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# **PP After PREVCOM**

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# PP After PREVCOM



- PREVCOM recommendations are advice to NASA.
- NASA will consider PREVCOM advice as part of its planning for future evolution of policy and practice.
- The Mars Exploration Program is *continuing* to invest in expanded operational options--new assays, new cleaning and sterilization options, improved mission planning options and models
- The MEP is also actively supporting the MEPAG **Special Regions Science Analysis Group** to provide detailed and operationally useful definitions of regions at Mars in which terrestrial organisms could find conditions conducive to propagation.
- In parallel, the Mars Exploration Program is examining the implications and options for key elements pertinent to PP planning and implementation.
  - Capability to implement **system sterilization** may provide a needed option for future missions.
  - A Mars **geographic information system** (or equivalent) may be needed to support decision analysis of where system sterilization would and would not be required
  - A **genetic inventory** of relevant microbial populations would enhance understanding of organisms of concern



# PREVCOM 17 Recommendations to NASA



## *Paraphrased and Boiled Down a Lot*

1. Consider expansion of overall scope of PP policy
2. Provide adequate budget for PP, including growth of national expertise
3. Plan for effective implementation early in mission and instrument design
4. Establish independent review panel to meet every 3 years to advise NASA
5. *Require routine collection of phylogenetic data and require systematic archiving of environmental samples from ATLO environments and spacecraft*
6. Sponsor research (and lots of it) on microorganisms, especially those that can survive and/or prosper in very cold conditions (i.e. get a handle on probability of growth of terrestrial microorganisms in the martian environment)
7. Determine embedded bioburden in contemporary and future s/c materials
8. *Develop alternatives to dry heat sterilization and assess h/w compatibility*
9. Sponsor research on non-living contaminants of s/c and their potential to confound science measurements
10. *Assign high priority to defining and obtaining measurements needed to identify special regions on Mars*
11. *Transition toward a modern approach for assessing s/c bioburden. Complete the transition to molecular methods by 2016.*
12. Abandon PP categories IVa to IVc and replace with IVn and IVs (non-special and special)
13. Treat all potential direct-contact missions as category IVs until we can identify non-special regions
14. Ensure that all category IVs missions satisfy at least surface sterilization requirements. Appoint external committee to decide if more bioburden reduction is needed.
15. *Sponsor research on how to implement higher levels of bioburden reduction in practical ways*
16. Require any mission that will access regions or sites strongly suspected (or known) to have long-lived liquid water to satisfy Viking level sterilization
17. Increase bioburden reduction requirements for orbiters that cannot meet orbital lifetime requirements.



# Research and Reconnaissance



## Recommendation 5:

NASA should **require the routine collection of phylogenetic data** to a statistically appropriate level to ensure that the microbial diversity of assembly, test, and launch operations (ATLO) environments, and of all of NASA spacecraft to be sent to Mars, is reliably assessed. NASA should also **require the systematic archiving of environmental samples** for ATLO environments and for all spacecraft to be sent to Mars.



# Phylogenetic Data Collection & Archive



- What are the technology options for creating a genetic inventory of biological contaminants on spacecraft?
  - Live vs. Live + Dead
    - Live only is ideal. Is it an option?
    - Live + dead tells broadly what is present. Is it a reasonable first step?
  - Quantitative vs Qualitative
    - Can we do both?
    - Is there a reasonable first step?
  - Level of sampling
    - Is it possible to get a complete inventory? 95%? 90%
    - Can a baseline be established with comprehensive study of the assembly environment? A representative spacecraft? Each spacecraft?
- What are the costs of the options?
- Could any of the options be used to create the inventory before 2016? What does the timeline look like?
- What is the best way to get the work done?