

Friday 1 July 2022

Smelly tablets survive better in space

After returning from their trip into space, tablets subjected to the harsh effects of cosmic radiation have shown some unexpected results: those with increased aroma were not degraded as much as those with less taste.

“Medicines taken on space missions are exposed to cosmic rays which limit their ‘space shelf life’ and can even lead to the formation of toxic substances as the drug content declines,” said the University of Adelaide’s Professor Volker Hessel, Research Director of the Andy Thomas Centre for Space Resources and Professor in the School of Chemical Engineering and Advanced Materials, who led the project to send tablets into space.

“We have tested and proven countermeasures to the degrading effects of cosmic rays by sending ibuprofen tablets made in our laboratory to the International Space Station (ISS) for six months and checking them on their return.

“Four of the six ibuprofen tablets from outside the ISS, each made with a distinct formulation and protection concept, significantly decomposed to a high number of ibuprofen fragments. The tablet with highest iron oxide content in the coating showed only minor ibuprofen loss.”

A coating of iron oxide was formed under the pressure of compacting the tablets during manufacturing in the lab.

“But to our surprise, natural aroma enhancers, which were added to the tablets by our research partners from the University of Nottingham’s International Flavour Research Centre led by Professor Ian Fisk, seemed to help stabilise the ibuprofen even when no large iron oxide content was present,” said Professor Hessel.

“While this result needs further investigation and verification, one might guess that the radical scavenging nature of the aroma molecules – terpenes and alkyl-phenols with reactive chemical bonds – might cause this effect.”

Terpenes and alkyl-phenols are naturally occurring chemical compounds found in plants and some animals.

The team developed special tablet formulations of the anti-inflammatory drug that include solid and dense drug packing which protected the drug from damage by some of the cosmic radiation. They also modified the chemical nature of ibuprofen by complex formation of the drug with the excipients, resulting in a ‘stronger’ ibuprofen. Excipients are substances that are included in a tablet in addition to the drug component that has a variety of uses assisting the manufacturing process or enhancing the stability of the drug.

The tablets were sent to the [ISS for six months](#) in a partnership between the University and space technology companies Space Tango and Aegis Technologies. One batch of 60 tablets was carried inside the space station and one batch of six tablets was outside the station in the Materials International Space Station Experiment (MISSE) platform. They were exposed to one of the harshest environments known.

When they returned from their epic journey the space tablets were compared to a control batch of tablets left on Earth.

“The results from sending tablets to the ISS shows that experiments carried out in space can provide insights for improving manufacturing on Earth,” said Professor Hessel.

University of Adelaide researchers are continuing their investigations in the lab by using different radiation sources to test the effect of them on pure ibuprofen on its own as well as inside tablets.

“High energised photon radiation – synonymous with the cosmos’ gamma radiation – is likely to be the biggest threat to medicines in space as it’s been found to penetrate the tablets and destroy the ibuprofen,” he said.

/continued

Media Release

adelaide.edu.au/newsroom/



About the University of Adelaide

The [University of Adelaide](http://www.adelaide.edu.au) unites and serves those striving to change the world—and themselves—for the better. It's a place where history is made. Established in 1874, we're home to over 29,000 students and 3,000 staff, all striving to create progress. For our community. For all. This is a university of outstanding quality—ranked among the top 1% globally—in the heart of one of Australia's most liveable cities. We were our country's first university to welcome female students. The first to teach science and business. Our alumni have won Nobel Prizes, led the nation, and walked in space. So, what's next?

About the University of Nottingham

The University of Nottingham is a research-intensive university with a proud heritage. Studying at the University of Nottingham is a life-changing experience, and we pride ourselves on unlocking the potential of our students. We have a pioneering spirit, expressed in the vision of our founder Sir Jesse Boot, which has seen us lead the way in establishing campuses in China and Malaysia - part of a globally connected network of education, research and industrial engagement.

Media Contacts:

Professor Volker Hessel, Deputy Dean – Research, Faculty of Engineering, Computer and Mathematical Sciences, and Professor, School of Chemical Engineering, The University of Adelaide. **Mobile** +61 (0)466 488 051. **Email:** volker.hessel@adelaide.edu.au

Crispin Savage, Media and Communications Officer, The University of Adelaide. **Mobile:** +61 (0)481 912 465.
Email: crispin.savage@adelaide.edu.au

CRICOS 00123M