EVA Suit Studies
Human Forward Contamination Project

EVA Technology Workshop 2017

October 17, 2017
Michelle Rucker
JSC Exploration Mission Planning Office
Issue: we have knowledge gaps!
- Whether/how microbes are released from crewed pressure systems

Why do we care?
- Informs Mars operational concepts
- Informs architecture decisions
- Informs landing site selection decisions

Project goal: get some data to fill in these gaps
- Data will help determine whether we’re ready to go to Mars, or if we need to change our systems or operational designs
New EVA Sample Kit
8-Sample Caddy and a Tool Handle

6 swab canisters on top, 2 on bottom (not shown)

Repurposed Shuttle tile repair hardware!
Dual-action swab end effector release
Tool Form, Fit, Function Test

With a Mark III Suit

Lab Environment (4.3 psid)

Suit joints & vents are the most likely microbial escape paths
- Microbes only need 0.5 to 1.0 µm gap
- Vents can be filtered, but joints can’t

Culture Analysis
- No fungal spores detected
- Common skin bacteria detected
Space Suit Swab Testing
4.3 psi differential suit pressure

We need to characterize the suits before we send suited crew to sample anything else.

Initial tests: did not modify any suit cleaning or handling protocols.

Saved cost by piggy-backing onto EMU-suited ISS crew training runs.
Sample EMU Swab Test (4.3 psi differential pressure)
Entry Zipper Swab Test (External Vacuum)

5 test runs to date

Click here to play video
Next Steps
Analysis, flight certify the Tool, and Swab ISS

**Culture and DNA analysis in progress**

- Additional EVA suit ground test “piggy-back” opportunities in FY18
- Will feed results back to suit designers and publish test data

Working with CASIS to identify potential commercial partners
- Two companies have expressed interest in looking for extremophiles outside ISS

**ISS is seeking ideas for additional research that could be conducted after USOS increases to 4 crew (after September, 2017)**

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**From:** InnoCentive [mailto:no-reply@innocentive.com]
**Sent:** Thursday, August 24, 2017 4:44 PM
**Subject:** Award Announcement for NASA@work Challenge: Submit Your Research Idea to be Conducted on ISS!: Congratulations!

**Congratulations, your submission to NASA@work Challenge: 2270 - Submit Your Research Idea to be Conducted on ISS! has been awarded!**
Thanks to Lots of Smart People

JSC Orgs
- XM, XI, XX, CB, EA, EC, ER, SK

NASA Centers
- JSC, JPL, ARC & GSFC

External orgs
- SETI Institute and University of Florida

### JSC INTERNAL ORGS

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*Early career/student interns*
Questions?

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