UV-C radiation induces nucleoid remodeling and major changes in HU dynamics in the radiation resistant bacterium *Deinococcus radiodurans*.

Pierre Vauclare[1†], Jip Wulffele[1†], Françoise Lacroix[1], Pascale Servant[2], Fabrice Confalonieri[2], Jean-Philippe Kleman[1], Dominique Bourgeois[1*] and Joanna Timmins[1*].

[1]Univ. Grenoble Alpes, CNRS, CEA, IBS, F-38000 Grenoble, France

[2]Université Paris-Saclay, CEA, CNRS, Institute for Integrative Biology of the Cell (I2BC), 91198, Gif-sur-Yvette, France

pierre.vauclare@ibs.f

Ultraviolet-C (UV-C) light, covering wavelengths from 100 to 280 nm, is considered the most lethal form of radiation in space. UV-C profoundly affects all living organisms on Earth's surface by inducing several cytotoxic DNA lesions, leading to irreversibly compromised cell survival [1]. However, *Deinococcus radiodurans*, one of the most radioresistant bacterium on earth, has developed exceptional tolerance to UV-C radiation[2]. To withstand DNA lesions produced by UV-C radiation, this fascinating non-pathogenic bacterium has developed a wide range of strategies, one of which is the rapid large-scale reorganization of its nucleoid using a small number of nucleoid-associated proteins (NAPs)[3,4]. These small basic proteins bind to DNA and are believed to play a major role in DNA organization through the remodeling of genome architecture[5,6]. Here, we examined the changes in nucleoid morphology and compaction induced by exposure to UV-C light using both single-molecule and conventional fluorescence microscopy. We also characterized the associated changes in the abundance and dynamics of the major NAP in *D. radiodurans*, known as the HU protein[5,7]. Our findings highlight the complexity of nucleoid remodeling processes triggered by hostile environments and their intricate relationship with the exceptional radioresistance properties of *D. radiodurans*.

References

(1) Cadet, J.; Richard Wagner, J. DNA Base Damage by Reactive Oxygen Species, Oxidizing Agents, and UV Radiation. *Cold Spring Harbor Perspectives in Biology* **2013**, *5* (2). https://doi.org/10.1101/cshperspect.a012559.

(2) Blasius, M.; Sommer, S.; Hübscher, U. Deinococcus Radiodurans: What Belongs to the Survival Kit? *Critical Reviews in Biochemistry and Molecular Biology* **2008**, *43* (3), 221–238. https://doi.org/10.1080/10409230802122274.

(3) Timmins, J. *DNA Repair in Deinococcus Radiodurans*. http://hal.univ-grenoble-alpes.fr/tel-01301831.

(4) Floc'h, K.; Lacroix, F.; Servant, P.; Wong, Y. S.; Kleman, J. P.; Bourgeois, D.; Timmins, J. Cell Morphology and Nucleoid Dynamics in Dividing Deinococcus Radiodurans. *Nature Communications* **2019**, *10* (1). https://doi.org/10.1038/s41467-019-11725-5.

(5) de la Tour, C. B.; Passot, F. M.; Toueille, M.; Mirabella, B.; Guérin, P.; Blanchard, L.; Servant, P.; de Groot, A.; Sommer, S.; Armengaud, J. Comparative Proteomics Reveals Key Proteins Recruited at the Nucleoid of Deinococcus after Irradiation-Induced DNA Damage. *Proteomics* **2013**, *13* (23–24), 3457–3469. https://doi.org/10.1002/pmic.201300249.

(6) Chen, Z.; Tang, Y.; Hua, Y.; Zhao, Y. Structural Features and Functional Implications of Proteins Enabling the Robustness of Deinococcus Radiodurans. *Computational and Structural Biotechnology Journal* **2020**, *18*, 2810–2817. https://doi.org/10.1016/j.csbj.2020.09.036.

(7) Stojkova, P.; Spidlova, P.; Lenco, J.; Rehulkova, H.; Kratka, L.; Stulik, J. HU Protein Is Involved in Intracellular Growth and Full Virulence of *Francisella Tularensis*. *Virulence* **2018**, *9* (1), 754–770. https://doi.org/10.1080/21505594.2018.1441588.