Equipment Name: High Content Analysis **Cellomics Arrayscan VTI 640**	**Category:** **D. In-vitro toxicity studies** **Institute:** University College Dublin **Location:** Centre for BioNano Interactions, Conway Institute, University College Dublin, Belfield, Dublin4, Ireland **Contact Details of Technology Expert:** **Name:** Dr. Sergio Anguissola **Phone: +353 1 716 2418** **Fax:** **E-mail:** sergio.anguissola@cbni.ucd.ie

Short technology description/Overview:

The Thermo Scientific Cellomics ArrayScan VTI allows high capacity, automated fluorescence imaging, and quantitative cellular analysis of both fixed and live cells. The instrument in UCD features optics by Carl Zeiss®, a broad spectrum white-light source coupled to excitation and emission filters, a 12-bit cooled CCD camera, and integrated acquisition and analysis software.

Experiments can be designed to probe a number of cellular indicators simultaneously (membrane integrity, nuclear size and shape, lysosomal size and pH, ROS production etc.), as well as to screen uptake, localisation and impacts of a range of nanoparticles (depending on the detection mode) or of selected nanoparticles on a range of different cells types, in both time and particle concentration dependent manners.

In all cases, the quality of the nanoparticle dispersion, and the quality of the label (detection mode) on the particles is essential to the successful outcome of the experiments, so advise on these aspects should be sought from the Technology expert when planning your experiments.

Main Features (Equipment Capabilities):

General

- Arrayscan VTI HCS Reader, modular, multi-mode High Content Screening instrument
- Microscope optics by Carl Zeiss
- Fully automated and software controlled
- Compatible with samples in SBS-compliant microwell plates and microscope slides
- Camera: 12 bit, 1344 x 1024 pixels, thermoelectrically cooled, Pixel size: 6.45 µm x 6.45 µm
- Field of view: 1.3 mm x 1.3 mm with 5x objective
- Excitation Wavelength: 350nm – 700nm
- Optics: Range of filters for all common flurophores

ArrayScan VTI Modules in the UCD system

ApoTome™ Optical Sectioning Device

- Grating Imager
- Reduces background fluorescence and removes out of focus light
- Enables fine structure elucidation

Live Cell Module

- Full control of temperature (Ambient to 45°C), CO_2 (0-10%) and added humidity (>90% relative humidity) to maintain optimal cell health
- Proprietary cell tracking algorithm allows for both motility and kinetic measurements at the cell and well level
- Cell movement can be monitored over seconds, minutes, hours or days

Brightfield Module

- Enables label-free analysis
- A brightfield illuminator with a white light LED to visualize and capture non-fluorescent images
- Focus, analyze and overlay brightfield and fluorescent images

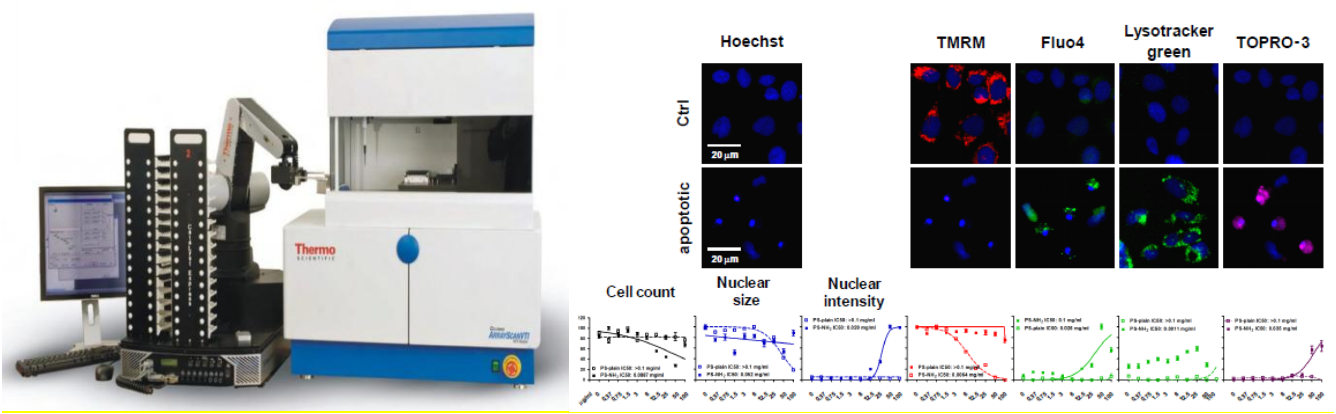
Liquid Handling Module

- Single channel full function pipetting

Issues to consider when designing a TA experiment:

- Fluorophors of nanoparticle and assay should not interfere with one another or overlap
- There should be no interaction of the assay label with the test nanoparticles
- Dispersion protocol for nanomaterials should not be toxic to cells
- If comparing across cell lines, cell culture media and conditions should be identical where possible, or where not possible, appropriate control steps must be built into the experimental protocol to allow cross-comparison of data.

Typical Samples & Images:



Key references:

- Mohamed BM, Verma NK, Prina-Mello A, Williams Y, Davies AM, Bakos G, Tormey L, Edwards C, Hanrahan J, Salvati A, Lynch I, Dawson K, Kelleher D, Volkov Y. Activation of stress-related signalling pathway in human

cells upon SiO_2 nanoparticles exposure as an early indicator of cytotoxicity. J Nanobiotechnology. 2011, 9, 29.

- Long A., Volkov Y. High Content Analysis approach for targeted gene silencing and probing nanoscale cell responses. European Pharmaceutical Reviews. 2009, (1):22-30.

Any further Information:

QNano partner Trinity College Dublin (TCD) has a well established HCA facility that offers access to 3 instruments and to automated cell seeding and drug/nanoparticles application on cells, together with high throughput software analysis. The facility in UCD offers the possibility to analyse a higher number of parameters in the same assay.

Joint access to both facilities may be envisaged.

Access to UCD's HCA facility can also be coupled to a access to flow cytometry or confocal microscopy.