# The worm that feels at home in space

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Caenorhabditis elegans is a transparent nematode worm about 1 mm in length. It lives in temperate soil but research shows that it adapts very well to space conditions. Credits: Creative Commons ShareAlike license-B. Goldstein

(Phys.org) -- Astronauts return to Earth weakened and unsteady after weightlessness and radiation in space take their toll on the human body. New research now shows that the humble nematode worm adapts much better to spaceflight.

When ESA astronaut André Kuipers first went to space in 2004 to the International Space Station he took with him some microscopic Caenorhabditis elegans worms.

An international team of scientists from the US, Japan, France and Canada were interested in seeing how C. elegans reacts to living in space.

This species was chosen because it was the first multicellular life form to have its full genetic structure mapped.

Afterwards, researchers found the astronaut worms showed less toxic proteins in their muscles than if they had stayed on Earth, according to results published in the journal *Nature Scientific Reports* recently.

ESA astronaut André Kuipers (middle) and cosmonaut Gennady Padalka (right) practising using ESA's Kubik incubator before their first mission together in 2004. The incubator contains microscopic Caenorhabditis elegans worms to investigate how they adapt to space conditions. Eight years later André and Gennady were reunited on the International Space Station with a follow-up study on the same species of worms. Credits: NASA

## All in the genes

The scientists were intrigued and further investigation revealed that seven genes were less active in space. Living on the Space Station was preventing certain genes from functioning normally.

Surprisingly, the worms seemed to function better without them.

What would happen if the same genes were turned off in a laboratory? The researchers found that worms raised without the seven genes also lived longer and healthier.

Nathaniel Szewczyk, a scientist from the project, explains: “Muscle tends to shrink in space. The results from this study suggest that muscles are adapting rather than reacting involuntarily to space conditions.

Soyuz spacecraft after landing, photographed from a recovery helicopter circling the touchdown zone in Kazakhstan, on 1 July 2012. ESA astronaut André Kuipers landed in the steppes of Kazakhstan at 08:14 GMT after 193 days in space. André conducted many scientific experiments during his six-month PromISSe mission on the International Space Station. In addition to his scientific workload, André carried out maintenance and operational tasks. Highlights included receiving ESA’s Automated Transfer Vehicle Edoardo Amaldi cargo ferry and docking the first commercial spacecraft, Dragon. Credits: ESA-S. Corvaja, 2012

“Counterintuitively, muscles in space may age better than on Earth. It may also be that spaceflight slows the process of ageing.”

Humans share around 55% of genes with C. elegans so the next step is to probe human muscle response to spaceflight.

André finished his second mission to the International Space Station on 1 July landing in the Kazakh steppe. This mission carried more worms for follow-up study, but this time the astronaut himself was investigated

as well.

Before the start of André's mission, a small piece of muscle was removed from his leg and kept for analysis. After six months in space, scientists are eager to see how his muscles have reacted to spaceflight.

Unlike the worms André took with him, the astronaut is being allowed a few weeks to recuperate from his tiring space travel before scientists put his muscles under the microscope.

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