

## STRIVE Projects Listing

### Environment & Health

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For more information, please contact [research@epa.ie](mailto:research@epa.ie)

# **Health effects associated with the atmospheric degradation of polycyclic aromatic hydrocarbon**

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## **Lead Organisation**

University College Cork

## **Principal Investigator**

Shouming Zhou

## **Project Type**

Research Fellowship

## **Funded under:**

STRIVE Research Fellowship Scheme 2007

## **Project Description**

Polycyclic aromatic hydrocarbons (PAHs) are major air pollutants produced from combustion processes. They can be chemically transformed in the atmosphere to generate a range of secondary pollutants including ozone and secondary organic aerosol (SOA) which are known to have an adverse effect on human health. In this project, a comprehensive programme of laboratory studies will be performed on the atmospheric degradation of a series of PAHs in order to determine the oxidation products and the yields of SOA. The health effects associated with exposure to SOA produced from the PAHs will be investigated through a series of toxicology tests.

# **Establishment and validation of human blood-brain barrier model for screening and risk assessment of nanoparticle access to the brain**

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## **Lead Organisation**

University College Dublin

## **Principal Investigator**

Meredith Brown

## **Project Type**

Research Fellowship

## **Funded under:**

STRIVE Research Fellowship Scheme 2007

## **Project Description**

The “blood-brain barrier” has evolved to prevent harmful chemicals from reaching the extremely sensitive cells and tissues of the brain. However, it has recently emerged that nanoparticles can pass through the blood-brain barrier. To date there are no well validated co-culture models of the human blood-brain barrier, which could be used as the basis of a nanoparticle screening and risk-assessment program. The aim of this work is to establish and validate such a model and to screen a range of relevant nanoparticles for their ability to pass through the barrier. Comparison with literature animal studies of ultra-fine and nanoparticle uptake and translocation will help to establish the risk parameters.

# **Nanotechnology: engaging the public health, environmental and social issues**

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## **Lead Organisation**

Dublin City University

## **Principal Investigator**

Padraig Murphy

## **Project Type**

Research Fellowship

## **Funded under:**

STRIVE Research Fellowship Scheme 2007

## **Project Description**

Nanotechnology has huge potential for Irish research and development. However there is a lack of awareness and little public discourse about these technologies. There is some concern, particularly about the unknown effects to health and the environment. In the EU and US, public consultation processes have begun to gauge opinion and facilitate public involvement in decision-making. This two-year research fellowship, drawing on ongoing multidisciplinary science and society work at DCU, will focus on issues of public perception and response to environment-health issues regarding nanotechnology under the Health & Environment theme of the EPA STRIVE programme. Focus groups, online forums, and content analysis will map out how various publics understand the benefits and risk around the theme of environmental health, as well as connected social and ethical concerns. A pilot public engagement and consultation model based on international deliberative processes will be developed. A final report will increase the knowledge base about the social acceptance of such technologies and informing policy.

# **Role of engineered nanoparticles in protein fibrillation diseases**

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## **Lead Organisation**

University College Dublin

## **Principal Investigator**

Fiona Quinlan Pluck

## **Supervisor**

Prof Kenneth Dawson

## **Project Type**

Doctoral Scholarship

## **Funded under:**

STRIVE Doctoral Scholarship Scheme 2007

## **Project Description**

The health and safety aspects of nanoparticles released into the environment (either intentionally, such as in controlled release products for agriculture, or accidentally, as waste products, spillages, etc.) is at present entirely unknown. What is known, is that nanoparticles can reach all areas of the body, including the brain, and that their enormous surface area offers potential for considerable adsorption of proteins, with subsequent alterations in protein aggregation and function. Our preliminary results show that nanoparticles such as cerium oxide (used in fuels and released as emissions) can modulate the rate of protein fibrillation in vitro, highlighting a pressing need for further research.

# **Antimicrobial resistant enterococci (ARE) in Irish waters: Sources, transfers and impacts**

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## **Lead Organisation**

University of Ulster

## **Principal Investigator**

Victoria Daniels

## **Supervisor**

Dr James Dooley

## **Project Type**

Doctoral Scholarship

## **Funded under:**

STRIVE Doctoral Scholarship Scheme 2007

## **Project Description**

Antimicrobial resistant enterococci (ARE) are increasingly important pathogens, yet environmental data are scarce. We will explore ARE sources, transfers and potential impacts on recreational waters. ARE occurrence is widespread in subcatchments of the Blackwater River. They would pose a health hazard if they were transferred to Lough Neagh. The project includes sampling daily cycles during low flows and flood events in headwaters and a similar regime for Lough Neagh. Molecular epidemiological methods (MLST) will be used for ARE source tracking. Survival times and resuscitation potential of enterococci strains will be determined to assess their potential threat in water.

