## Cardiovascular Disease (CVD) Risk Approach Plan

### Risk Characterization / Formulation

- **CVD-101**: Determine whether long duration weightlessness induces cardiovascular structural and functional changes and/or oxidative stress and damage (OSaD)/inflammation, that can contribute to development of disease.

- **CVD-102**: Determine whether space radiation induces cardiovascular structural and functional changes and/or oxidative stress and damage (OSaD)/inflammation, that can contribute to development of disease.

- **CVD-103**: Determine whether the combined effects of relevant deep-space radiation and weightlessness induce additive or synergistic effects on the cardiovascular system, and whether it is of concern for development of disease.

### CM Development / Evaluation

- **CVD-201**: Select countermeasures and procedures to be tested based on previous objectives.

- **CVD-202**: Develop and ground-test countermeasures against the spaceflight-induced changes in the cardiovascular system of importance for development of disease.

- **CVD-203**: Test countermeasures on the ISS against the spaceflight-induced changes in the cardiovascular system of importance for development of disease.

### CM Integration/Validation

- **CVD-301**: Test the integrated countermeasure suite in deep-space missions and on the moon, based on previous tests of countermeasures on the ground and ISS.

### External Deliverables

- **CVD Standards based on weightlessness**

- **CVD Standard Combined Effects**

- **Validated CVD Countermeasure Requirements (ISS)**

- **Validated Countermeasure Requirements (Lunar/Mars)**

### HRR Gap: Research Logic Description

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**CVD-103**: Determine whether the combined effects of relevant deep-space radiation and weightlessness induce additive or synergistic effects on the cardiovascular system, and whether it is of concern for development of disease.

### Note

Milestones (○) and Gap Closures (●) are Program reviews with defined entry/exit criteria.

Legend:

- Analog
- Flight environment
- Cross Element Integration
- Anticipated PRR Color Change