleeding, bleeding from gums and genitals, subcutaneous bleeding, fever, inflammation of the pharynx and stomach, and menstrual abnormalities. Marked destruction of bone marrow, lymph nodes and spleen causes decrease in blood cells especially granulocytes and thrombocytes.	Radiation-induced atrophy of the endocrine glands including the pituitary, thyroid and adrenal glands. From the third to fifth week after exposure, death is closely correlated with degree of leukocytopenia. More than 50% die in this time period. Survivors experience keloids, ophthalmological disorders, blood dyscrasis, malignant tumours, and psychoneurological disturbances.

Dose in Rems (whole body)	Health Effects Immediate	Delayed
150-250	Nausea and vomiting on the first day. Diarrhoea and probable skin burns. Apparent improvement for about two weeks thereafter. Foetal or embryonic death if pregnant.	Symptoms of malaise as indicated above. Persons in poor health prior to exposure, or those who develop a serious infection, may not survive. The healthy adult recovers to somewhat normal health in about three months. He or she may have permanent health damage, may develop cancer or benign tumours, and will probably have a shortened lifespan. Genetic and teratogenic effects.
50-150	Acute radiation sickness and burns are less severe than at the higher exposure dose. Spontaneous abortion or stillbirth.	Tissue damage effects are less severe. Reduction in lymphocytes and neutrophils leaves the individual temporarily very vulnerable to infection. There may be genetic damage to offspring, benign or malignant tumours, premature ageing and shortened lifespan. Genetic and teratogenic effects.
10-50	Most persons experience little or no immediate reaction. Sensitive individuals may experience radiation sickness.	Transient effects in lymphocytes and neutrophils. Premature ageing, genetic effects and some risk of tumours.
0-10	None	Premature ageing, mild mutations in offspring, some risk of excess tumours. Genetic and teratogenic effects.

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Part 3

Pictures

(Picture Below - Radiation Burns)

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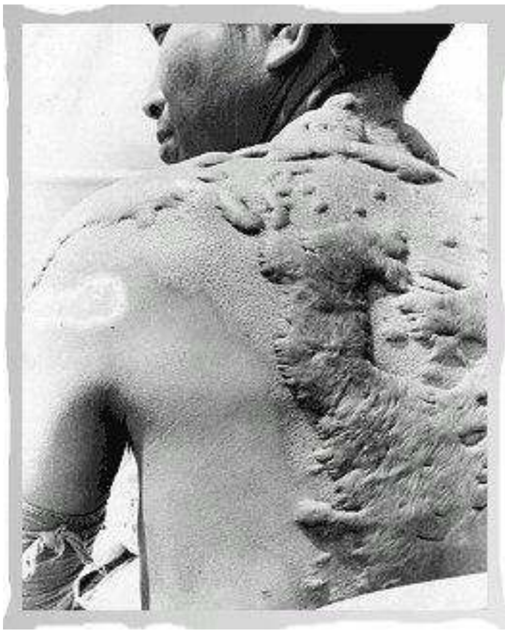
(Picture Below - Hiroshima Victim)



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Picture Below - Hiroshima Victims

The inhabitants of Hiroshima were bombed on 08 August 1945. Some were vaporised (left), others were carbonised (centre), and others died slowly from radiation sickness (right).

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(Picture Blow - Hiroshima Victim)

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(Picture Below - Acute Radiation Sickness)

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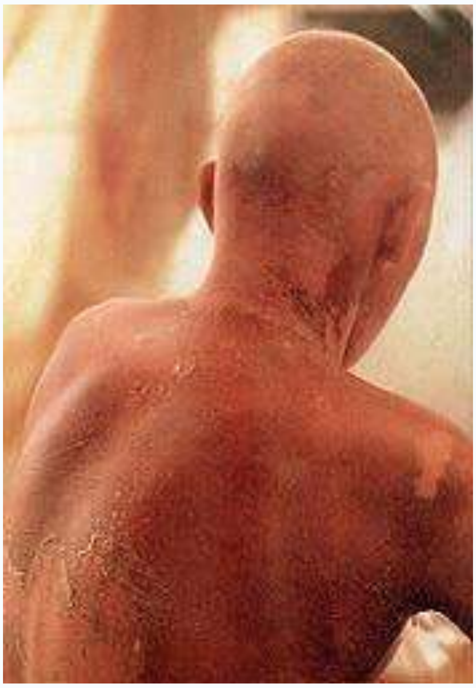
(Picture Below - Radiation Sickness - Chernobyl)



