IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support, habitats and EVA Systems (7)

Author: Prof.Dr. Christine Rozand
France

Mrs. Cecile Thevenot
MEDES - IMPS, France
Dr. Marie-Pierre MONTET
France
Dr. Sébastien ROUQUETTE
CNES, France
Mr. Yoann BUATHIER
France
Dr. Anne-Dominique MALINGE
Altran France, France
Mr. Tristan HERMEL
MEDES - IMPS, France

EVALUATION OF AN ALTERNATIVE SOLUTION FOR WATER MICROBIAL MONITORING OF FECAL CONTAMINANTS FROM WATER IN THE INTERNATIONAL SPACE STATION

Abstract

To keep astronauts in good health and to prevent infection by the spacecraft environment, it is necessary to periodically control the level of contamination of air, surface and water. During future manned space mission, crew will have to be independent for a long period: the tests procedure must be as simple as possible, with long shelf-life reagents.

The Aquapad 1ml experiment was developed for Thomas Pesquet Proxima mission (2016-2017) in collaboration between the French Space Agency (CNES) and bioMérieux. It aimed to evaluate a new solution for microbial water monitoring (total count parameter in 1 ml of water sample).

Compared to the Aquapad 1ml, the new Aquapad 100ml aims to quantify the fecal contamination of 100ml of water and allows the detection of both E. coli and Enteroccocus bacteria. The reference method used for terrestrial monitoring of fecal contamination of water is also done on 100ml of water but it does not allow the detection of both Gram + and Gram - bacteria from the same sample .

As the Aquapad 1ml, the Aquapad 100ml is also based on PAD (Paper Analytical Device), a bioMerieux patented technology which allows bacterial growth inside a cellulosic support containing culture medium powder.

The 100ml volume drinking water to analyze is injected inside the Aquapad 100ml disposable embedding a filtration membrane that traps the bacteria on its surface and a PAD with specific and chromogenic dry culture medium components that solubilize in contact with water. The filtered water going out of the disposable could be reinjected in the ISS water recycling system.

If E. coli bacteria are present in water, red dots will appear after an incubation step (1 red dot = 1 Unit Forming Colony). The coloration of the dot will be green for Enterococcus bacteria. Thus, the Aquapad 100ml provide a multiplex detection and quantification of two different types of fecal contaminants from the same water sample.

Parabolic flights are optimal tools for the evaluation of the operational workflow and fluidics analysis of new disposables such as the Aquapad 100ml in microgravity environment. A parabolic flights campaign

is scheduled in April 2019 in Bordeaux (France). The French Space Agency and bioMérieux teams will do together the 0g experimentations and analyze the Aquapad 100ml performances for microbial monitoring of fecal contaminants from water.

Presentation of the results and their analysis will be done at the 70th International Astronautical Congress.