

## Challenges in radiobiology research with heavy ion beam in Poland

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Research in radiation biology develops knowledge about the effects of radiation in cells, tissues, organs and organisms. Discoveries and fundamental biological insights realized through these studies has led, for example, to innovation and progress in radiation oncology [1].

In radiobiology cellular experiments with broad ion beam, regardless of its horizontal [2] or vertical orientation [3], the number of ion tracks registered in individual cell varies over the population of cells due to Poisson distribution. It is a serious problem for high-LET ions, where at low doses the fraction of cells in which no ion track was registered can be very high. To overcome the problem and target single cell with a predefined number of particles the microbeams were designed in the last decade of the past century [4].

Today ion microbeams are important tools in radiobiological research. These facilities provide unique features to study targeted and non-targeted radiation response as well as radiation-induced DNA damage and repair. There is a growing interest of using charged-particles to generate highly localized DNA damage since they offer the advantage of a well characterized dosimetry and a better understanding of the physical and biochemical processes of damage induction in comparison to the laser microirradiation commonly used in the DNA repair community [5]. Unfortunately, the worldwide number of ion microbeam facilities where biological experiments can be performed is limited. Even fewer facilities combine ion microirradiation with fluorescent labelling and advanced fluorescence microscopy, allowing for online observation of cellular response reaction starting very fast after irradiation [6].

Currently in Poland there are only two radiobiological facilities with ion beams: Ion microbeam at the van de Graaf accelerator (The Henryk Niewodniczanski Institute of Nuclear Physics Polish Academy of Sciences, Kraków) [7], and the Warsaw cyclotron facility with a horizontal broad ion beam (Heavy Ion Laboratory at University of Warsaw, Warszawa) [8]. During the talk a possibilities of construction a new radiobiology facility and new research perspectives at HIL will be presented.

### Bibliography

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