NANO WORLD CANCER DAY 2016

Sponsors and Organisers

With special thanks to the University of Liverpool for making its facilities available for Nano World Cancer Day 2016

AGENDA

February 2, 2016

The University of Liverpool in London, 33 Finsbury Square, EC2A 1AG, London

13.30 - 13.45	Registration and networking
13.45 - 14.00	Welcome and introduction to the day
14.00 - 15.05	Session: Cancer diagnosis
15.05 - 15.25	Tea break
15.25 - 16.30	Session: Targeted therapeutics
16.30 - 17.00	Panel: The future of nanotechnology in cancer treatment
17.00 - 17.10	Closing remarks
17.10 - 18.00	Reception and networking

Nanomedicine is nanotechnology applied to innovation in healthcare. It impacts virtually all therapeutic areas, including oncology, cardiovascular diseases and neurologic disorders. With approximately 50 nanomedicine products already on the market and 200 more undergoing clinical trials, nanomedicine is already showing its benefits to patients.

The most active and promising area of nanomedicine research is cancer. Cancer is targeted by 31% of the nanomedicine products under clinical trials which have been developed for diagnostics, treatment and monitoring of patients.

Today's 3rd edition of the Nano World Cancer Day (NWCD) is taking place simultaneously in 12 countries including Austria, Czech Republic, Finland, France, Germany, Greece, Italy, Ireland, Luxembourg, Netherlands, Norway, Portugal, and the United Kingdom.

CANCER DIAGNOSIS

Billy Boyle, Co-founder, Owlstone Medical
(available for interviews)

"Nanotechnology is enabling sensors for early detection of cancer when more lives can be saved."

Background

Owlstone Medical has developed a cancer breathalyzer. Medical researchers are increasingly finding that specific chemical compounds are present in the breath or bodily fluids of people suffering from various medical conditions, such as TB, cancers or diabetes. This suggests a new way of diagnosing these diseases early, without the need for costly and invasive medical procedures, by simply testing for the presence of these tell-tale chemicals. For this to be a practical method of diagnosis, though, we not only need an extremely sensitive, accurate and fast means of identifying chemicals but also a portable, easy to use and affordable detector. This is what the Owlstone system provides.

Our Vision: Owlstone Medical will become the global leader in non-invasive diagnostics for cancer, infectious disease and inflammatory disease

Our Mission: Save 100,000 lives and save $1.5B in health care costs by 2020

Dr Maya Thanou, Kings College London
(available for interviews)

"Nanotechnology enables us to develop theranostics for cancer image guided drug delivery."

Background

Imaging can be used to support and improve drug delivery and therapy in tumours. For the last years the Thanou group at King's College London aims at developing nanoparticles for cancer image guided drug delivery. Multifunctional nanoparticles labelled for imaging (such as MRI) can detect tumours and deliver their therapeutic payload upon activation.

We have developed multimodal imaging labelled nanoparticles that respond to increased temperature by releasing their drug cargo. When these nanoparticles are detected in tumours, Focused Ultrasound is applied upon image guidance to promote acute drug release. This leads to a dramatic increase of therapeutic concentration in tumours. These "nanotheranostics" can be valuable tools in targeted drug delivery in solid tumours.

CANCER DIAGNOSIS

Dr Eric Mayes, CEO, Endomag
(available for interviews)

"Nanotechnology helps to provide the standard of care to breast cancer patients who could not otherwise access it. Magnetic nanoparticles are being used to guide surgeons in locating lymph nodes that indicate the spread of the disease."

Background

Endomag is a rapidly growing medical device company headquartered in Cambridge. Endomag was founded in 2007 as a spin-out from University College London and the University of Houston, and its first products were launched in Europe in 2012. It has since successfully treated over 10,000 breast cancer patients across 20 countries.

Endomag has developed a minimally-invasive surgical guidance system using magnetism to improve tissue localisation in surgical oncology. Its core device is called the Sentimag which consists of a handheld probe and base unit that guides surgeons to tissue of interest.

Sienna+ is a magnetic nanoparticle tracer that is injected into the body to locate lymph nodes as part of a sentinel lymph node biopsy (SLNB) procedure. Suspicious lymph nodes containing Sienna+ are located and identified by the surgeon using the Sentimag. By avoiding the traditional requirement of radioactive isotopes, Sentimag and Sienna+ improve workflow, lower costs, enhance patient comfort and quality of life, and provide a better standard of care available to everyone, everywhere.

