



## HEALTH

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# Q&A: Health effects of radiation exposure

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**By Richard Warry**  
BBC News

**Japanese officials have ordered anyone living within 20km (12 miles) of the Fukushima nuclear power plant to evacuate the area.**

A large explosion has occurred in one of its buildings and some radiation leakage has been detected. If the Japanese authorities act swiftly, they should be able to minimise the cost to human health.

### **What are the immediate health effects of exposure to radiation?**

Exposure to moderate levels can result in radiation sickness, which produces a range of symptoms.

Nausea and vomiting often begin within hours of exposure, followed by diarrhoea, headaches and fever.

After the first round of symptoms, there may be a brief period with no apparent illness, but this may be followed within weeks by new, more serious symptoms.

At higher levels of radiation, all of these symptoms may be immediately apparent, along with widespread - and potentially fatal - damage to internal organs.

Exposure to a radiation dose of four grays will typically kill about half of all healthy adults.

For comparison, radiation therapy for cancer typically involves several doses of between one and seven grays at a time.

### **How is radiation sickness treated?**

The first thing to do is to try to minimise further contamination by removing clothes and shoes, and gently washing the skin with soap and water.

Drugs are available that increase white blood-cell production to counter any damage that may have occurred to the bone marrow, and to reduce the risk of further infections due to immune-system damage.

There are also specific drugs that can help to reduce the damage to internal organs caused by radioactive particles.

### **How does radiation have an impact on health?**

Radioactive materials that decay spontaneously produce ionising radiation, which has the capacity to cause significant damage to the body's internal chemistry, breaking the chemical bonds between the atoms and molecules that make up our tissues.

The body responds by trying to repair this damage, but sometimes it is too severe or widespread to make repair possible. There is also a danger of mistakes in the natural repair process.

Regions of the body that are most vulnerable to radiation damage include the cells lining the intestine and stomach, and the blood-cell producing cells in the bone marrow.

The extent of the damage caused is dependent on how long people are exposed to radiation, and at what level.

### **What are the most likely long-term health effects?**

Cancer is the biggest long-term risk. Usually when the body's cells reach their "sell-by date" they commit suicide. Cancer results when cells lose this ability, and effectively become immortal, continuing to divide and divide in an uncontrolled fashion.

The body has various processes for ensuring that cells do not become cancerous, and for replacing damaged tissue.

But the damage caused by exposure to radiation can completely disrupt these control processes, making it much more likely that cancer will result.

Failure to repair the damage caused by radiation properly can also result in changes - or mutations - to the body's genetic material, which are not only associated with cancer, but may also be potentially passed down to offspring, leading to deformities in future generations. These can include smaller head or brain size, poorly formed eyes, slow growth and severe learning difficulties.

### **Are children at greater risk?**

Potentially yes. Because they are growing more rapidly, more cells are dividing, and so the potential for things to go wrong is greater.

Following the Chernobyl nuclear reactor accident in the Ukraine in 1986, the World Health Organization recorded a dramatic increase in thyroid cancer among children in the vicinity.

This was because the radioactive materials released during the accident contained high levels of radioactive iodine, a material that accumulates in the thyroid.

### **How can the Japanese authorities minimise the cost to human health?**

Professor Richard Wakeford, an expert in exposure to radiation, said provided the Japanese authorities acted quickly most of the general population should be spared significant health problems.

He said in those circumstances the only people likely to be at risk of serious health effects were nuclear workers at the plant or emergency workers exposed to high levels of radiation.

He said the top priority would be to evacuate people from the area and to make sure they did not eat contaminated food. The biggest risk was that radioactive iodine could get into their system, raising the risk of thyroid cancer.

To counter that risk people could be given tablets containing stable iodine which would prevent the body absorbing the radioactive version.

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