Iron Ladies – How desiccated asexual rotifer species deal with high dose Fe irradiation?

Cécile Bopp[1], Boris Hespeels[2], Véronique Baumlé[2], Lucie Bruneau[2], Bjorn Baselet[3], Marjan Moreels[3], Ralf Moeller[4], Anne-Catherine Heuskin[1], Sarah Baatout[3], Stephane Lucas[1], and Karine Van Doninck[2]

(1) Research Centre for the Physics of Matter and Radiation (PMR), University of Namur, Namur, Belgium
(2) URBE, Laboratory of Evolutionary Genetics and Ecology, University of Namur, Namur, Belgium Namur
(3) Radiobiology Unit, Molecular and Cellular Biology Expert Group, Institute for Environment, Health and Safety, SCK-CEN, Mol, Belgium
(4) Space Microbiology Research Group, German Aerospace Center DLR, Köln Germany

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Abstract:
Bdelloid rotifers are one of the smallest animals on earth. Living all over the world, mostly in semi-terrestrial environments, they appear to be extremely stress tolerant. Their desiccation tolerance at any stage of their life cycle is known to confer tolerance to a variety of stresses including high doses of radiation and freezing. Like bacteria Deinococcus radiodurans, bdelloid rotifers appear to survive such extreme conditions because of efficient antioxidants and DNA repair mechanisms. In addition, they constitute a major scandal in evolutionary biology due to the putative absence of sexual reproduction for at least 60 million years.

Space exposure experiments from the last fifteen years have unexpectedly shown that several terrestrial organisms, including some multi -cellular species, are able to survive in open space without protection. The proven robustness of bdelloids suggests that these tiny creatures can possibly be added to the still restricted list of 'cosmophile' animals. Experiments on rotifers with their unique characteristics may contribute significantly to our understanding of living in extreme environments. The RISE (Rotifer In SpacE) experiment is an astrobiology study aimed at identifying and quantifying biological damage suffered by rotifers when exposed to the space environment. Through this project, bdelloid rotifers will be exposed to space environment, a combination of full-spectrum electromagnetic radiation from the Sun, cosmic particle radiation, vacuum, wide temperature fluctuations and microgravity. This research aims to determine limits and consequences of bdelloids extreme resistance to radiation.

Iron is one of the major cosmic particle founded by samples exposed to space environment. In the context of the StarLife project, desiccated bdelloid rotifers from two different species were exposed to increasing dose of irons particles (up to 2000 Gy). Results highlighted a resistance of bdelloids up to 2000Gy of iron particules and a capacity to produce viable offsprings up to 500Gy. The impact of irradiations on genomic structure of irradiated animals and genomic consequences on offspring are discussed.