TARGETED THERAPEUTICS

Dr Christine Dufès, University of Strathclyde
(available for interviews)

"Nanotechnology is a new promising field that has the potential to transform the way new medicines are developed for cancer treatment. It enables us to develop new 'seek and destroy' nanomedicines able to selectively target cancer cells."

Background

The possibility of using genes or natural product extracts as medicines to treat cancer is limited by the lack of delivery systems able to selectively deliver these promising drugs to tumours. In order to overcome this issue, we are currently working on developing new "seek and destroy" nanomedicines able to selectively reach the tumours after their administration in the blood circulation.

We demonstrated that the intravenous administration of a tumour-targeted dendriplex carrying a therapeutic DNA led to tumour disappearance of 90% of the tested A431 epidermoid carcinoma tumours over one month, in laboratory settings. In addition, we also devised an alternative "green "tea"rapy strategy" to deliver a green tea extract with promising anti-cancer properties specifically to the tumours. The intravenous administration of the green tea extract epigallocatechin gallate encapsulated in tumour-targeted vesicles resulted in complete disappearance of 40% of the tested tumour types, in laboratory settings. "Seek and destroy" nanomedicines are therefore highly promising strategies for cancer therapy.

TARGETED THERAPEUTICS

Dr Kathryn Hill, AstraZeneca

"Nanotechnology is a developing field that has the potential to transform challenging molecules into oncology medicines with improved efficacy and reduced side-effects and to enable the development of a whole new area of medicine in nucleic acid based drugs."

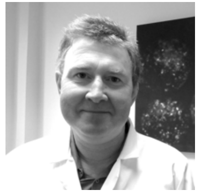
Background

AstraZeneca is a global, innovation-driven biopharmaceutical business that focuses on the discovery, development and commercialisation of prescription medicines. Oncology is a key therapy area for AstraZeneca. AstraZeneca has a deep rooted oncology heritage and a strong pipeline of next generation medicines.

Nanomedicine has the potential to transform challenging molecules into oncology medicines by:

1. Improving therapeutic index (the ratio of the highest drug exposure that is tolerated to the drug exposure that produces efficacy). Lack of therapeutic index remains one of the biggest reasons for drug failure in the Industry.
2. Enabling the intracellular delivery of nucleic acid drugs against 'intractable' targets. Approximately 70% of disease targets are intractable to traditional small molecule drugs or antibodies, and thus many new modalities are being investigated. The difference between these new modalities and previous drugs is that drug delivery is required to ensure they reach their intracellular targets.
3. Enabling successful formulation of poorly water soluble drugs.

AstraZeneca leverages the potential of advanced drug delivery through both its own innovative research and collaboration with external drug delivery companies and academic institutions.



Prof. Arwyn Tomos Jones, Membrane Traffic and Drug Delivery
Cardiff School of Pharmacy and Pharmaceutical Sciences, Cardiff University
(available for interviews)

"Treating many types of cancer is likely to need biological drugs called biopharmaceuticals. Nanotechnology gives us the opportunity to package these as nanomedicines or nanoparticles with the hope that we can deliver them to hit the inside of cancer cells."

Background

At the Cardiff School of Pharmacy and Pharmaceutical Sciences, Cardiff University we are working with industry and leading academic research groups in the UK, Europe and indeed the world to design and test biological drugs called biopharmaceuticals to treat cancer. The challenge is to get them to hit their targets inside cancer cells. This we do by packaging them inside nano-sized shuttles that are designed to target cancer cells and enter via a natural process called endocytosis. Thus we are persuading cancer cells to open their doors to these nanoparticles containing a drug that is designed to kill them.

Endocytosis is highly complex, and something that we have been studying in a number of very different cancer cell types including leukaemia, breast and brain. We have also been using agents that are part of the body's natural defence mechanism, called antibodies, to target cancer. These are highly selective and we have recently discovered a new trick for opening the endocytosis door to allow the antibody to enter breast cancer cells. The hope now is that we can use these as drug loaded nanostructures that when inside cells can release their payload to hit a target.

