Expiring medications could pose challenge on long space missions

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Medications used by astronauts on the International Space Station might not be good enough for a three-year journey to Mars. A new study led by Duke Health shows that over half of the medicines stocked in

space—staples such as pain relievers, antibiotics, allergy medicines, and sleep aids—would expire before astronauts could return to Earth.

Astronauts could end up relying on ineffective or even harmful drugs, according to the study appearing July 23 in *npj Microgravity*.

"It doesn't necessarily mean the medicines won't work, but in the same way you shouldn't take expired medications you have lying around at home, space exploration agencies will need to plan on expired medications being less effective," said senior study author Daniel Buckland, M.D., Ph.D., an assistant professor of emergency medicine at Duke University School of Medicine and an aerospace medicine researcher.

Expired medications can lose their strength by a little—or a lot. The actual stability and potency of medications in space compared to Earth remain largely unknown. The harsh space environment, including radiation, could reduce the effectiveness of medications.

Buckland and co-author Thomas E. Diaz, a pharmacy resident at The Johns Hopkins Hospital, noted that expired medications could pose a challenge as space agencies plan for long-duration missions to Mars and beyond.

Diaz used a Freedom of Information Act Request to obtain information about the space station formulary, assuming NASA would use similar medications for a Mars mission.

Using a database of international drug expiration dates, the researchers determined that 54 of the 91 medications had a shelf-life of 36 months or less.

Using the most optimistic estimates, about 60% of these medications

would expire before a Mars mission concludes. Under more conservative assumptions, the figure jumps to 98%.

The study did not assume accelerated degradation but focused on the inability to resupply a Mars mission with newer medicines. This lack of resupply affects not only medications but also other critical supplies, such as food.

Increasing the number of medications brought on board could also help compensate for lowered efficacy of expired meds, the authors said.

"Those responsible for the health of space flight crews will have to find ways to extend the expiration of medications to complete a Mars mission duration of three years, select medications with longer shelf-lives, or accept the elevated risk associated with administering expired medication," Diaz said.

"Prior experience and research show astronauts do get ill on the International Space Station, but there is real-time communication with the ground and a well-stocked pharmacy that is regularly resupplied, which prevents small injuries or minor illnesses from turning into issues that affect the mission," Buckland said.

Additional authors include Emma Ives and Diana I. Lazare.

More information: *npj Microgravity* (2024).

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