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Cell type evolution and nervous system regeneration: insights from acoel worms

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Hundreds of millions of years of evolution have led to the incredible diversity that can be observed in the animal kingdom. However, the mechanisms that drove the evolution of cell types are still poorly understood. To address core questions regarding the evolution of cell types in bilaterians with a focus on the evolution of the nervous system, we investigated the biology of acoel worms. These worms evolved independently from all other animals for over 500 million years and could therefore hold keys to understanding the early evolution of the nervous system.

Single-cell RNA sequencing was performed in the species *Isodiametra pulchra,* to generate a full cell atlas of this species and molecularly characterize the different cell types that compose these animals. The different types of cells could be described in detail and compared with different species in order to better reconstruct the evolutionary history of cell types in early-branching bilaterians.

Additionally, experiments were performed to characterize stem cells, cellular proliferation and brain regeneration in the species *Symsagittifera roscoffensis.* We could describe in detail the different steps of brain regeneration in this worm and correlate them with different degrees of cellular proliferation.

Together this work provides new insights about the evolution of this mysterious clade of animals and paves the way for future studies of their cell types.

Jury:

Prof. Dr. Simon Sprecher (thesis supervisor)
Dr. Stéphanie Bertrand (external co-examiner)
Dr. Boris Egger (internal co-examiner)
Prof. Dr. Jörn Dengjel (president of the jury)