CONDITION

Radiation sickness

Radiation sickness is illness caused by a large dose of penetrating radiation reaching most of the body in a short time.

WHAT IT IS
Illness after a large, short-term whole-body radiation dose

BODY SYSTEM
Bone marrow, digestive tract, skin, and nervous system

MAIN SYMPTOMS
Nausea, vomiting, diarrhea, weakness

WHAT CAUSES IT
High-dose ionizing radiation over a short time

HOW IT IS DIAGNOSED
Exposure assessment, serial blood counts, and radiation dose estimation

MAIN TREATMENT
Decontamination, supportive care, and blood-cell growth factors

CAN IT BE CURED?
Sometimes - recovery possible after survivable doses

IS IT AN EMERGENCY?
Yes - suspected major exposure needs immediate assessment

LONG-TERM OUTLOOK
Recovery possible; higher doses cause lasting harm or death

Overview

Radiation sickness, also called acute radiation syndrome, is a serious condition caused by a large dose of penetrating ionizing radiation reaching all or most of the body over a short time. Ionizing radiation has enough energy to damage cells and their genetic material.

The condition is most likely after a major radiation emergency, such as an industrial accident, nuclear event, or exposure to a powerful radiation source. It is not caused by everyday background radiation. Routine medical X-rays and CT scans do not deliver the type of whole-body dose that causes radiation sickness. Radiation therapy is carefully targeted and is more likely to cause effects in the treated area than full acute radiation syndrome.

Fast-growing cells are especially sensitive to radiation. These include cells in bone marrow, which makes blood cells, and cells lining the digestive tract. Very high doses can also damage

the skin, blood vessels, heart, and nervous system.

Radiation sickness is different from radioactive contamination. Exposure means radiation energy reached the body. Contamination means radioactive material is on the skin, clothing, or inside the body. A person who was exposed to radiation is not automatically radioactive or dangerous to others.

Symptoms

Symptoms depend mainly on the radiation dose, how quickly it was received, and how much of the body was exposed. Other injuries, such as burns or trauma, can make the illness more severe.

Early symptoms may begin within minutes, hours, or days:

Symptoms may briefly improve during a latent phase , which is a period when the person appears or feels better. This does not always mean the danger has passed. Damage to bone marrow or other tissues may become clear days or weeks later.

Later symptoms can reflect different patterns of organ injury. Bone marrow damage may reduce white blood cells, red blood cells, and platelets. This can lead to infections, tiredness, shortness of breath, easy bruising, or bleeding.

Damage to the digestive tract may cause severe diarrhea, vomiting, abdominal pain, fluid loss, and infection. Extremely high doses can cause confusion, loss of coordination, seizures, loss of consciousness, or a rapid fall in blood pressure.

Radiation injury to the skin may develop slowly. Pain, redness, blistering, sores, or hair loss in one area can appear days to weeks after exposure. A local skin injury can occur without full-body radiation sickness.

Symptoms alone cannot show how much radiation someone received. Vomiting and diarrhea have many other causes, so exposure history and medical testing are essential.

- Nausea and vomiting
- Loss of appetite
- Diarrhea
- Headache, weakness, or unusual tiredness
- Skin redness, swelling, itching, or burning

Causes and risk factors

Radiation sickness requires a substantial dose of penetrating radiation delivered over a short period, usually to most of the body. Penetrating radiation includes gamma rays, X-rays, and neutrons.

Possible situations include:

Risk increases with a higher dose, a shorter exposure time, and a larger area of the body being exposed. Distance from the source and the amount of shielding also matter.

Children may be more sensitive to some radiation effects because their cells divide more quickly. Pregnancy requires specialist assessment because radiation can affect a developing pregnancy, depending on the dose and stage of development.

Radioactive material can enter the body by breathing it in, swallowing it, or through a wound. This is called internal contamination. Its effects depend on the substance, where it collects in the body, and how long it remains there. Internal contamination does not always cause acute radiation syndrome.

- A nuclear detonation or major reactor accident
- Mishandling of an industrial or medical radiation source
- Being close to an unshielded high-activity radioactive source
- A deliberate radiological or nuclear event

Diagnosis

Diagnosis begins with information about what happened, including the suspected source, distance from it, shielding, exposure time, and whether radioactive contamination is possible. Emergency teams may use radiation detectors and records from the incident.

Blood tests are repeated over hours and days. A complete blood count measures different blood cells. A rapid fall in lymphocytes, a type of white blood cell, can help estimate the severity of exposure.

Special laboratories may use biodosimetry , which estimates radiation dose by examining changes in blood cells or chromosomes. Physical dosimeters worn by workers, environmental measurements, and computer models may also help reconstruct the dose.

Doctors assess vomiting, diarrhea, skin changes, neurological symptoms, and other injuries. The time between exposure and early vomiting may provide a clue to severity, but it is not reliable enough to use by itself.

Tests may also check electrolytes, kidney and liver function, infection, pregnancy, and internal contamination. Swabs or whole-body monitoring may be used when radioactive material could be present.

Treatment and management

Suspected radiation sickness is treated as a medical emergency. Care is coordinated with radiation specialists, emergency services, public health teams, and poison or radiation control experts.

If radioactive material may be on the body, the first step is decontamination. Carefully removing the outer layer of clothing can remove much of the material. The skin and hair may then be washed gently with soap and water. Scrubbing hard can damage the skin and allow material to enter.

Treatment supports the body while damaged tissues recover. It may include:

Growth factors and other medicines are chosen according to the estimated dose, blood counts, symptoms, and additional injuries. In selected cases, specialists may consider a stem cell transplant. This cannot repair severe damage to the digestive tract, lungs, brain, or other organs, so it is not suitable for everyone.

