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Schmidtea mediterranea: A new animal model for neurodevelopmental toxicology studies?

Mary M Staehle
Rowan University, USA

Schmidtea mediterranea (Smed) planaria are small, freshwater flatworms with a centralized nervous system, a sequenced genome, and a large population of pluripotent stem-like cells known as neoblasts. These worms have remarkable regenerative capabilities, including the ability to regenerate any or all of the nervous system. We hypothesize that head regeneration in Smed is analogous to neurodevelopment in higher level organisms like humans and that these processes require similar mechanisms such that characterization of the disruption of head regeneration in Smed provides insight into neurodevelopmental effects in humans. We have tested this hypothesis with exposure to two known teratogens: ethanol and bisphenol A (BPA). Our results indicate that the reacquisition of cognitive function in head-regenerating Smed exposed to either of these is delayed, as evidenced by delayed movement-normalized photophobic behaviour. This suggests direct effects on neuro regenerative processes that can be characterized at the molecular level. We have also begun to use this system to assess BPA-alternative materials. Taken together, our results suggest that the Smed could be a "coal-mine canary" for neurodevelopmental effects of novel materials.

Biography

Mary M Staehle is an Assistant Professor of Chemical and Biomedical Engineering at Rowan University. Before joining the faculty at Rowan in 2010, she worked at the Daniel Baugh Institute for Functional Genomics and Computational Biology at Thomas Jefferson University and received her PhD in chemical engineering from the University of Delaware. She also holds a BS in Biomedical Engineering from the Johns Hopkins University. Her research interests include neuro regenerative dynamics, the characterization of toxicity in novel materials, systems biology, and biomedical control systems.

staehle@rowan.edu