RADAM Conference

RADIATION DAMAGE IN BIOMOLECULAR SYSTEMS

24 - 27th June 2004
LYON, FRANCE

SCIENTIFIC REPORT

More than one hundred scientists were in Lyon for the first conference organised by the P9 COST action. The scientific programme consisted of a plenary lecture, a poster session, and invited talks relevant to the five working groups (WGs):

- Electron and biomolecular interactions
- Ions and biomolecular interactions
- Radiation in physiological environments
- Theoretical developments for radiation damage
- Track structure in cells

Participants were invited to present posters in fields related to the main objective of this COST action: "… to obtain a detailed understanding of the fundamental interaction processes initiated by the deposition of radiative energy which can cause damage to biological material…"

The understanding of the effects of electrons upon biomolecules, most notably at very low energies, is advancing significantly. Several groups are carrying out research in this subject using experimental systems which feature new and innovative technologies. Closer association is developing between the electron-impact studies of gas phase molecules (including the four DNA bases) and those carried out upon plasmid DNA.

Studies upon the interactions between ions and biomolecules in the gas phase demonstrate the capacity to provide new and quantitative information which is essential to understand the initial steps in radiation-induced damaging processes. The experiments draw upon multi-coincidence techniques in order to characterise these preliminary interactions and quantify their potentially damaging effects. Important and original work is also being carried out upon the effects of UV radiation upon gas phase biomolecules.

The objectives of the groups specialising in theoretical Chemistry relate to the characterisation of elementary processes and quantum effects initiated by the irradiation of biomolecules. Faced with the difficulties in describing *large systems* with the necessary precision, new developments in quantum chemistry are opening perspectives for the calculation and perhaps even the control of the branching ratios for photodissociation and transfer reactions (electrons, protons and hydrogen atoms).

The study of radiation in physiological environments covers a broad field of research: from the irradiation of nucleotides in solution compared with the gas phase, to the investigation of radiative damage upon cells. New developments related in particular to targeted radiation on the cellular (or even intra-cellular) scale and the application of micro-beams.

The description of track structure in cells introduces problems on different scales: Physical-chemical stages, damage to DNA, intra- and inter-cellular communication, and the characterisation of links between chromosome aberration and pathology. The presentations made by WG5 thus served to highlight the key questions raised and the importance of targeting the specific objectives of the Action

in order to maximise the value of the scientific progress made by each of the working groups. From this perspective, it is clear that the network is engaged in research pertinent to the deposition of energy on the molecular scale and the resultant processes for biomolecular damage. Groups 3 and 5 also focus upon questions related to the reparation of damage as well as the role of intercellular communication.

The first RADAM conference brought together researchers with a common interest in the development of the P9 action. The extensive programme of oral presentations allied to the poster announcement session enabled participants to gain a broad understanding of the current contribution and potential of the various groups involved in this diverse and emerging field. The success of the conference has provided a new impetus for the development of inter-disciplinary collaborations and coherent projects to achieve the research objectives of the network.

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