

# **Bacteria in space: Statistical facts of the first 50 years of research and an experiment currently being conducted onboard ISS**

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From the USSR's launch of Korabl-Sputnik 2 in 1960, numerous studies on bacterial proliferation and antibiotic effectiveness have been conducted in space. A literature review of over 300 publications and international databases was conducted to identify which spaceflights carried bacterial experiments along with their respective experimental details and findings. The compiled data include the bacterial species and strains that have been used as model organisms and the scientific aim of the experiments, among other parameters. These statistical data and discussions will help researchers plan better future experiments and to more readily find applicable references. It also serves as the introduction to an experiment currently being conducted onboard ISS: Antibiotic Effectiveness in Space-1 (AES-1).

Studies describing enhanced bacterial proliferation and increased antibiotic minimum inhibitory concentrations (MIC) during spaceflight have been documented since early in the US and Soviet space programs. It is still unclear, however, how much of the latter phenomenon is due to a net decrease in antibiotic effectiveness versus the potential development of microbial antibiotic resistance. The AES-1 experiment seeks to differentiate the individual potential contributions to this response due to decreased drug effectiveness and/or increased drug resistance by analyzing the resistome (antibiotic resistance genes), as well as characterizing various physiological and morphological traits of *E. coli*. AES-1 also investigates if and to what extent enhanced bacterial proliferation in space plays a role in the observed increased MIC reported in the literature. Samples have already started to return from ISS and data analysis is now on its early stages.