

Expanded abstract

Chromosomal damage in Norwegian reindeer after the Chernobyl accident

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Following the Chernobyl accident on 26 April 1986, substantial quantities of radioactive material were released into the atmosphere, which resulted in considerable radioactive fallout in large parts of central Norway. The reindeer, *Rangifer tarandus* L., is particularly exposed to the radioactive isotopes contained in the fallout due to its reliance on lichen, a very efficient absorber of all kinds of airborne particles, as the main food resource during the winter season. Ionizing radiation is known to induce genetic damage, and analysis of chromosome aberrations is considered to be a very sensitive biological indicator of the effects of ionizing radiation.

In the present study, chromosome aberrations in peripheral lymphocytes were investigated in semi-domestic reindeer from areas in Norway which have been exposed to varying degrees of ionizing radiation from the Chernobyl accident. Approximately 10 000 mitoses from 192 reindeer sampled from seven different areas were analysed. Four of these areas were, in decreasing order of radioactive contamination, Vågå, Brurskanen, Lom, and Røros, all in central

Norway. The three other areas, Vuorjenjarg, Seiland, and Frakfjord in Finnmark, northern Norway, were not affected by fallout from the Chernobyl accident.

Significant heterogeneity in distribution of chromosome aberrations between areas was detected. Disregarding age, the pattern of chromosome aberration frequencies in the different areas was not related to the variation in radiation exposure due to the Chernobyl accident. However, calves from the most contaminated area exhibited significantly more chromosome-type aberrations characterized by 2-break events compared to calves from areas not affected by the Chernobyl accident (Røed *et al.* 1992). Dicentric (n=3), rings (n=2) and translocations (n=3) were all found in calves from Vågå, while no dicentric, or rings, and only one translocation, were detected in calves from Finnmark. Studies in humans and other vertebrates have clearly shown that the incidence of such aberrations is dose dependent, and that these aberrations are typical radiation-induced events (Evans *et al.* 1979; Lucnik 1983; Das and Sharma 1983; Metalli 1985).

Within the most contaminated area, the reindeer born in 1986 showed significantly ($p < 0.01$) more chromosome aberrations compared to reindeer born before, or after, 1986 (Røed *et al.* in prep.). The frequency of lymphocytes with chromosome aberrations in reindeer from Vågå born in 1986 was about twice that in those born before, or after, 1986. Overall, results indicated that the Chernobyl accident has affected the frequency of chromosome aberrations in Norwegian reindeer living in the most contaminated areas, and that calves, especially those born in 1986, have been particularly affected.

Keywords: Radioactivity, effects, chromosomes

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