THE FUTURE

Mr. Christopher Halloran, Consultant Pancreato-Biliary Surgeon

Institute of Translational Medicine, University of Liverpool

(available for interviews)

"Pancreatic cancer is a devastating disease. Although advances in surgical technique along with post surgery chemotherapy have made an important impact there is still much to do. A truly personalized, theragnostic therapy is key to making a difference."

Background

Liverpool is uniquely equipped with a core of translational scientists and clinicians who have expertise in nano-technologies. My group works with colleagues in chemistry, pharmacology, imaging and cell biology in an effective multi-disciplinary approach. We have developed a self-assembled nano-hybrid with dual (antibody/magnetic) targeting capability combined with a pH-labile drug release system and the fluorophore, rhodamine, which enables particles to be visualized using fluorescent microscopy.

The cores of this hybrid are hydrophobically-modified superparamagnetic iron (II,III) oxide nanoparticles (SPION's); thus the assembled "functionalized" nano-hybrid are denoted as $_f$SPION's. We have shown that by using an externally placed magnet, gemcitabine-loaded $_f$SPIONs (**$_f$G-SPIONs**) can be guided towards specific sites of pancreatic cancer cells in culture. Once in that vicinity, an antibody to a tumour specific antigen facilitates uptake of the **$_f$G-SPION** by endocytosis. This triggers release of the chemotherapeutic drug, gemcitabine, through a pH-dependent mechanism, where the hydrophobically-modified prodrug within the core of the nanoparticle hydrolyses in response to the acid environment. This design ensures that gemcitabine predominantly becomes active following uptake by the cancer cells, avoiding toxicity to non-cancerous host tissue.

Prof. Andrew Owen, Chairman, British Society for Nanomedicine
Department of Molecular and Clinical Pharmacology, University of Liverpool
(available for interviews)

"As a registered charity (Charity number 1151497), the British Society for Nanomedicine was created to exemplify research from industry, academia, and clinicians, and our mission includes explanation of the ongoing science to facilitate public understanding of exciting developments as they impact global healthcare."

Background

Andrew Owen is a Professor in the Department of Molecular and Clinical Pharmacology at the University of Liverpool. He is also affiliated to the MRC Centre for Drug Safety Science and the Wolfson Centre for Personalised Medicine. He is Chair of the British Society for Nanomedicine, a fellow of the Royal Society of Biology, a fellow of the British Pharmacological Society and a member of the steering committee for the APS Nanomedicines Focus Group. His clinical and basic research focuses on understanding the mechanisms that underpin inter-patient variability in pharmacokinetics and pharmacodynamics. In recent years a major emphasis has been to employ knowledge of these mechanisms to accelerate the translation of nanomedicine candidates to clinical applications.

Work is supported by grants from the US Agency for International Development, US National Institutes for Health, the UK Medical Research Council, the European Commission, the UK Engineering and Physical Sciences Research Council. Professor Owen has published over 140 original research papers, review manuscripts and book chapters. He is co-inventor of patents relating to the application of nanotechnology to drug delivery and a co-founder of Tandem Nano Ltd. He is also a founder and Editor in Chief for the *Journal of Interdisciplinary Nanomedicine*.

THE FUTURE

Dr Thanos Mitrelias, Founding CEO, Cavendish NanoTherapeutics

(available for interviews)

C A V E N D I S H
NanoTherapeutics

"Nanotechnology and nanomedicine have the potential to minimise or even eliminate the serious side effects associated with traditional systemic chemotherapy."

Background

Cavendish NanoTherapeutics Ltd (CNT) is a spin off company from the Dept of Physics (Cavendish Laboratory) of the University of Cambridge and is developing medical systems based on electromagnetism and nanomagnetism aimed at increasing the efficacy of cancer treatment.

CNT's first generation system, MagTherm®, utilises non invasive treatment protocols and can increase the efficacy of chemotherapy by about 15 to 20%, mainly of breast cancer patients. CNT is developing a second generation system, NanoMagTherm®, which utilises magnetic nanocomplexes for targeted drug delivery. Preclinical animal studies indicate that NanoMagTherm® has the potential to replace systemic chemotherapy, thus minimising the side effects associated with current cancer treatment methods.

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