

Ionising Radiation and Cell Membranes

Tuesday, 3 December 2019 11:30 (15 minutes)

Living matter is exposed many forms of radiation from both natural and artificial sources. Broadly speaking these can be classified as either non-Ionising or Ionising, depending on whether the radiation is sufficiently energetic to induce an ionisation event in an atom or molecule. It is recognised that the interaction of ionising radiation (IR) with biological matter can be beneficial, for therapeutic or diagnostic applications, or potentially harmful from uncontrolled or unexpected exposure. IR generates reactive oxygen species via the ionization of water leading to the oxidation of macromolecules such as proteins, DNA and lipids damaging biological systems.¹ Gamma radiation is an example of IR and materials can be dosed with high precision at GATRI (ANSTO). For instance, studies have been undertaken on Fibroblast cells irradiated at the GATRI facility (R. M. & G-J. L.) where radiation induced DNA damage and cell death pathways were assessed to determine radiosensitivity. However, to have a better understanding of how cells respond to radiation we would like to determine the impact of radiation on cellular components such as membranes.

To reduce biological complexity, we have studied simplified systems, the lipids in isolation and membranes containing both lipid and cholesterol. These model cell membranes have been studied as planar films by Neutron Reflectometry and Electrical Impedance Spectroscopy (EIS) and in vesicle form by Small Angle Scattering. The neutron scattering experiments yield structural information while the EIS is an extremely sensitive probe of ion transport across the membrane. These experiments have demonstrated delayed damage onset, as seen in living cells.

References.

1. Betlazar, C. et al. Redox Biology 9 (2016): 144–156.

Level of Expertise

Expert

Do you wish to take part in the poster slam

No

Travel Funding

No

Speakers Gender

Male

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Session Classification: Session 14

Track Classification: Structural biology and biological systems