

Key note address:

Radiation effects in reindeer

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A considerable part of the Swedish and Norwegian areas used for reindeer herding was contaminated by radioactivity from the accident on April 26, 1986 at the Chernobyl nuclear power plant. Both winter and summer grazing areas were affected, mainly by radiocesium. Limited areas in the Swedish mountain region were found to be contaminated by more than 80 kBq/m² of ¹³⁷Cs, but generally 40 to 60 kBq/m² were found. The levels of ¹³⁷Cs in lichens growing in such areas were up to 120 kBq/kg dry matter (Eriksson *et al.*, 1987) but generally the levels were lower, around 30 kBq/kg d.m. Regular sampling of reindeer meat in the first year after the accident (NFA 1987) confirmed the seasonal variation observed earlier in radiocesium content of the muscular tissue (Lindén & Gustafsson 1967).

Earlier studies of radiocesium in reindeer have concerned the metabolism of the reindeer and transfer of this nuclide to reindeer meat consumers, especially Eskimos and Lapps who can have an extremely high reindeer meat intake (e.g. Lindén & Gustafsson 1967, Nestruева *et al.* 1967, and Westerlund *et al.* 1987).

With the present level of radiocesium contamination, direct radiation effects have been hypothesised. The annual radiation dose to a re-

indeer containing a maximum amount of radiocesium, i.e. 60 to 70 kBq/kg muscular tissue in February or March according to NFA measurements, could be up to 0,5 Sv. Studies performed in domestic ruminants, like sheep and goats, show that the dose rate from such an internal contamination would be too low to give acute effects (see reviews by Still & Page, 1971 and Bell 1985) in a reindeer. Experimental results show that internal contamination with large amounts of radiocesium will lead to bone marrow depression due to the rather homogeneous distribution of this element in the body of an animal. It has been shown that chronic intake of several MBq radiocesium per day will cause bone marrow depression of this kind and death in cattle and dogs (Shannon *et al.* 1965 and Boecker 1972). The direct cause of death is hemorrhage and infection due to thrombocytopenia and leukopenia, respectively. Although reindeer differ from these experimental animals, the effects of high levels of radiocesium would be expected to be the same. The use of more sensitive recent methods to detect irradiation of an animal, i.e. detection of micronuclei and chromosome aberrations in cultured lymphocytes, has been used in reindeer with high body burdens of radiocesium (Röed *et al.*

1989)but the results have not indicated any increase in this type of damage to the chromosomes. Other more sensitive tests to detect decreased immunological response after irradiation could be tried but most probably it will be difficult to detect such an effect in normally free-ranging reindeer.

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