

Results of competition: Developing Non-Animal Technologies

Competition code: 1503_CRD2_ETECH_I_NAT2

Total available funding for this competition was £6m from Innovate UK, MRC, BBSRC, EPSRC & NC3Rs

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Asterand UK Acquisition Limited DefiniGEN University of Nottingham	Development of a human 3D in vitro model of pancreatic beta cell health	£744,698	£491,696
Project description - provided by applicants			
<p>Diabetes is a serious condition where the amount of sugar (glucose) in the blood is too high because the body either cannot produce enough of the hormone insulin or cannot use the insulin effectively. There is no known cure for diabetes, and although many treatment options are available, they often do not prevent the disabling long-term complications of the disease. In the search for new treatments, researchers are now trying to find drugs that will protect the insulin-producing (beta) cells of the pancreas. To support this research, the aim of this project is to develop a new 3D human cell-based model of pancreatic beta cell health. The model will be developed using freshly isolated human islets. The team will then investigate whether a more sustainable human cell source can be used and whether the model can be miniaturised, so more drugs can be tested in each assay. If the project is successful, it will enable the faster testing of potential new anti-diabetes drugs, and ultimately help to identify new and improved treatments for diabetes. If widely adopted, the resulting model will also reduce the number of animals currently used in diabetes research and drug discovery.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Chronos Therapeutics Ltd University of Oxford	An integrated non-vertebrate drug discovery platform for neurodegenerative disease	£856,554	£599,596
Project description - provided by applicants			
<p>With a rapidly increasing ageing population, age-related health problems (including neurological disorders such as Alzheimer's disease and Parkinson's disease) are presenting a challenge to, and burden on existing health care provision. Yet whilst such diseases represent a growing therapeutic need, their treatment is hampered both by the cost and time commitment to bring new medicines to market. Currently, two major reasons for failure of new drugs are complications associated with negative side-effects and the ethical and cost issues associated with experimentation in non-human vertebrates. Our aim is to develop a robust screening platform in a worm model of neurodegenerative disease. The screening pipeline will make it possible to test drugs for effectiveness against symptoms of neurodegenerative disease and also establish early on whether the same drugs have toxic effects; this will help to reduce failure or "attrition" of drugs at later stages of testing. Consequently, we anticipate that those drugs that do go through to trial in human subjects will offer the best likelihood of treatment success without adverse side-effects.</p>			

Participant organisation names	Project title	Proposed project costs	Proposed project grant
SimOmics Limited AstraZeneca University of York	Virtual Fish Ecotoxicology Laboratory	£995,661	£446,785
Project description - provided by applicants			

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All new active pharmaceutical ingredients must undergo an environmental risk assessment (ERA) before being authorised. Currently tens of thousands of fish are used worldwide as part of API ERAs. Development of predictive in silico models has the potential to significantly reduce animal use (3Rs) and reduce R&D costs around the ERA of pharmaceuticals. These models, when combined with recently developed in vitro bioassays, can be used to determine up front risk. Evidence based, in silico approaches that predict the movement of an API from the patient to aquatic systems and the subsequent impacts on the ecosystems. The "Virtual Fish EcoToxicology Laboratory" will be a transparent, evidence-based system of interlinked mathematical models, combined with extensive datasets, that will determine risk to both apical end-points (e.g. impacts on fish reproduction and growth) and non-apical end-points (e.g. effects on behaviour).

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Asterand UK Acquisition Ltd Sheffield Hallam University	Development of a robust and sustainable in vitro 3D model of human tumours for the identification and evaluation of anti-cancer drugs	£651,866	£465,971
Project description - provided by applicants			

