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WOUND HEALING IN A SPACE ANALOG ENVIRONMENT

Abstract

Long duration exploration missions include increased medical risks to crew and may even require more extensive medical intervention. Injuries are inevitable and their chances increase during long duration missions. Potential physiological stressors in the space environment include microgravity and radiation, as well as reduced exposure to magnetic field. To prepare for possible injuries, it is important to understand how wound healing progresses in the space environment. Radiation and microgravity studies of growth and regeneration have been conducted, but little research has been published on possible effects of low magnetic field environments. We have focused our research on the seldom-studied reduced magnetic field environment aspect of spaceflight missions. In an effort to better understand wound healing in reduced magnetic field environments, we chose to use a well-established model of wound healing and growth, the planarian.

In *Girardia tigrina*, we conducted a series of regeneration experiments according to well-documented methods. Each of the worms were sectioned into three segments, above and below the pharynx, creating a head, body, and tail segment. We measured survival and new tissue growth over the 15 days needed for complete regeneration. Two groups were studied, one exposed to a low magnetic field environment, inside a custom-made mu-metal chamber (2μT, 2 hours daily), and the other, a sham exposure in a similar container with no effect on magnetic field (45μT). In 23% of the low magnetic field exposed- animals, we saw complete survival of all segments throughout the experiment compared to 42% of the control group. In the experimental group, 31% of the head segments, 54% of bodies and 54% of the tails survived compared to control group where 59% of the heads, 67% of bodies and 84% of the tails survived. This left only 18 segments that regenerated into flatworms with a head, middle and tail, in the experimental group, and 25 segments in the control group that regenerated fully. Regeneration rate analysis is currently underway. Findings from the experiment illustrate that the *G. tigrina* exposed to space-like low magnetic field conditions exhibited reduced survival compared to the control group.

Our results are consistent with others that show reduced magnetic fields may influence the way that stem cells multiply, and in turn, delay regeneration. Since mammals, including humans, use many of the same biochemical pathways for wound healing and growth, there are implications for astronauts during deep space missions.