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Ignicoccus hospitalis: a polyextremophilic microorganism with unusual high radiation tolerance

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Ignicoccus hospitalis´ tolerance to ionizing and non-ionizing radiation has been studied extensively, and the DNA damages were visualized on a molecular level.
Ignicoccus species, strictly anaerobic, hyperthermophilic ($T_{opt.}$ 90°C), chemolithoautotrophic, were found in deep-sea hydrothermal vents, and belong to the phylogenetically deep-branching crenarchaeal phylum. In this study *I. hospitalis* has been characterized in respect to its tolerance towards non-ionizing and ionizing radiation. High fluences (1000 J/m^2) of monochromatic UV-C (254 nm) led to a reduction in survivability of 2 to 3 orders of magnitude. Focusing on ionizing radiation, *I. hospitalis* showed a strong X-ray tolerance, although never exposed to it in the natural habitat. Cells survived an exposure with up to 24 kGy. This tolerance gives first hints on highly effective DNA repair mechanisms for maintaining DNA integrity in life-hostile terrestrial environments. Up to now, little is known of the repair genes and mechanisms which are active in *I. hospitalis*. DNA damages caused by X-ray irradiation were analyzed using agarose gel electrophoresis: increasing X-ray doses led to increased DNA damages in terms of strand breaks. PCR-based assays like RAPD analysis (randomly amplified polymorphic DNA) qualitatively confirmed changes in the genomic DNA after irradiation treatment. Irradiated cells showed different band patterns compared to non-treated cells.
Future experiments will focus to uncover unknown genes involved in DNA repair and their underlying repair mechanism. In addition, it will be interesting to investigate whether repair mechanisms involved in the repair of damages induced by radiation are also used for repairing DNA damage caused by other environmental factors.