STUDY OF BLOOD GLUCOSE LEVELS IN TWO RODENTS GENERA INHABITING RADIOACTIVELY CONTAMINATED AREAS OF THE EXCLUSION ZONE

M. Grybenko[1,2], O. Burdo[1], D. Vyshnevskyi[3], I. Lozovytska[1,2], A. Lypska[1], A. Patiuk[1,2,4], I. Chyzhevskyi[4], T.A. Mousseau[5], A. Vasylenko[6], T. Mappes[6], P.C. Watts[6], E. Tukalenko[1]

[1] Institute for Nuclear Research, National Academy of Sciences of Ukraine, Kyiv, Ukraine
[2] Taras Shevchenko National University of Kyiv, Kyiv, Ukraine
[3] Chornobyl Radiation and Ecological Biosphere Reserve, Chornobyl, Ukraine
[4] State Specialized Enterprise "Ecocentre", Chornobyl, Ukraine
[5] University of South Carolina, Columbia, SC, United States of America
[6] University of Jyväskylä, Jyväskylä, Finland

Background. Evaluating the biological consequences of the Chornobyl Nuclear Power Plant accident requires approaches that go beyond controlled laboratory studies. Research on free-ranging organisms living in radioactively contaminated habitats offers ecologically relevant insight into physiological responses to prolonged low-dose radiation exposure. The Exclusion Zone provides a unique natural setting for investigating long-term physiological and metabolic adaptations under chronic environmental stress.

Aim. To assess glucose homeostasis in small mammal models from radioactively contaminated areas of the Exclusion Zone in comparison with conspecific populations from uncontaminated control sites.

Methods. Small rodents of the family *Cricetidae*, including bank voles (*Clethrionomys glareolus*) and *Microtus* species (*Microtus spp.*), were captured in the Red Forest – the most radioisotope-contaminated region of the Exclusion Zone – as well as at control sites. In total, 180 animals were analyzed: 113 bank voles (68 from contaminated areas and 45 from control sites) and 67 voles of genus *Microtus* (37 contaminated and 30 control). Animals were trapped using Ugglan live traps and transported to the laboratory for morphometric assessment and gamma spectrometric analysis. Peripheral blood glucose levels were measured using a OneTouchSelectSimple® glucometer from samples collected via orbital sinus puncture. Statistical analyses included both parametric and nonparametric approaches, along with multiple regression modeling.

Results. In both genera, rodents from contaminated areas of the Exclusion Zone showed significantly higher blood glucose concentrations compared with individuals from control sites. In bank voles, glucose levels (mean ± SD) were 5.9 ± 1.5 mmol/L at control sites and 7.0 ± 2.5 mmol/L in contaminated areas ($p < 0.01$). Multiple regression analysis revealed significant effects of irradiation ($b = 1.05$; $t = 2.57$; $p < 0.01$), sex ($b = 0.99$; $t = 2.24$; $p < 0.05$), and ectoparasite infestation (*Ixodes ricinus*) ($b = 1.35$; $t = 2.48$; $p < 0.05$). In *Microtus spp.*, glucose concentrations were 5.3 ± 1.9 mmol/L at control sites and 7.3 ± 2.6 mmol/L at contaminated sites ($p < 0.001$), with regression analysis indicating a significant influence of irradiation ($b = 1.87$; $t = 3.26$; $p < 0.01$).

Conclusions. Chronic exposure to radioactively contaminated environments is associated with increased blood glucose concentrations in two genera of small rodents. These findings point to radiation-related alterations in glucose regulation and highlight the need for further studies on metabolic homeostasis, including glucose tolerance and metabolomic profiling, under conditions of long-term environmental radiation exposure.