Specific medicines can reduce the absorption or speed the removal of certain radioactive substances. They work only for particular contaminants. Potassium iodide protects the thyroid from radioactive iodine; it does not protect the rest of the body from radiation and does not treat acute radiation syndrome. It should be taken only when public health authorities advise it.

- Fluids and treatment for electrolyte loss
- Medicines for nausea, vomiting, pain, and diarrhea
- Antibiotics or other medicines for infection
- Blood or platelet transfusions
- Care for burns, wounds, and damaged skin
- Blood-cell growth factors that help bone marrow recover

Complications

Bone marrow injury can lead to severe infection because the body has fewer white blood cells. Low platelet levels can cause internal or external bleeding. Low red blood cell levels can cause

anemia, with weakness and shortness of breath.

Digestive tract injury can cause dehydration, poor nutrient absorption, bleeding, and infection spreading from the bowel. Skin injury may progress to ulcers, tissue death, scarring, or long-lasting pain.

Very high exposure can damage several organs at once and may be fatal despite intensive treatment. Burns, blast injuries, wounds, or chemical exposure can reduce the chance of recovery.

People who survive may have a higher long-term risk of certain cancers. Depending on the tissues exposed, later effects can include cataracts, fertility problems, thyroid disease, heart or blood vessel disease, and lasting skin changes. Anxiety, sleep problems, grief, and post-traumatic stress can also follow a radiation emergency.

Prevention

Radiation sickness can often be prevented by controlling radiation sources and following safety rules. However, an individual cannot always prevent exposure during an unexpected nuclear or radiological emergency.

During an emergency, follow official instructions. The basic protective actions are time, distance, and shielding: spend as little time near the source as possible, move farther away, and place dense material such as building walls between you and the source.

You may be told to go inside and remain there. Move to the basement or middle of a substantial building, away from windows and the roof. Close doors and windows and turn off systems that draw outside air inside, if officials advise this.

If you were outside where radioactive material may have been released, remove your outer clothing without shaking it. Place it in a bag away from people and animals, then wash exposed skin and hair gently. Follow local instructions about food, water, travel, and evacuation.

Do not take potassium iodide, iodine supplements, or unproven "radiation detox" products unless public health authorities recommend them. Potassium iodide helps only in specific radioactive iodine emergencies and can cause harm if used incorrectly.

Living with it and what to expect

The course over the first weeks depends strongly on the dose and the organs affected. Some people have early symptoms, a short period of improvement, and then falling blood counts.

Recovery of bone marrow may take weeks or months and often requires close monitoring.

People with lower, survivable exposures may recover fully, although tiredness and emotional distress can continue for some time. Higher exposures can cause persistent skin, digestive, fertility, or organ problems. Extremely high whole-body doses have a poor outlook.

After leaving hospital, follow-up may include blood counts, wound or skin care, infection monitoring, and checks for organ effects. People with known significant exposure may need long-term cancer screening or other surveillance based on the dose and tissues involved.

Radiation emergencies can disrupt housing, work, family life, and access to familiar places. Fear of contamination is common. Clear information from radiation specialists and public health agencies can help you understand whether you pose any risk to others. Most people who were exposed but not contaminated do not need to avoid family or friends.

When to get medical help

Seek emergency help after a known or suspected major radiation exposure, even if you feel well. Follow emergency broadcasts and instructions rather than travelling through a contaminated area without guidance.

Get urgent medical help for:

If contamination is possible, tell emergency services before arriving so they can prepare safely. Do not delay lifesaving care to attempt extensive cleaning.

Routine follow-up is different from emergency assessment. After a confirmed exposure, keep planned appointments even if symptoms improve. Report new skin changes, frequent infections, unusual bleeding, ongoing digestive symptoms, or concerns about pregnancy or fertility.

- Vomiting, diarrhea, confusion, or severe weakness after suspected exposure
- Skin burning, blistering, swelling, or unexplained localized hair loss
- Fever, shaking chills, unusual bleeding, or widespread bruising
- Trouble breathing, fainting, seizures, or loss of consciousness
- Radioactive material on the body, clothing, or in a wound

Common questions

Can a CT scan or X-ray cause radiation sickness?

Routine diagnostic imaging does not deliver the large, rapid whole-body dose associated with acute radiation syndrome. Medical imaging still uses ionizing radiation, so it should be justified and performed with appropriate dose controls, but radiation sickness is not an expected result.

Is radiation sickness contagious?

No. Radiation exposure itself cannot spread from person to person. Radioactive dust or liquid on clothing or skin can sometimes transfer to other people until it is removed. Emergency teams can check for and manage this contamination.

How soon does radiation sickness start?

Early nausea or vomiting may begin within minutes to days, depending on the dose. Bone marrow problems, infections, bleeding, and skin injury may appear later. Timing alone cannot confirm the condition or estimate the dose safely.

Can you recover from radiation sickness?

Recovery is possible after some exposures, especially when the dose is lower and prompt supportive care is available. Severe damage to the digestive tract, nervous system, or multiple organs is less likely to be survivable. Each incident needs specialist assessment.

Does potassium iodide prevent radiation sickness?

No. Potassium iodide protects only the thyroid gland from radioactive iodine. It does not block external radiation or protect other organs. Take it only when public health officials recommend it for a specific emergency.

Can someone have radiation injury without feeling sick?

Yes. Symptoms may be delayed, and a temporary period of feeling better can occur. Local skin injury or falling blood counts may also develop later. Anyone with a credible major exposure needs assessment even without immediate symptoms.

Sources

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