The Hidden Hazard of Infant Formula: Evaluating the Effect of Food Additive λ-Carrageenan on Blastemal Cell Growth and Development in a Dugesia tigrina Model

Chittibabu, Akshayaa (School: Southwestern Educational Society)

Carrageenans are linear sulfated polysaccharides derived from red seaweeds that are popularly used in the food industry to gel, thicken and stabilize properties in certain foods, but their use in infant formulas has been banned in Europe. However, carrageenan is still a prevalent food additive in the United States. In this study, the effect of λ-Carrageenan on blastemal cell growth and development in Dugesia tigrina was investigated. Concentrations of 1%, 0.75%, 0.5%, 0.25%, and 0.1% λ-Carrageenan were prepared with spring water, along with a spring water control group. The planarians were transversely amputated and exposed to the solutions over an experimental window of 8 days, as the normal epimorphosis rate of D. tigrina is 7 days. Death and inactivity were observed in the 1%, 0.75%, 0.5% and 0.25% λ-Carrageenan groups between day 2 and day 4. Images taken with the Carl Zeiss Stemi 2000-C dissecting microscope of the 0.1% group and the control group on days 6 and 8 were analyzed using the mid-ordinate rule of integral calculus to calculate blastemal growth and formation. It was found that carrageenan significantly inhibited the overall amount of cell growth and development, and data collected suggests that carrageenan triggers the earlier onset of blastemal cell differentiation in Dugesia tigrina by inhibiting the ERK/mkpA pathway. The data collected also suggests that pregnant women should avoid carrageenan in their diets, especially in the first trimester, when potentially impacted cell development and differentiation could lead to many birth defects such as holoprosencephaly and other cephalic disorders.

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