# **Efficiency of Sligo Secondary Sewage Treatment Systems in the Removal of Cryptosporidium and other Human Enteric Pathogens**

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## **Lead Organisation**

Institute of Technology Sligo

## **Principal Investigator**

Angel Chan

## **Supervisor**

Dr Frances Lucy

## **Project Type**

Doctoral Scholarship

## **Funded under:**

STRIVE Doctoral Scholarship Scheme 2007

## **Project Description**

This project will assess the efficiency of four Co. Sligo secondary sewage treatment plants in removing a range of human enteric pathogens namely: Protozoan endoparasites; Cryptosporidia spp., Giardia and microsporidia. Bacterial indicators: Faecal coliforms, Enterococci, Clostridium perfringens. Enteric virus. The presence and viability of these enteric pathogens will be assessed by analysing samples from each stage of the treatment process, in the end-sludge and in effluent released to the receiving waters. This will benefit public health by (1) source-tracking pathogens, (2) risk assessment, (3) developing molecular methodologies to accelerate the detection and enumeration of enteric pathogens.

# **An investigation of the disease-causing potential of environmental isolates of *Aspergillus fumigatus***

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## **Lead Organisation**

National University of Ireland, Maynooth

## **Principal Investigator**

John Fallon

## **Supervisor**

Dr Kevin Kavanagh

## **Project Type**

Doctoral Scholarship

## **Funded under:**

STRIVE Doctoral Scholarship Scheme 2007

## **Project Description**

The fungus *Aspergillus fumigatus* is major cause of disease among immunocompromised patients and is a common contaminant of domestic dwellings in Ireland. We wish to examine the possibility that environmental isolates of this fungus are capable of initiating disease and that toxins secreted by this fungus have the ability to inhibit the function of neutrophils which are a major element of the host's immune response. We postulate that environmental isolates of this fungus are virulent and produce toxins that may act on the immune system of susceptible patients (e.g cystic fibrosis) and make them prone to secondary bacterial infections.

# **SADOSE - Safe disposal of sewage effluent in coastal waters designated for the cultivation of oysters and for water-contact recreation**

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## **Lead Organisation**

University College Cork

## **Principal Investigator**

Kevin Barry

## **Supervisor**

Prof J Philip O'Kane

## **Project Type**

Doctoral Scholarship

## **Funded under:**

STRIVE Doctoral Scholarship Scheme 2007

## **Project Description**

Sewage effluent in coastal waters used for oyster culture and water-contact recreation poses a risk to human health. The primary pathogen in outbreaks of gastroenteritis following consumption of raw oysters is the Norovirus or "winter vomiting bug". The virus is life threatening to those with post-operative stress, the very young and very old. An infected person may excrete 0.15 billion Norovirus particles per day to the sewer system. The goals are to (a) quantify the risk of infection through coastal waters, (b) evaluate possible containment of treated sewage effluent, rather than dilution, and (c) to make a prototype early alert system.

# **A Personal Exposure, Activity/Location, GIS Model for the Greater Dublin Area (GDA) and its Satellite Towns (STs)**

## **Lead Organisation**

Trinity College Dublin

## **Principal Investigator**

Dr Brian Broderick

## **Project Type**

Medium-Scale Study

## **Funded under:**

STRIVE Environment and Health Call 2007

## **Project Description**

This project aims to develop a personal exposure GIS model for the Greater Dublin Area (GDA) and for its satellite towns (ST). Through experimental sampling of the real time personal exposure of various subjects and modelling ambient and indoor air quality, a model will be developed to make predictions of personal exposure based on a subject's locations and activities throughout the day. Influencing factors such as weather conditions and traffic flow/composition/density will form part of the model predictions. The final model would be capable of predicting the personal exposure of individuals and of population sub-groups. It can be employed in operational analysis or in the assessment of the health impacts of air pollution.

