Microhost Risk Approach Plan

**Risk Characterization / Formulation**

- Micro-101: Evaluate the effects of isolation, confinement and weightlessness on changes in the vehicle microbiome, the human microbiome, and microbial virulence
- Micro-102: Evaluate whether deep-space radiation has an additive or synergistic effect with weightlessness/isolation/confinement on microbial types, numbers, and virulence.
- Micro-103: Evaluate whether atmospheric composition, such as elevated CO₂ levels or mildly hypoxic exploration atmospheres, are a significant contributor to changes in the microbial profile of spaceflight.

**CM Development / Evaluation**

- Micro-201: Evaluate the contribution of changes in microbial numbers, types, and virulence on the likelihood and consequence of adverse health events (infection) during the mission.
- Micro-202: Evaluate the contribution of changes in microbial numbers, types, and virulence on the likelihood and consequence of non-infection-based effects on health and performance, including: decrease in cognition/mood/performance/BBB function related to the change in the gut’s microbiome and gut-brain axis (collaboration with HFBP), increase in cardiovascular health risks, effects of change in gut microbiome on metabolism of nutrients, correlation with inflammation.

**CM Integration/Validation**

- Micro-301: Identify, develop, and implement in-flight microbial monitoring/diagnostic tools for support of research and crew health during Gateway, Lunar, and Mars missions.
- Micro-401: Test, optimize and validate existing terrestrial or novel technologies that can maintain in-flight microbial counts, types, and virulence at terrestrial equivalent levels.

**Legend**:
- Analog
- Flight environment
- Cross Element Integration
- Anticipated PRR Color Change

**Inputs to Standards**

**Microbial Changes Evaluated**

**Microbial Profile Characterized**

**Note**: Milestone (●) and Gap Closures (○) are Program reviews with defined entry/exit criteria.