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Combined Effects of Ionizing Radiation and Primary Succession on Populations of Mouselike Rodents Inhabiting Former CNPP Cooling Pond

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The investigation was initiated in 2018, four years after the decommissioning of the CNPP Cooling Pond commenced and is ongoing till now. Following the initiation of the CNPP cooling pond (CP) decommissioning, the water level in the cooling pond gradually declined, exposing the pond bottom sediments with radioactive materials and creating new areas for primary succession and habitat formation for wildlife. Direct precedent for the planned decommissioning of a cooling pond affected by significant radioactive contamination is absent, highlighting the need for dedicated research and monitoring.
This study aims to investigate the combined effects of ionizing radiation and ecological succession processes. Three test sites were selected: No 1 - on the former bank, representing a stable and mature ecosystem, No2 and No3 - on the contaminated former bottom of the CP at different stages of ecological succession.
The results of radioecological studies at the test sites are referenced in [1].
Small rodents were captured using Sherman live traps arranged in line transects. For each animal, the level of incorporated 137Cs was measured in the whole body and 90Sr was measured in femur.
To calculate the internal dose of Cs-137, the dose coefficient, we used the BiotaDC program (http://biotadc.icrp.org/). The internal dose of Sr-90 was calculated using the dose coefficient for the “Rat” model organism as provided in ICRP Publication 136.
The effect of radiation exposure on bone marrow was evaluated by measuring the frequency of micronucleated polychromatic erythrocytes (MNPCEs) and the ratio of polychromatic erythrocytes (PCEs) to normochromatic erythrocytes (NCEs).
In Myodes glareolus, the key species in this study, individuals collected from the control site (No 1) exhibited total absorbed doses ranging from 1.74 to 46.2 μGy/day, with 90Sr contributing 49–96% of the dose. In contrast, at sites No2 and No3, 137Cs was the predominant contributor, accounting for 76–93% of the total dose.
In Apodemus flavicollis, another major species in our study, individuals collected from sites No2 and No3 during 2018 and 2019 showed total absorbed doses ranging from 3.7 to 219.2 μGy/day. At these sites, 137Cs was the dominant contributor, accounting for 63–97% of the total dose, while 90Sr contributed the remainder. Most of the total absorbed dose is attributed to incorporated radionuclides. Data from the 2019 capture show that the level of incorporated strontium may be influenced by the age of the animal.
The observed increase in the frequency of PCE-MN and the substantial rise in the cytotoxicity index during 2018-2019 suggest that ionizing radiation has a detrimental effect on the bone marrow cells, impairing the maturation and differentiation of erythroid cells.

Authors: Пані БУРДО, Олена (ІЯД); Пані ISHINIWA, H (School of Environment and Sustainability,); Пан ВИШНЕВСЬКИЙ, Д (Chornobyl Radiation and Ecological Biosphere Reserve, Ukraine); Пані ЛИПСЬКА, А (ІЯД); Пані РЯБЧЕНКО, Н (ІЯД НАНУ)

Доповідач: Пані БУРДО, Олена (ІЯД)

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