CASE STUDY:

PROTEOMICS

CORE TECHNOLOGIES
at UCD Conway Institute

Research Question

How do nanoparticles interact with living systems? What is the role played by the interface between the nanoparticle and the surrounding biofluid? How does this protein and biomolecule corona determine the fate and behaviour of the nanomaterials in living systems?

Our Approach

By adapting existing proteomics approaches and developing new methods, we assess, identify and quantify the proteins that selectively bind to nanoparticles from biological fluids and begin to tease out the implications of these bound proteins for determining nanoparticle fate and behaviour in living systems.
In particular, where low abundance proteins are selectively concentrated on nanoparticle surfaces, or where known transporter proteins are bound to the nanoparticles, it is vital to understand the implications of these proteins for nanoparticle uptake, localisation and impacts *in vitro* and *in vivo*.

Resulting Publication

Monopoli M.P et al. Physical-chemical Aspects of Protein Corona: relevance to in vitro and in vivo biological impacts of nanoparticles. Journal American Chemical Society, 2011, 133, 2525-2534.

'The support of Giuliano and his team has been a crucial factor in the success of the CBNI in terms of the development and optimisation of mass spectrometry approaches for understanding, characterising and quantifying the proteins bound to nanoparticles via the nanoparticle protein corona.'

Professor Kenneth Dawson
UCD Centre for BioNano Interactions (CBNI)

Dr Marco Monopoli
postdoctoral fellow

CASE STUDY:

PROTEOMICS

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Research Question

Can we characterise endogenous protein complexes and posttranslational protein modifications in human platelets?

Our Approach

Our research focus is on characterising signalling networks in human platelets. In this context, we wanted to elucidate the identity of an unknown protein that appeared in Western blots of prostacyclin and nitric oxide treated platelets. With the help of the mass spectrometry resource, we have been able to identify this protein as a new regulator of G-protein signalling. This discovery has opened up a whole new research field for our group.

Resulting Publication

Gegenbauer et al. Regulator of G-protein signalling 18 integrates activating and inhibitory signalling in platelets. Prepublished online as Blood First Edition paper, Jan 10 2012; DOI 10.1182/blood-2011-11-390369

'The mass spectrometry resource has been crucial for the success of our project. High quality data has been obtained throughout. The expertise and continuous support of the mass spectrometry team have been extremely helpful.'

Dr Albert Smolenski
UCD

CASE STUDY:

PROTEOMICS

CORE TECHNOLOGIES
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Research Question

Can we identify trace amounts of protein that stimulate cell migration?

Our Approach

Cell migration holds the balance between health and disease through processes such as wound healing, immune response, and embryo development. We wanted to identity the active components of a potent stimulator of migration - the secreted proteins of platelets - by correlating protein fractions with activity in a bioassay. Platelets are difficult to work with, and only very small amounts of protein were available for analysis after the bioassay. However, through the use of cation exchange fractionation and highly sensitive nano-electrospray mass spectrometry, we were able to narrow the list of candidates from more than 300 down to three proteins.

Resulting Publication

O'Connor R et al. (2010) Proteomics strategy for identifying candidate bioactive proteins in complex mixtures: application to the platelet releasate. J Biomed Biotechnol 2010;2010:107859

'Our attempt to map protein function in a delicate biofluid was a major challenge but the Core staff designed a configuration that gave us the sensitivity we needed. The hardware in the MSR is world class, but it is the problem solving skills of the staff that makes the difference.'

Dr Gerard Cagney
UCD

CORE TECHNOLOGY:

PROTEOMICS

OUR EXPERTISE:

Offering proteomics solutions to academic and commercial clients in a customisable range of services at each stage of the research pathway; from experimental design to final publication.

WHO TO CONTACT:

Dr Giuliano Elia

Director, Proteomics Core

T: (+353-1) 716 6986

E: giuliano.elia@ucd.ie

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Register your interest here:
http://conway.ucd.ie/coretech