

NUCLEAR WEAPONS: FOOD SUPPLIES AND THE RURAL ENVIRONMENT.

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Delayed Effects: Radioactive Fallout

Background: Nuclear weapons are no longer seen purely as deterrents by military strategists, who discuss not only massive, accurate attacks on missile silos, but also battlefield use in the European theatre. As inhabitants of that 'theatre', we are entitled to know just what this means for us, our children, our environment and our economy.

This fact-sheet, prepared by scientists from published information, is one of a series which summarises the effects of nuclear weapons explosions on farms, food supplies and the rural environment. It deals with the delayed effects, especially those of radioactive fallout. Other fact-sheets cover prompt effects on farm animals, indirect dislocation of agriculture, etc.

Radioactive Fallout - Primary Cause of Delayed Effects: If a nuclear weapon of 20 kilotons to 10 Megatons 'yield' is exploded at ground level, between 100 thousand and 100 million tons of soil and other material are forced out of the crater into the fireball and the 'mushroom cloud'. Rendered intensely radioactive, the heavier particles return to earth at once or over the next few hours and days, the distribution of this local fallout depending on the direction and speed of winds at various altitudes, and on rain. Thus, no part of the Scottish mainland would have been safe from the risk of local fallout following the explosion of the 12 groundbursts in Scotland supposed in the Government's 'Square Leg' exercise. Some 1-5000 square miles would have been contaminated, not including the 'wet fallout' from two nuclear explosions in the Clyde estuary.

Finer dust particles are carried higher in the atmosphere, where they are distributed around the globe. Through rainfall, they reach the Earth's surface again as global fallout, affecting countries anywhere in the world.

Radioactive Elements Causing Delayed Effects: Many of the radioactive substances in fallout, which are very damaging to living organisms in the short term, decay rather rapidly. Four which present a special longer term hazard are Iodine-131, Carbon-14, Strontium-90 and Caesium-137, because they are accumulated in body tissues, and because the last three remain radioactive for long periods. Although Iodine-131 is relatively short-lived (see below), it is quickly taken up through the food chain, gets into milk and is concentrated in the thyroid gland of humans. In the late 1950s, following the above-ground testing of about 100 nuclear weapons, Iodine-131 levels from global fallout became so high in the wetter counties in Wales that some milk deliveries were intercepted and poured away on a hill near Aberaeron.

Caesium-137 also gets into milk, and is accumulated in blood, as well as being retained in plant tissue. Strontium-90 is more readily absorbed by plants from soil than any other main component of fallout, and when eaten by animals or humans is incorporated in place of Calcium into bone marrow cells, where the blood cells are formed. Strontium-90 from global fallout is now thought to be present in the bones of everyone in the world. Carbon-14 occurs naturally at low levels, but the annual growth rings in the trunks of trees record that there was a sudden rise to a peak in the mid-1960s, followed by a decline. This is presumably because only just over 50 atmospheric tests have been carried out since they were banned by the Partial Test Ban Treaty in August, 1963, whereas there were 400 before that date. Each component part of all the cells in every living organism contains Carbon, including the chromosomes and genes which carry the genetic characteristics over into new cells, and via the sex cells to the next generation.

Examples of Specific Hazards: Radioactive fallout can damage animals and humans when it is eaten, either directly or after incorporation into plants; when the dust is inhaled into the lungs or lodges on the skin or clothes, or remains on roofs, etc in the vicinity; and via contaminated water supplies. Besides the prompt lethal effects on many organisms exposed to high levels of radiation, moderate and lower doses can produce:

- (a) Radiation sickness, and damage to the blood-forming system, eyes, gut and lungs, with a general lowering of resistance to disease.
- (b) Cancer. Nine different organs of the body have been reported to show increased cancer with additional radiation, with leukaemia the earliest radiation-induced malignancy to show up. An official U.S. government study estimates that a 1 Megaton airburst would eventually kill 200-2000 people somewhere in the world through cancer, besides its prompt effects.
- (c) Genetic effects. The same study suggests that 100-1000 extra abortions would occur due to damage to the chromosomes, plus 350-3500 other genetic effects. These could include temporary or permanent sterility, and increased rates of mutation or changes in the chromosomes in the sex cells. Since such alterations are usually harmful, and may be passed on from generation to generation, they clearly arouse great concern. The long periods of time involved, however, make this a difficult area for precise estimates.

Are there Safe Limits? Half the radioactivity of strontium-90 originally present decays in 28 years, 75% in 56 years, and so on. Similarly the 'half-life' for Caesium-137 is 30 years, for Carbon-14 5730 years, and for Iodine-131 8 days. Clearly, many of these substances are already booked for a long stay in the UK environment due to atmospheric testing of nuclear weapons. Thus in a nuclear war, although simple screening or washing might partially protect animals and humans, these long-lived components of fallout would present a long-term health hazard to those who might survive the immediate effects.

Four points need to be considered regarding 'safe' limits -

- (1) They are estimates in an area of uncertainty, rather than precisely determined statistics
- (2) Those for peaceful purposes have become increasingly stringent, whereas those discussed for nuclear war are much more lax
- (3) Many authorities regard all radiation as potentially dangerous
- (4) Special equipment is required to measure radiation, which cannot be detected by the human senses

Other Delayed Effects: A major nuclear war, using many of the 50-60,000 nuclear weapons at present stockpiled, might have slight to moderate temporary effects on global climate and crop yields, because of widespread dust and smoke, and through the formation of large amounts of oxides of nitrogen and hydrocarbons. Some authorities consider that these might diminish the ozone layer around the Earth, allowing more ultra-violet light to reach its surface. It is also possible that other irreversible changes in the environment and ecological systems might occur.

Summary of Implications: "The effects of a nuclear war that cannot be calculated are at least as important as those for which calculations are attempted". There is clearly no way of protecting the countryside, its farms and their food production except by adopting policies which reduce, rather than increase the numbers of nuclear weapons and the risks of their being used.

Main Sources: "The Effects of Nuclear War", Office of Technology Assessment, U.S. Congress, Croom Helm, London, 1980.

"Weapons of Mass Destruction and the Environment", Stockholm International Peace Research Institute, Taylor & Francis, London, 1977.

"Nuclear War: The Aftermath", Ambio, Vol. 11, nos 2-3, pp 76-176, 1982.

Published by: the Scottish Group of Scientists Against Nuclear Arms, 67 Warrender Park