Radiation burns and vomiting accompanied the Radiation Sickness at Chernobyl

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(Picture Below - Hiroshima Victim)

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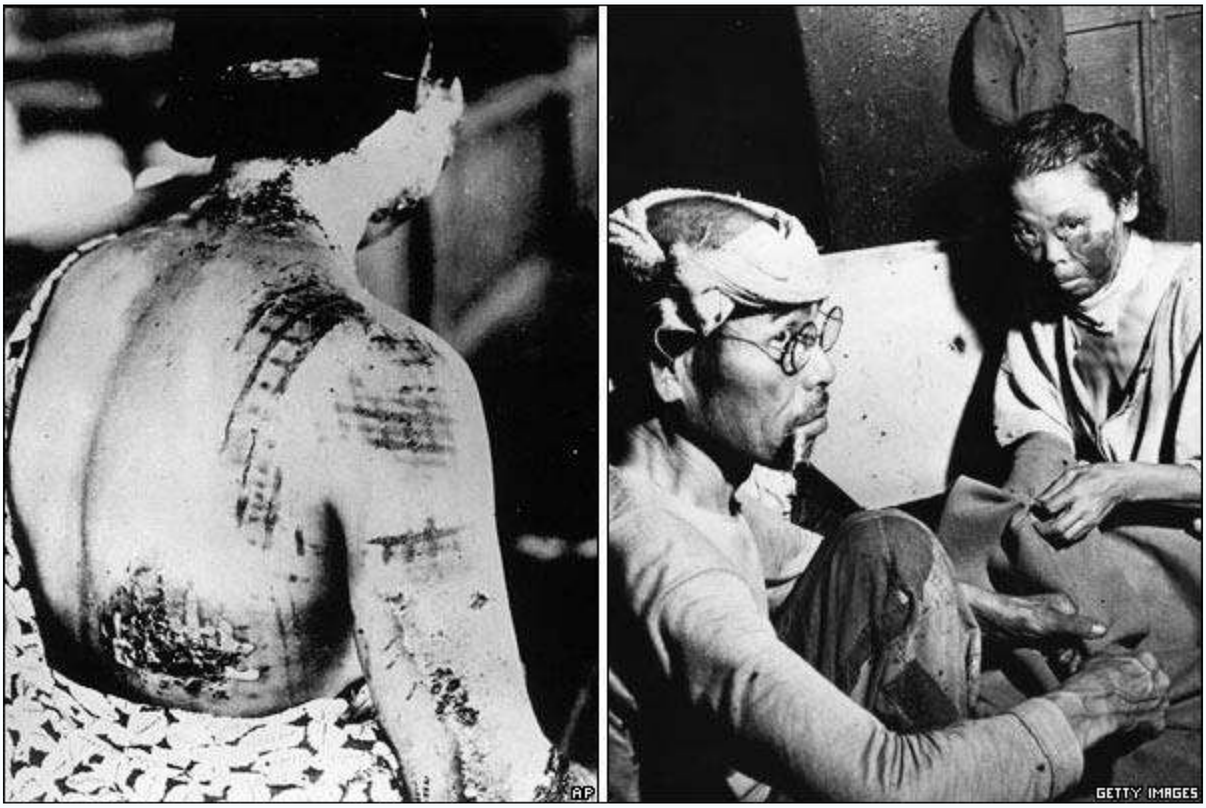
(Picture Below - Hiroshima Radiation Victims)



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(Picture Below - Hiroshima)

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(Picture below - Hiroshima)

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(Picture Below - Hiroshima Victim)

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(Picture Below - Hiroshima Victims)

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(Picture Below - Hiroshima)

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Picture Below - "Final Word"

Final Word

During World War II the United States dropped A-bombs on Hiroshima and Nagasaki. Approximately 105,000 Japanese were killed in Hiroshima, or died from injuries and radiation afterwards, and there were 60,000 victims in Nagasaki.

In the above photograph this injured Hiroshima mother and her baby wait for medical treatment. The baby, too weak to suckle, died in ten days...

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