A Study of the Effects of Transplantation of Tissue from Planarian Flatworms Conditioned with Light-Shock Therapy into Naïve Planarian Flatworms

Sherry, Chloe

Planarian flatworms are again gaining notoriety as creatures useful for scientific research. Through the use of stem cells, these worms regenerate lost tissue and repair structural damage. Planaria can be classically conditioned with a light-shock program that results in worms reacting to a light stimulus as if it were an electric shock. It has also been hypothesized that learned behavior might be transferred between worms through tissue transplant, without the need for recipient conditioning. In this investigation, a novel method of tissue transplantation was utilized to study behavior transfer between donor and recipient worms. Planaria, in groups of 6, were conditioned with light-shock stimuli for 0 (control), 2, and 4 days. Conditioning efficacy was measured. Tissue was then transplanted, via aspiration and injection, into corresponding groups of naïve worms. After 7 days, the recipient worms were evaluated for response to light stimulation. In the donor group, worms conditioned for 4 days had a significantly greater light stimulus response vs. the 2-day group (95.8% vs. 75.0%; $p < 0.03$). In the recipient group, recipients from the 2-day donors had a significantly greater light stimulus response than those in the control group (50.8% vs. 2.5%; $p < 0.001$), as did recipients from the 4-day donors (65.8% vs. 2.5%; $p < 0.0001$). The difference in the light stimulus response between recipients from the 2-day and 4-day donors was not significant (50.8% vs. 65.8%; $p > 0.05$). Conclusion: Light-shock stimulation of planaria successfully produces a predictable change in behavior. This behavior can be successfully transferred to naïve worms via a novel aspiration-injection technique. The underlying mechanism of behavior transfer should be the subject of further study.

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