## **Indoor Air Pollution and Health (IAPAH)**

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### **Lead Organisation**

National University of Ireland, Galway

### **Principal Investigator**

Dr Marie Coggins

### **Project Type**

Medium-Scale Study

### **Funded under:**

STRIVE Environment and Health Call 2007

### **Project Description**

The major sources of indoor air pollution are smoking and the combustion of fuel for heating and cooking. This study will measure levels of indoor air pollution in homes in Ireland and Scotland, will identify how many people are exposed to different concentration bands and will use this data to generate an estimate of the size of health burden that is attributable to air pollution within homes. To achieve this we will draw on published material identifying concentration-response co-efficients from outdoor air pollution literature and recent studies examining the relationship between biomass fuel smoke and health in the developing world.

# **Hospital effluent: impact on the microbial environment and risk to human health?**

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## **Lead Organisation**

National University of Ireland, Galway

## **Principal Investigator**

Prof. Martin Cormican

## **Project Type**

Medium-Scale Study

## **Funded under:**

STRIVE Environment and Health Call 2007

## **Project Description**

Antimicrobial resistance is a significant public health problem. The contribution the environment makes to emergence and dissemination of antimicrobial resistance is an area of increasing concern. This project will detect and quantify antimicrobial resistant E. coli and quinolone residues in hospital effluent, urban wastewater, sewage sludge and biosolids. The impact of secondary wastewater treatment and sludge treatment processes in removing antimicrobial resistant E. coli and quinolone/fluoroquinolone residues from wastewater will be assessed. This information will contribute to the development of a risk assessment model of human exposure to antimicrobial resistant E. coli and quinolone/fluoroquinolone residues related to the discharge of hospital effluent.

# **Assessment of exposure to metallic nanoparticles on marine and fresh water model organisms at cellular and genetic level**

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## **Lead Organisation**

National University of Ireland, Galway

## **Principal Investigator**

Prof. Lokesh Joshi

## **Project Type**

Medium-Scale Study

## **Funded under:**

STRIVE Environment and Health Call 2007

## **Project Description**

Despite the benefits of nanotechnology, concern is mounting that due to their unique physico-chemical properties, nanoparticles (NPs) may cause unknown biological effects with environmental and human health consequences. Bioaccumulation, bio-persistence, environmental fate and exposure effects remain to be evaluated. Here, the relationships between physico-chemical properties of metallic NPs and biological effects will be examined using two aquatic (one marine and one freshwater) model organisms. Characterisation of NP accumulation and consequent changes in morphology, development, gene and protein expression will provide a basis for the determination of safe concentrations, detectable exposure levels, and potential biomarkers for NP impact and environmental monitoring.

# **Visualisation and Quantification of the interaction of fluorescent nanoparticles with ecotoxicologically relevant species**

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## **Lead Organisation**

University College Dublin

## **Principal Investigator**

Prof. Kenneth Dawson

## **Project Type**

Medium-Scale Study

## **Funded under:**

STRIVE Environment and Health Call 2007

## **Project Description**

Engineered nonmaterial's are able to access many compartments of living systems not usually accessible to bulk materials. Nanoparticles currently in use, or nearly so, in industry will be studied as a priority. By labelling these particles, representative biological and environmental fate as a function of size will be studied by tracking and imaging methods. Using established biological methods and 'omics' techniques as a reference, high throughput automated methods (such as high content analysis) will be adapted to give lead information on a wide range of undesirable impacts on organisms.

# **Cryptosporidiosis: Human, animal and environmental interface**

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**Lead Organisation**

University College Dublin

**Principal Investigator**

Dr Theo De Waal

**Project Type**

Medium-Scale Study

**Funded under:**

STRIVE Environment and Health Call 2007

**Project Description**

Cryptosporidium is one of the most important zoonotic parasites in the developed world including Ireland. Although cases are reported throughout the year, over 60% of human cryptosporidiosis cases occur during the spring peak between March and June. This project aims to determine the cause(s) of the spring peak. Livestock, wildlife and the environment in 2 reservoir catchment areas will be screened for the presence of Cryptosporidium oocysts. Molecular analysis will be carried out to determine the importance of the Cryptosporidium genotypes of animal origin to human health.

# **Assessing the Impact of Waste Water Treatment Plant Effluent on Norovirus contamination in shellfisheries**

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## **Lead Organisation**

Marine Institute

## **Principal Investigator**

Bill Dore

## **Project Type**

Medium-Scale Study

## **Funded under:**

STRIVE Environment and Health Call 2007

## **Project Description**

Norovirus (NoV) is the leading cause of gastroenteritis in the general population. NoV contamination of shellfisheries presents a significant public health risk. This study will compare NoV survival during sewage treatment and in seawater alongside indicator organisms. The impact of sewage discharges on NoV contamination in shellfisheries will be assessed. In-situ studies will investigate NoV levels in influent and effluent from a Wastewater treatment plant (WWTP). The relative impact of storm overflows and continuous treated sewage discharges will be investigated. Laboratory studies will investigate the survival of NoV in seawater. Finally, laboratory-based studies will investigate the use of UV treatment of secondary effluents to reduce NoV levels.

