Space mission for worms

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(PhysOrg.com) -- Worms from The University of Nottingham should be checking in for a flight onboard the Space Shuttle later this year — to help researchers investigate the effect of zero gravity on the body's muscle development and physiology. Researchers are also hoping to get primary school children involved in the project.

The worms will spend about two weeks in the Japanese Kibo laboratory onboard the International Space Station (ISS) before returning to earth.

Dr Nathaniel Szewczyk, from the Institute of Clinical Research in Derby, studies the signals that control muscle protein degradation and is an old hand at organising space travel for worms to do this. The 2009 mission will be his fourth space worm project — his booking on the ISS has been negotiated through the Japanese space agency. The worms are scheduled to fly to the ISS onboard the Space Shuttle Discovery as part of NASA's mission STS-129/ULF-3, currently scheduled for October.

Dr Szewczyk's work centres on the microscopic worm, Caenorhabditis elegans (C. elegans). These worms are the perfect substitute for studying long term changes in human physiology because they suffer from muscle atrophy — muscle loss — under many of the same conditions that people do.

The worms are being sent into space to understand more about muscle atrophy in the hope of helping people who suffer from muscle wasting which can be caused by a myriad of diseases and conditions. Dr Szewczyk wants to explain why astronauts can experience dramatic

muscle loss — some astronauts can lose up to 60 per cent of their muscle density in a single mission.

Dr Szewczyk said: “Worms are an excellent model to study the genetic basis of muscle atrophy. This flight should allow us to continue to uncover new ways muscle atrophy is controlled. Our current results suggest that our findings from this space flight mission may be of particular interest not only to astronauts but also to individuals who are bed ridden, immobilized in casts, aged, or who suffer diabetes.”

The C. elegans was the first multi-cellular organism to have its genetic structure completely mapped and many of its 20,000 genes perform the same functions as those in humans. Two thousand of these genes have a role in promoting muscle function and 50 to 60 per cent of these have very obvious human counterparts.

The experiment will be part of the Japanese CERISE payload and is being funded as part of a $1M (£0.6M) United States National Institute of Health grant to investigate the genetic basis of muscle atrophy. The recently installed Kibo lab is being used for the study of biomedicine and material sciences making use of the weightless conditions experienced in orbit.

Biological experiments in space need life support — oxygen, temperature control and pressure — so competition for space on manned flights is fierce and in short supply. The selection process is decided on an international basis through the International Life Sciences working group.

The origins of Dr Szewczyk's worms can be traced back to a rubbish dump in Bristol. C. elegans often feed on bacteria that develop on decaying vegetable matter. In space they will be fed bacteria that have been heat inactivated.

Dr Szewczyk's C. elegans made news in 2003 when they survived the Space Shuttle Columbia disaster. Living in petri dishes and enclosed in aluminium canisters the worms survived re-entry and impact on the ground and were recovered weeks after the disaster.

Space flight research poses two big problems — access and money. Securing a place onboard the international space station is not only expensive it is also an exercise in diplomacy and international politics. It might not come up with as many direct answers as research carried out on Earth but Dr Szewczyk argues that space flight research is a unique opportunity to put life in difficult conditions and learn something fundamental about it. He also thinks that the work is a great way to get school children excited about science. He plans to work with Orion's quest (www.orionsquest.org) to involve primary school children in this experiment.

Provided by University of Nottingham