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TITLE OF HIS PRESENTATION

„Digging” for the roots of innate immunity with comparative experimental approach

RESULTS FOR THE TALENTUM PRIZE 2026 NOMINATION

Identification of an evolutionary conserved β -catenin homologue and elucidation of its role in tissue regeneration and innate immune response

RESEARCH AREA

At our department, we have been studying the evolution of innate immunity for several decades applying an invertebrate model system. One of the initial and, to this day significant area of our research interest is the morphological and functional characterization of the immunocompetent cellular elements of annelids, known as coelomocytes.

Our current research focuses on the relationship between tissue regeneration and innate immunity. In annelids, regeneration is well studied from anatomical and histological point of view, but the molecular and immunological background of this process is less well understood. Numerous studies have confirmed that immune system can play an essential role in regenerative processes, and that high tissue restoration capacity is inversely proportional to the complexity of the immune system.

In our experiment, we investigated the infiltration of coelomocytes into regenerating tissues and demonstrated that the depletion of coelomocytes negatively affects the formation of blastema (blastema: an aggregation of undifferentiated cells, from which the restoration of new tissue begins) and cell proliferation during earthworm regeneration.

Our results highlighted the importance of cellular and humoral immune components during earthworm segment regeneration. A more precise understanding of the factors influencing the presence or loss of regeneration requires multidisciplinary scientific approach. Our comparative studies offer the opportunity to identify the mechanisms involved in regeneration and wound healing. This information can be utilized in the tissue/organ regeneration of vertebrates.

TECHNIQUES AVAILABLE IN THE LAB

- Immunohistology (immunofluorescence and immunocytochemistry)
- Flow cytometry, functional assays (cell cycle analysis, assessment of cell proliferation rate, and measurement of intracellular reactive oxygen intermediates)
- In vitro cell- and tissue culture, cell-tracing analysis
- Analysis of gene and protein expressions (qPCR, Western blot)

SELECTED PUBLICATIONS

Bodó, K., Boros, Á., da Costa, C.B., Tolnai, G., Rumpler, É., László, Z., Nagyeri, G., Németh, P., Kille, P., Molnár, L., Engelmann, P. (2025) A novel beta-catenin homologue from the earthworm *Eisenia andrei*: identification and characterization during embryonic development, segment regeneration and immune response. *Int J Biol Macromol* 306: 141397.

Kokhanyuk, B., Bodó, K., Sétáló, G. Jr., Németh, P., Engelmann, P. (2021) Bacterial engulfment mechanism is strongly conserved in evolution between earthworm and human immune cells. *Front Immunol* 12: 733541.

Bodó, K., Hayashi, Y., Gerencsér, G., László, Z., Kéri, A., Galbács, G., Telek, E., Mészáros, M., Deli, A.M., Kokhanyuk, B., Németh, P., Engelmann, P. (2020) Species-specific sensitivity of *Eisenia* earthworms towards noble metal nanoparticles: a multiparametric in vitro study. *Environ Sci: Nano* 7: 3509-3525.

Bodó, K., Boros, Á., Rumpler, É., Molnár, L., Böröcz, K., Németh, P., Engelmann, P. (2019) Identification of novel lumbricin homologues in *Eisenia andrei* earthworms. *Dev Comp Immunol* 90: 41-46.

Engelmann, P., Hayashi, Y., Bodó, K., Ernszt, D., Somogyi, I., Steib, A., Orbán, J., Pollák, E., Nyitrai, M., Németh, P., Molnár, L. (2016) Phenotypic and functional characterization of earthworm coelomocytes: linking light scatter-based cell typing and imaging of the sorted populations. *Dev Comp Immunol* 65: 41-52.