# **Development of Microbial Source Tracking Techniques**

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## **Lead Organisation**

University College Dublin

## **Principal Investigator**

Prof Wim. G. Meijer

## **Project Type**

Medium-Scale Study

## **Funded under:**

STRIVE Environment and Health Call 2007

## **Project Description**

This proposal focuses on Microbial Source Tracking (MST) tools for application in Ireland. In particular it centres on Bacteroidetes as marker for faecal pollution, as applicants have previously shown the usefulness of these in Ireland. This proposal aims to validate additional MST markers for use in Ireland. The behaviour of MST markers in a well-characterised catchment will be analysed, with emphasis on relation to bacteriological parameters set out in the EU water directives. The potential role of riverine sediments as reservoir for MST markers will be determined. The relationship of MST markers with their hosts will be studied.

# **Early Warning System for Water Treatment Plants as Basis for Defining and Supporting the Concept of Early Warning Analysis (SCEWA)**

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## **Lead Organisation**

University College Cork

## **Principal Investigator**

Prof Wim. G. Meijer

## **Project Type**

DERP- Developing Environmental Research Potential

## **Funded under:**

STRIVE DERP Scheme 2007

## **Project Description**

Supporting the Concept of Early Warning Analysis (SCEWA) is a 5-year research project focusing on the development of methods and tools which are aimed at supporting the analysis, design, and development of early warning systems in engineering facilities and in critical infrastructures whose undisturbed operation is important for maintaining and improving the quality of our everyday life. The goal in SCEWA is to develop an early warning service aiming at receiving from and transmitting to stakeholders (i.e. EPA, HSE, local authorities and water utilities personnel) information and signals on imminent events and critical conditions that might cause problems and failures to water treatment plants, as well as warnings of imminent failures in a timely, effective and reliable manner. A brief description of the categories of events and conditions leading water treatment utilities to failures and operational problems will be given, together with high level descriptions of the of the early warning service operation and architecture. Emphasis will be given also on the implementation of computer science and knowledge engineering methods and technologies as well as at the safety science tools which will be used extensively for the development of the knowledge base of the early warning service.

# The assessment and potential human impact of exposure to environmental contaminants on marine and freshwater bivalves

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## Lead Organisation

Galway Mayo Institute of Technology

## Principal Investigator

Dr. Brian Quinn

## Project Type

DERP- Developing Environmental Research Potential

## Funded under:

STRIVE DERP Scheme 2007

## Project Description

This project shall concentrate on developing novel biomarkers in bivalve mussels (*Mytilus edulis* & *Dreissena polymorpha*) to investigate chronic effects of exposure to novel environmental contaminants, particularly pharmaceuticals and endocrine disrupting compounds (EDCs), using recently developed proteomic and genomic techniques. The recent addition of a state of the art liquid chromatography, 2-D Gel Electrophoresis and imaging system to the lab will greatly aid this research. The team shall also be identifying and quantifying numerous pharmaceutical compounds (including non-steroidal anti-inflammatories, antibiotics, lipid regulators, anti-convulsants and beta-blockers) and EDCs (numerous xenoestrogens and oestradiol) in treated effluent (municipal, hospital & industrial), receiving waters (freshwater and marine) and measuring their ability to bioconcentrate and bioaccumulate up the food chain and their potential effect on human populations.

# **Comparative study of the health status in two semi-rural Irish communities with commentary on the ambient environmental factors in each**

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## **Lead Organisation**

Health Service Executive, West

## **Principal Investigator**

Valerie de Souza

## **Project Type**

Medium-Scale Study

## **Funded under:**

STRIVE Environment and Health Call 2007

## **Project Description**

The purpose of this study is to compare the health status of the populations of two regions of Co Clare (Clarecastle and Ennistymon) with health status which was determined as part of a separate study completed in 1996.

At the time the baseline data was being collected, a licence to operate a waste incinerator was granted to a pharmaceutical factory in Clarecastle, amid local health concerns. This study was designed to re-assess the self-reported health status of the residents of Clarecastle to determine if this has been altered in the decade that the incinerator has been operational. Ennistymon was also included in the original study and acted as a control region for this study.