

Why are planarians the "gold standard" for studying weak and ultra-weak impacts?

Tiras Kh.P¹, K.N. Novikov,² V.L. Voeikov², N.R. Tiras¹

¹Institute of Theoretical and Experimental Biophysics, Russian Academy of Sciences, Pushchino
Russia ²Moscow State University, Faculty of Biology, Moscow, Russia;

Freshwater flatworms - planarians - "champions" of the animal world in terms of regeneration: the restoration of the head end of the body with the ganglion (CNS of worms) takes 5-7 days. This is ensured by the presence of a giant pool of reserve (stem) cells - neoblasts, from which any other cells, including nerve cells, are formed.

A system for dynamic morphometry of planarian regeneration was developed, which includes non-invasive control of morphogenesis by digital in vivo morphometry and registration of ultraweak photon emission, which makes it possible to register weak and superweak effects on the regeneration process. Using this system, data were obtained on the effect of neuropeptides-stimulators and inhibitors of regeneration at concentrations from 10^{-9} M to 10^{-15} M, as well as the effect of weak magnetic fields from 50 μ T to 130 nT [1–3]. This allows us to consider this test system the most sensitive in the field of experimental biology, designed to control proliferation and regeneration in vivo.

The main advantage of the system is that it registers the action at the level of the whole organism, which allows for the most adequate translation of the information obtained to other eukaryotes, including vertebrates.

Literature

1. Sheiman I.M., Tiras Kh.P., Balobanova E.F. Morphogenetic function of neuropeptides // Physiological journal of the USSR, 1989. V.75, No. 5, S. 619-625 (In Russian).
2. Lednev V.V., Ermakov A.M., Ermakova O.N., Rozhdestvenskaya Z.E., Srebnitskaya L.K., Tiras Kh.P. // Modulation of the effect of pharmacological agents by weak and extremelyweak alternating magnetic fields on a model of regeneration of the planarian *Girardia tigrina*. // Biophysics. 2005a. V. 50 (Suppl. 1), P. S130-S133.
3. Kh Tiras, U Vorobeva, K Novikov, V Voeikov, V. Emelyanenko, G Davidova, A Skripnikov // Peptide regulation of plant and animal morphogenesis: general mechanisms and specificity of action // IOP Conf. Series: Materials Science and Engineering, 487 (2019) 012020