

Biomedical and Eco-toxicological Studies

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Objectives

The ion beam laboratory of ITN runs several collaborations with other institutions in the field of medicine, biology and biochemistry. The main research activities focus the morphological characterisation of biological tissues. In particular the determination of trace elements distribution together with other biochemical markers are related with physiology, redox equilibrium and inflammation.

Results

Medical Studies

Most of the work performed was carried out under running projects that recently started, besides the Spain/Portugal cooperation project established between CAN of Seville and ITN. The study of allelic profiles for specific proteins and systemic markers for inflammation and for antioxidative capacity in human pathological conditions are being related with clinical data in Chronic Obstructive Pulmonary Disease (Project FCG/SDH.IC.I.01.22 /2001-2004) and in atherosclerosis (Project POCTI /ESP/41008/2001-2004). Apart the grants provided to two graduated students and to a PhD student, two BsC. in Biology and one PhD. in Physics were accomplished. Results have been presented in international conferences and submitted for publication.

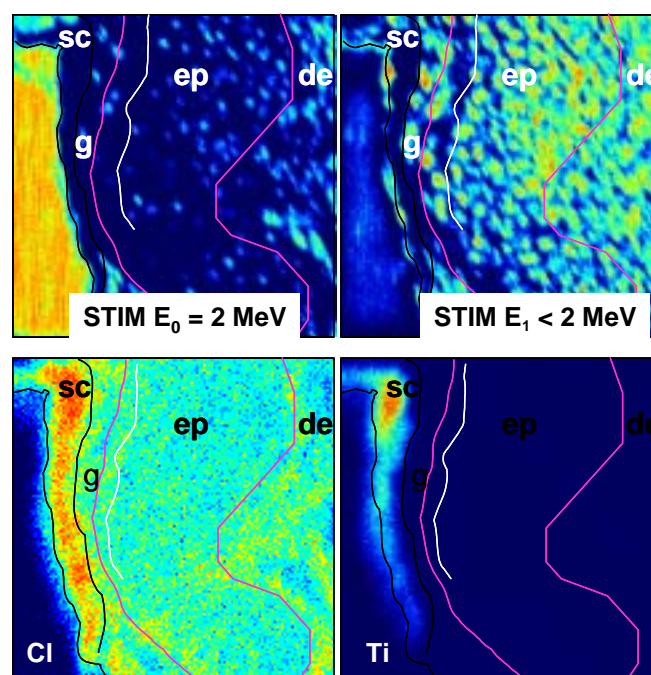
Under the contract EC/QLK4-CT-2002-02678 (Nanoderm Project) the human skin permeability to nanoparticles of Ti and Zn used as UV shields, in commercial sunscreens formulations, is being studied. Efforts on developing methodologies and on establishing validation protocols for nuclear microscopy techniques were made during 2003. Inter-laboratory tests for the Ti quantification in thin cryosections were carried out and protocols for the application of sunscreen formulations and penetration determination were developed. The major achievements relate to the identification of skin layers using Scanning Transmission Ion Microscopy (STIM). Skin layers identification would be crucial to determine how deep Ti or Zn nanoparticles can penetrate in skin and to start to evaluate the risks of long-term exposure to these particles. Cross-linking this information with optical microscopy and elemental mapping data, as illustrated in Fig. 1., the penetration of particles can be assessed.

Ecotoxicological Studies

The study of bioavailability of lead in small mammals is carried out at mine-contaminated areas in Alentejo (project POCTI/BFE/3991/2001-2004). The project includes a PhD. programme of study in Biology. Aside, a BsC. thesis was performed using the wild

rabbit as sentinel for metal pollution. First results of the project were presented at international conferences and are being prepared for publication.

Fig. 2. Section of skin exposed to sunscreen formulation. Keratinocyte cells can be identified through STIM images with detail. Different cell layers of skin can be defined: the first line of cells (pink line - g) after stratum corneum (sc), the second (white line), and so on. The epidermis (ep) and dermis (de) regions can be identified both from STIM and elemental distribution images (e.g. Cl). Ti is apparently confined to stratum corneum.



Published, accepted or in press work

1. M.C. Santos et al., Systemic markers of redox balance in Chronic Obstructive Pulmonary Disease, submitted to Eur. Resp. J.
2. M.D. Ynsa, et al. Effect of Hormone Replacement Therapy on the Elemental Contents of Uterus Tissue, submitted to Biol. Trace Elem. Res.

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