P-28

Effects of ionizing radiation on pharyngeal pumping in *Caenorhabditis elegans*

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To investigate the effects of ionizing radiation (IR) on vital functions such as learning/memory and volitional/nonvolitional movement is important for understanding the risk of manned space flight or the side-effects of radiation therapy. *Caenorhabditis elegans* is a good "*in vivo*" model system to examine radiobiological effects. Recently, we found that locomotion caused by body-wall muscles was reduced in a dose-dependent manner after γ-ray irradiation and that the locomotion was eventually restored. However, it is not known whether the same effects are observed in other types of movements in *C. elegans*. The combination of muscles and motoneurons used for locomotion is different from that used for the other movements such as chewing and swallowing (pumping motion). Therefore, to examine radiation effects on different types of movements might help to clarify the IR-affected regions among muscles and the nervous system. Here, we examine the radiation effects on pumping of pharyngeal muscles.

In the experiments, 50 or more well-fed adult animals were placed on an agar dish with a bacterial lawn (food) and irradiated with a graded dose (300, 500, and 1000 Gy) of 60Co γ rays. Pharyngeal pumping in 4 or more animals was recorded using a high speed camera at every 2 h from 0 h to 8 h after irradiation. The number of times of fast pharyngeal pumping was counted using 60 continuous recording images of 1 s.

Interestingly, irradiated animals were classified into 2 groups. One group stopped pumping immediately after irradiation and the other showed normal pumping activity. This tendency of the 2 groups was distinctly different from that of locomotion using body-wall muscles, wherein the motility of the irradiated animals reduced in the normal distribution wholly in a dose-dependent manner. In addition, the pumping activity was completely restored within 2 h and the restoration rate was higher than that of locomotion. These results indicate that the whole body irradiation reduced the pumping and locomotion in a different way, but both movements were restored within several hours. Our findings suggest the existence of multiple action mechanisms of radiation effects on *C. elegans*'s motility.