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The pharmaceutical industry has relied on in vitro models of cancer using traditional cell lines and animal models for the progression of drug treatment of cancer with poor success. This failure could be attributed to poor models with currently available human cell lines (where cell lines have the ability to change their genetic makeup over time in culture away from the original tumour biology) and results obtained in animals not translating to man. The aim of this study is therefore to address this problem by development of an in vitro model using innovative 3D cell culture methodologies alongside novel genetically stable human lung tumour cell lines (which have been shown to maintain their key tumour characteristics after long-term culture). If successful, this model will allow for better understanding of the crosstalk between the numerous cell types involved in this complex disease and how new drugs can manipulate this process. In the longer term, this will hopefully lead to the development of more effective anti-cancer therapies, improved treatments for patients and ultimately a reduction in the use of animals in cancer research and drug discovery.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
CN Bio Innovations DefiniGEN University College London	3D culture model for Non-Alcoholic SteatoHepatitis (NASH) drug discovery	£554,005	£357,613
Project description - provided by applicants			

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NASH presents a significant unmet medical need in more economically developed nations, affecting up to 5% of the US population alone. There is currently no medical treatment for NASH, where the condition is a precursor to cirrhosis and hepatocellular carcinoma, conditions with very poor prognoses. One key limiting factor in the development of a treatment for NASH is a lack of suitable in vitro models. The project will produce a highly representative, medium throughput, 3D perfused model of NASH using both primary human and induced pluripotent stem cell derived hepatocytes, kupffer and stellate co-cultures. These models can be used in collaboration with industry to enable highly effective drug discovery studies and macrosteatotically relevant ADME/Toxicology studies.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
SAL Scientific Limited GlaxoSmithKline University of Southampton	Development of a novel 3D microfluidic assay platform for the assessment of human stem-cell derived epithelial function.	£630,177	£360,747
Project description - provided by applicants			

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We aim to develop a novel analytical platform for the assessment of stem cell-derived epithelial function. The platform integrates novel microfluidic technology with a 3D stem cell-derived tissue model and a range of analytical outputs and delivers more physiologically relevant data than current in vitro models – uncovering previously unseen responses to environmental challenge. By delivering more predictive data, the system has huge potential to impact pre-clinical drug discovery, chemical safety testing and safety pharmacology. Here, we propose to determine the key design requirements to develop a commercially-viable, scalable platform to facilitate the analysis of multiple compounds in parallel.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
InoCardia Ltd Coventry University	InoCardia: Novel human-cell based assay for assessment of cardiovascular liability	£982,075	£708,687
Project description - provided by applicants			

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When drugs/chemicals are developed to treat a particular disease or for human use purposes they sometimes have side effects that cause damage to the heart. Occasionally these dangerous side effects are only recognised after the drug/chemical has been marketed & taken/used by thousands of people. This is a significant risk to human health & is costly to the pharmaceutical industry when a dangerous product is withdrawn from market. Although side effects of drugs can be caused by many things, one area of great concern is the effects of drugs on the force that heart muscle can produce during its role in pumping blood around the body. Current drug testing relies on the use of animals such that often the tests do not do well in predicting the effect on humans. Development of a human heart-cell contractility assay would greatly improve the under-standing of the human relevance of non-clinical findings; a chemical might cause a change in cardiac contract-ility in animals, but not humans & vice versa. We aim to develop a test that uses human heart cells in a way that can efficiently test many drugs/chemicals used in high-value industries & reduce the risk of causing any damage to the heart.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
National Physical Laboratory Xstrahl University of Hull	Development of a pre-clinical dosimetry service with multipurpose small animal phantom for radiotherapy studies	£688,207	£447,913
Project description - provided by applicants			

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The implementation of standardize and traceable dosimetry procedures for preclinical radiation experiments supported by an innovative multipurpose small animal phantom funded by Innovate UK to the tune of £XX aims to significantly improve the quality and impact of radiobiological studies whilst reducing the number of animals sacrificed. The collaboration includes the National Physical Laboratory, the University of Hull and Xstrahl who will combine and utilise their extensive knowledge, expertise and infrastructure. The funding will allow the partners to develop standards, equipment and techniques that will allow accurate monitoring of radiation dosages to animals during preclinical trials, something which is not available at present, with the potential of reducing the number of animals up to 50% for selected studies. The project will also enable scientists to develop a better understanding of animal and human responses to radiation. The new phantom will provide products and services to pharmaceutical companies interested in the development of drugs to aid radiation effects, and scientists across the globe to undertake novel and more accurate radiobiology research.

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