

## The biomedical programme of the Centre for Ion Beam Applications (CIBA)

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The biomedical programme at CIBA has expanded considerably over the last few years, using both the nuclear microscopy and the proton beam writing facilities. This programme will be briefly described:

a) *Degenerative diseases*: We are using the techniques of nuclear microscopy (PIXE, RBS and STIM) in an ongoing programme on degenerative diseases (Atherosclerosis, Parkinson's disease and Alzheimers disease), concentrating on the role of trace elements and in particular unregulated iron as a catalytic mediator of free radical damage in these diseases. Recently the emphasis has also included the beneficial role of zinc to reverse this free radical damage, and some of our latest results will be presented.

b) *Hard tissue characterization*: The large cross section of the  $^{19}\text{F}$  ( $p,\alpha\gamma$ ) reaction allows the quantitative fluorine trace analysis in Ca rich environments (eg teeth), a difficult task for other methods. We now can routinely focus a 1nA beam into one micron spot size allowing the lateral measurement of fluorine at a scale consistent with structural dimensions found in teeth. We are using this method to investigate modifications in the F uptake induced by laser irradiation techniques.

c) *Tissue engineering*: Cells respond to the physical environment by shape change and a change in motility. The motility of cells placed on a series of proton beam micromachined 3D ridges have been measured and compared with the motility of cells on a plain surface. The measurement of RNA of cells that are physically confined on a ridge structure requires the harvesting of many cells from large area 3D microsubstrates. Proton beam fabrication of metallic microstamps can be used to micro-imprint precise and large area 3D micro-substrates.

d) *Lab-on-a-chip technology*: The proton beam writing facility is now being used to fabricate polymer lab-on-a-chip systems for DNA, protein and cell separation. Preliminary results of these systems will be described.