Development of an Innovative Alternative Model for Teratogenicity Testing: Effect of Hypervitaminosis A in Regenerating Planaria

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According to the Center for Disease Control and Prevention, a child with birth defects is born approximately every 4.5 minutes. The currently accepted method to determine the potential of new medicines and chemicals to cause birth defects (teratogenicity) involves testing in pregnant animals. Millions of non-human mammals are sacrificed annually for research, and scientists are searching for alternative models to reduce animal use in research. This unique research study evaluated the potential use of brown planaria (Dugesia tigrine) as an alternative model for teratogenicity testing. There are similarities between mammalian embryonic development and the regeneration of planaria during the early stages of development of nervous system, including eyes. In this study, amputated planaria were exposed to varying concentrations of a known teratogen, vitamin A (retinol) for approximately 2 weeks, and multiple parameters including the formation of blastema and eyes were evaluated. High concentrations of retinol delayed the formation of blastema and eyes in regenerating planaria. At high concentrations of retinol, regenerating planaria also developed cyclopia, a well-known birth defect in humans, which has been linked to high levels of vitamin A in animal studies. The results from this study demonstrated that high concentrations of retinol caused defects in head and eye formation in regenerating planaria, with similarities to vitamin A related teratogenicity findings in animals. Based on these results, regenerating brown planaria is a promising alternative model for teratogenicity testing, which can potentially be paradigm shifting as it can reduce cost, time, and pregnant animal use in research.

Awards Won:
Fourth Award of $500