BIO-EXPLORE
Research Newsletter

New Genome sequence published by CIT researchers

Researchers at Cork Institute of Technology have recently found a new virus in soil that kills different types of mycobacteria.

Many well known pathogens such as the causative agents of tuberculosis and leprosy are mycobacterial in nature. Mycobacteria are also responsible for causing many serious infections in animals also.

Unfortunately, current drugs used to treat mycobacterial disease are becoming less effective and new drugs are proving difficult to discover. Using a different approach BIO-EXPLORE researchers went looking for a novel solution and found it in an unlikely source.

During the study, post-graduate student Marine Henry tested many environmental samples from different locations but the one containing this new anti-mycobacterial virus was sourced from soil recovered in Ardmore Co. Waterford.

In collaboration with scientists at the Moorepark Research Centre, the 52,000 base pair viral genome was sequenced allowing the team at CIT to study what makes the new agent so deadly to mycobacteria.

The project which is being led by Dr. Jim O’Mahony along with Dr. Aidan Coffey and Dr. Roy Sleator, uses conventional biology and modern computer analysis to study the properties of the virus. In particular the group are interested in a protein which is made by the virus called a “lysin” which is very toxic to mycobacteria but harmless to humans.

Although the prospect of developing a new anti-mycobacterial drug from this work is a long way off, sourcing new agents which are capable of treating infectious disease is an important first step in the process.

The results of this work were recently published in the international scientific journal “Gene”.

New inter-departmental Bio-informatics group initiated at CIT

CIT has recently created a new interdisciplinary Bio-informatics team consisting of Roy Sleator (Department of Biological Sciences), Paul Walsh and Paul Rothwell (Department of Computer Science) and MSc candidate John Carroll.

Bioinformatics - combines ICT and biotechnology within a new biology based information science; one in which high end computing is applied to identify new genes, predict new protein structures and even to design new and improved drugs.

The group which was formalised this year with the support of Michael Loftus head of the Faculty of Engineering and Science and Departmental Heads, Hugh McGlynn and Jim Dwyer, has already had a number of joint peer reviewed publications including a journal cover in “Science Progress” and a bioinformatics paper in the March issue of the scientific journal Archives of Microbiology.

Recent journal cover depicting the protein myoglobin as created by members of the group

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As happy as a pig - CIT research improves animal health

A variety of different microorganisms exist in the large intestine of mammals. These can be broadly divided into beneficial microbes such as Lactobacillus and Bifidobacterium and those which have the potential to cause illness such as Salmonella and E. coli. Recent work in CIT, in collaboration with Prof John O’Doherty at the Department of Animal Science in University College Dublin has shown that supplementing the diet of pigs with β-glucans promotes a greater diversity of Lactobacillus and Bifidobacterium species in the colon, but reduces pathogenic coliform numbers by up to 1000 fold. β-glucans are complex sugars, found commonly in plants, cereal grains, fungi and algae. Over the past two decades β-glucans have been recognized as functional, bioactive food ingredients. It has been reported in animal studies that β-glucans when used as nutritional supplements stimulate growth, improve nutritional retention and immune system function. In the CIT/UCD study, the effect of algal and yeast β-glucans on the porcine gastrointestinal microflora, specifically the populations of Lactobacillus, Bifidobacterium and coliforms was evaluated. Many analytical methodologies were used in the study including a highly specialized strain identification system known as Denaturing Gradient Gel Electrophoresis. This technology was set up and optimised in CIT by postgraduate students Padraigin Murphy and Ann Forde under the supervision of Dr Aidan Coffey. The project which is still ongoing is being funded by the Department of Agriculture, Fisheries & Food.

Molecular diagnostics features strongly within the BIO-EXPLORE research team. One of the flagship technologies available to the group is the Roche Light-cycler 480 real-time PCR instrument. It is designed to detect specific DNA targets, but unlike conventional PCR, it can also quantify the target allowing the researcher to determine exactly how much material is in a given sample. This has obvious applications for detecting infectious agents in food, water or clinical samples, but can also be applied to detect alterations in levels of cellular gene expression under different conditions. Post-PCR analysis which analyses changes in fluorescence under subtle temperature shifts also makes the instrument ideally suited to detecting mutational changes in a DNA target. This can be applied extensively in genotyping analysis for any cell type especially in clinical diagnosis.

Technology Spotlight: Real-time PCR

BIO-EXPLORE scientists including Dr. Ambrose Furey, Dr. Helen O’Shea, Dr. Roy Sleator and Dr. Hugh McGlynn played a very significant role in the recent Institutional delegation to India. The purpose of the trip was to build upon and strengthen academic links between strategic departments at CIT and The University of Pune; one of India’s leading third level institutions which boast over 650,000 students. The intensive week long trip involved a number of Academic and Industry visits and presentations, and has set the stage for further collaborations between the two institutes including a number of planned staff and student exchanges and research collaborations. Other significant participants from CIT included Dr. Michael Loftus head of the Faculty of Engineering and Science and Dr. Eamon Cashell, head of School.