

OPTICAL TRAPPING OF SMART NANOBLOBS FOR TARGETED NANODIGESTION OF INTRACELLULAR MEMBRANE PROTEINS

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KEY WORDS: Optical tweezers, optical trapping, nanoblobs, nanodigestion, microfluidics, cell migration, cell polarisation.

Localised protein distribution and cell polarisation are important features of cell migration that in turn drive processes such as organogenesis and cancer metastasis. However, in order to quantify and analyse these proteins properly it is necessary to develop some means of *in situ* protein extraction.

To this end we have developed a Smart Nanoblob technology, designed for targeted nanodigestion of intra- and extra-cellular membrane proteins, e.g. Ras-GFP involved in cancer signalling pathways.

The nanoblobs, see figure 1 (a), comprise of a hydrophobic and high refractive index cyclohexane core, that can be easily trapped and manipulated by optical tweezers, surrounded by a chemically active component such as the commonly used amphiphilic protein detergent, Triton-X100. This structure is formed as a nano- or micro-emulsion by sonication of the two components in water.

We show that a convenient platform for this biotechnology is microfluidics manufactured from Polydimethylsiloxane (PDMS). The microfluidic chip permits constant delivery of nanoblobs, which can then be optically selected and steered to a cell culture chamber for targeted nanodigestion as shown in figure 1 (b). After maintaining contact with a Ras-GFP labelled cell for 5 minutes, the nanoblob is withdrawn and can clearly be seen to have removed and stored an amount of the GFP-tagged protein from the cell.

In future we believe that this technology will be a powerful tool for the targeted extraction of localised proteins important in migrating cancer cells.

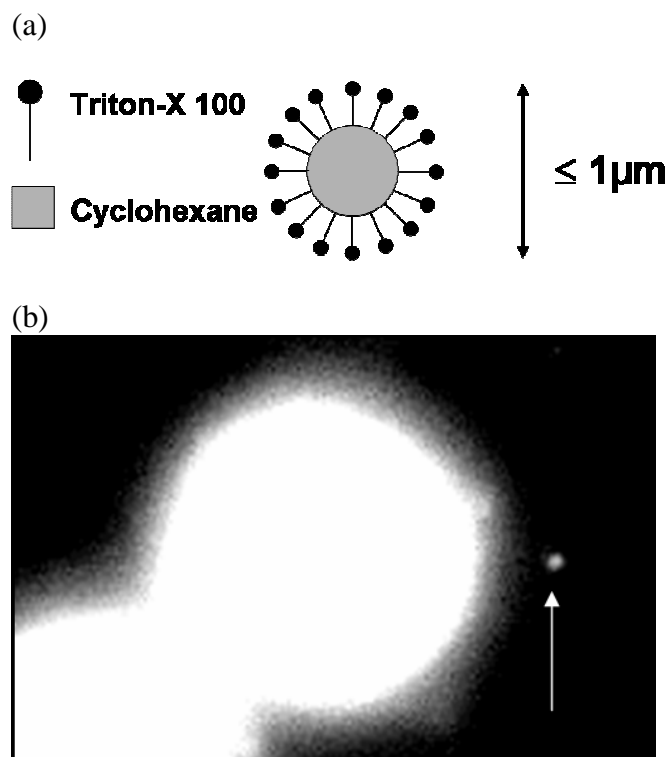


Figure 1. (a) Schematic of smart nanoblobs used for nanodigestion.

(b) Fluorescence image showing optically trapped smart nanoblob nanodigestion (arrow), of Ras-GFP after 5mins incubation with cancer cell on left.