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Use of Blood Parameters as Biomarkers of Contaminant Exposure in Fish Specimens from Sitnica River, Kosovo

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Abstract: To evaluate the use of blood parameters as non-lethal biomarkers of contaminant exposure, fish specimens (*Carassius carassius* and *Gobio obtusirostris*) were collected with electrofishing method from three sites along Sitnica River: 1-Ferizaj, 2-Vragoli, 3-Plemetin; along with two reference sites in Drini River streams. Image analysis measured major axis, minor axis, area, and shape factor of erythrocytes and their nuclei, which determined the proportions of mature, intermediate, and immature erythrocytes. Other types of erythrocytes (karyorrhetic, dividing, enucleate) and leukocytes (neutrophils, monocytes, lymphocytes) were quantified. To determine effects of capture stress, determination of plasma glucose levels were performed. Lastly, the micronucleus assay were used to assess genotoxic exposure. The latter provided another method to quantify polychromatic (immature) erythrocytes. Glucose levels of individuals from polluted areas were higher than normal glucose values for cyprinidae group ($p<0.001$).There were a correlation between high glucose levels and micronucleus frequency ($p<0.001$). The Micronucleus Test showed significantly more genetic damage at polluted areas than the reference sites. This research suggests that erythrocyte nuclear morphology, percent immature erythrocytes, and the micronucleus test are suitable non-lethal biomarkers of contaminant exposure in fish.

Keywords: *Gobio fish, Carassius fish, Erythrone profile; Fish blood; Sitnica; Drini.*

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