

# Animal welfare, etológia és tartástechnológia



## Animal welfare, ethology and housing systems

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**Acute Toxicity of Nickel Towards Freshwater Ciliate *Paramecium bursaria***

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Heavy metals are common contaminants present in aquatic environment and biological systems. The ciliated protista are generally the most abundant group in aquatic ecosystems and they can be used as an effective biological indicators of some pollutants. *Paramecium bursaria* is an unicellular organism which is widely distributed in freshwater environment. *P. bursaria* cells harbor several hundred symbiotic algae in their cytoplasm. The main purpose of this study was to determine in laboratory tests the acute toxicity of nickel chloride ( $\text{NiCl}_2$ ) to *Paramecium bursaria*. The ciliates were incubated in solutions with  $5 \times 10^{-6}$  to  $5 \times 10^{-1} \text{g/dm}^3$  of  $\text{NiCl}_2$  at the temperature of  $18^\circ\text{C}$ , in the light/dark conditions (12L/12D). Observations of cell shape and rate of cell division as well as the swimming behavior of paramecia were conducted after 24, 72 and 120 hours of incubation in the tested solutions and were compared to the control group. Nickel ions might be recognized as one of the most effective immobilizatory agents for ciliates. After 10 minutes from the beginning of the incubation the velocity of swimming falls simultaneously the spiralization diminishes and the rotary movement round the long body axis become slower. After next few minutes ciliates becomes a short crawling and stop more frequently. In the immobilization phase cilia of the whole cell work but without performing an effective stroke. The next macronucleus becomes distinctly visible, the vacuoles enlarge and the cell is being deformed. Microscopic observations revealed that the lethal dose was  $5 \times 10^{-4} \text{g/dm}^3$  and that in less constrained solutions the slowdown and characteristic movements like overturns were observed. The PEA measurements were carried on within 4 days, the first after a 24-hour incubation period in nickel solution. The measured parameter was Fv/Fm. Fv/Fm is a parameter widely used to indicate the maximum quantum efficiency of Photosystem II. These investigations revealed the highest fluorescence efficiency in culture incubating in the least concentration and the shortest time and the lowest one in a control sample, what can indicate the stimulating role of nickel to cells of *Paramecium bursaria*.