

## Chernobyl's Effects Linger On

1. When was this article published? *May 10, 2000.*
2. Why will restrictions on some food continue in the United Kingdom and former Soviet Union for another 50 years? *The environment is not cleaning itself as fast as was expected. Radioactivity can also be released again after it has been reabsorbed into the soil.*
3. Where have high levels of radioactive cesium been measured? *Northwest England in vegetation, lakes, and fish.*
4. What happened to the levels of radioactive cesium during the first five years after the Chernobyl accident? *Concentration of radioactive cesium decreased by a factor of 10.*
5. Describe why levels of radioactive cesium are not decreasing anymore. *Cesium is being re-released into the ecosystem. While the rate of absorption into the soil is slowing down, cesium is also diffusing back out.*
6. Why is diffusion of radioactive cesium back into the environment occurring? Explain the physical principle behind this diffusion. *There is a concentration gradient with more cesium in the soil and less in the ecosystem. As a result, cesium diffuses out until there is a balance.*
7. How long will the United Kingdom have to continue restrictions on sheep from the Cumbria region as a food item for humans? *10-15 years.*
8. How long will forest berries, fungi, and fish from parts of the former Soviet Union remain restricted? *50 years.*

## Chernobyl Children Show DNA Changes

1. Who are the children that this article is about? To whom were they born? *The children were born after the 1986 disaster to parents who had cleaned up the reactor.*
2. What are "liquidators"? *Members of the clean-up teams sent in after the reactor exploded.*

3. Why are scientists studying the children? *They are examining their DNA for the presence of mutations.*
4. What are the controls in this study? *The children's siblings who had been conceived before their parents' exposure served as internal controls and children from families who had not been exposed served as external controls.*
5. Describe what scientists discovered about the children's DNA. *They found a sevenfold increase in the number of new bands compared to the controls.*
6. Describe the factors that may be linked to the number of DNA changes observed in children. *The time between parental exposure and conception of the child, and the duration of the liquidator's work in the contaminated area.*

### **Nuclear Energy Agency: Health Impact**

1. Describe what happens to DNA, cells, and organs after low and high doses of radiation. *Radiation damages DNA. At low doses, the cell may be able to repair most of the damage. At high doses, repair and regeneration may be inadequate, so that a large number of cells may be destroyed leading to impaired organ function.*
2. Describe the acute health effects of the Chernobyl disaster. *Burns, radiation sickness, and decreased white blood cell count.*
3. Describe the chronic or late health effects of the Chernobyl disaster. *Leukemia, thyroid cancer, and mental diseases.*

### **Chernobyl Disaster's Effects on Biological Systems**

- **Macromolecules:** DNA is altered by radiation and mutations arise. At low, chronic doses, DNA mutations may lead to the cell becoming cancerous.
- **Organelles:** Because DNA, the critical genetic material, is damaged, important proteins may not be made correctly or made at all. This would affect organelle function.

- **Cells:** Cells may be able to repair damage to DNA and organelles if radiation is in low doses. Repair may be incomplete or defective however, in which case the cell will be altered and develop into a cancerous cell. The alterations in the cell may also be heritable, leading to long-term effects in progeny. If radiation occurs in high doses, damage to the cell may be irreparable and the cell may die either immediately or after several divisions.
- **Tissues:** Groups of damaged cells don't allow correct functioning. Among the people who were exposed acutely to the highest levels of radiation, the mucous membranes were severely affected, making breathing and swallowing extremely difficult.
- **Organs:** As groups of cells are damaged, normal organ functioning is impaired.
- **Organisms:** As tissues and organs are impaired, the entire human body is affected negatively. Chernobyl survivors have many long-term health problems such as cancer and autoimmune disorders.
- **Populations:** Entire populations have been exposed to radiation from Chernobyl. For example, sheep in the Cumbria region are not suitable for human consumption.
- **Communities:** Human beings have had to change their interaction with some of the vegetation in the area due to radiation. The population of Cumbria sheep will not be reduced due to human consumption. Certain berries, fungi, and fish from the former Soviet Union will also not be consumed for another half century.
- **Ecosystem:** The Chernobyl disaster affected not only human beings living in the area, but also the soil, water, animal life, and vegetation of the entire ecosystem. Contaminants in the soil and water are absorbed by vegetation and aquatic life. These contaminants then move to other organisms through the food chain. Slaughter restrictions have been placed on sheep in many places of Norway and the United Kingdom because of grazing on contaminated pasture.
- **Biosphere:** The Chernobyl incident affected all living things in a vast area of the former Soviet Union and Europe.