



ISSRDC



LambdaVision

Helping Patients Regain Sight

Long-Term Stability of Bacteriorhodopsin Stored on the ISS: Implications for In-Space Production of Artificial Retinas

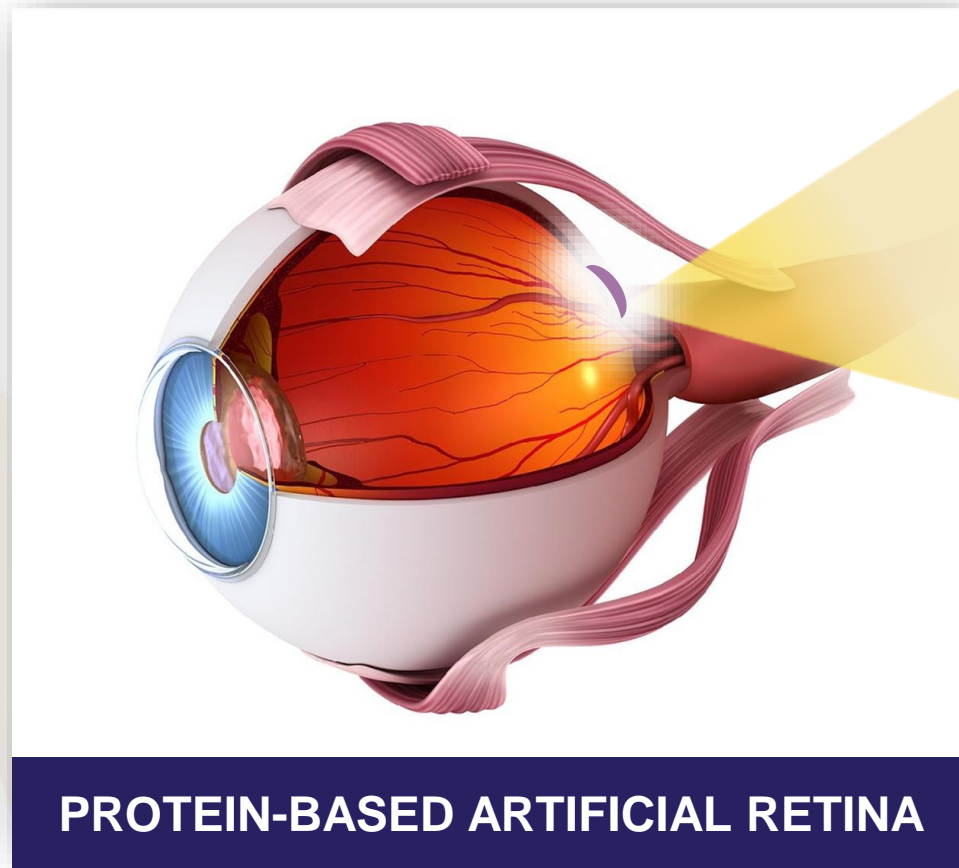
Daniel B. Sylva, M.A.
Lead Engineer – LambdaVision
June 12, 2024

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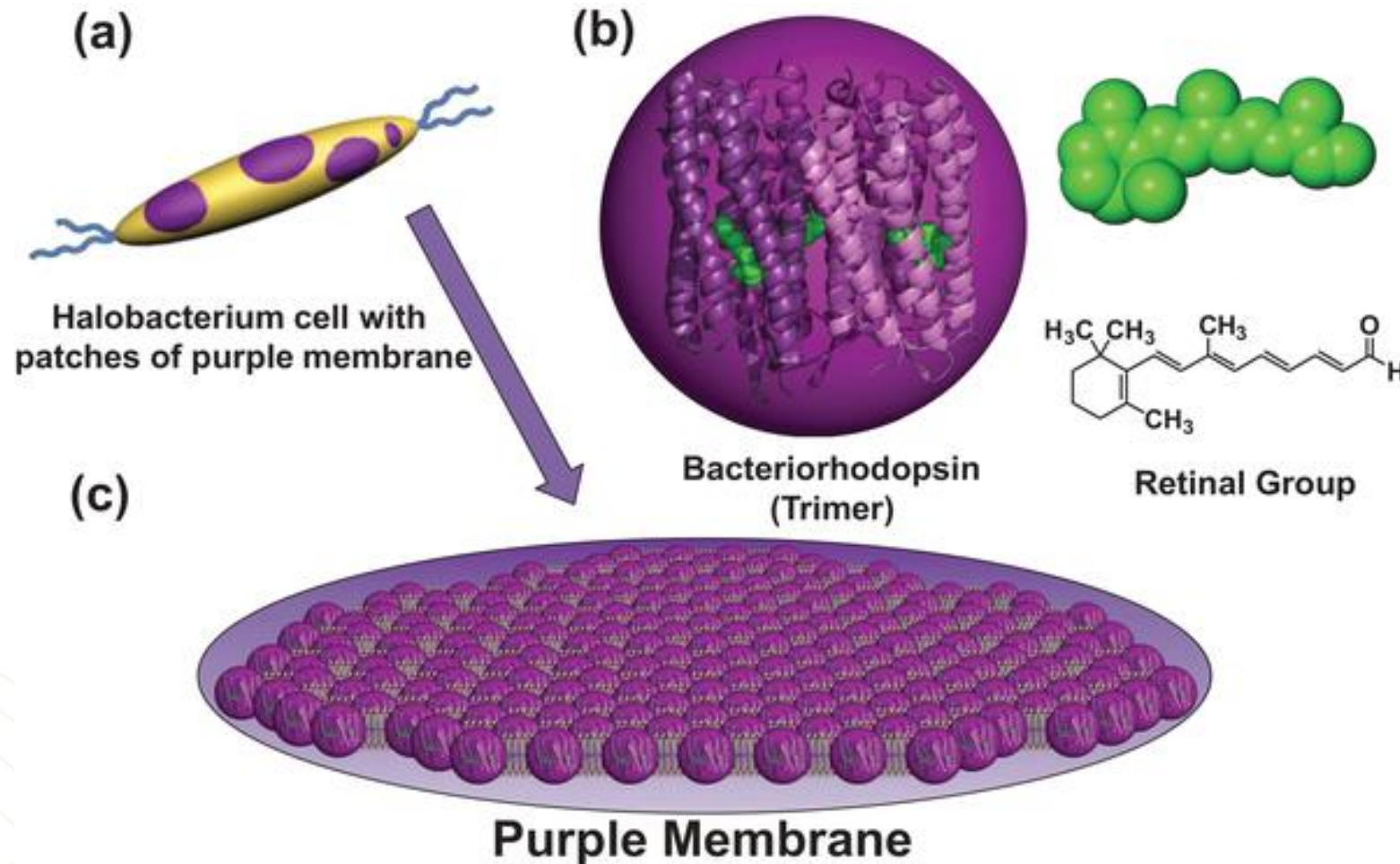
LambdaVision's Artificial Retina



PROTEIN-BASED ARTIFICIAL RETINA

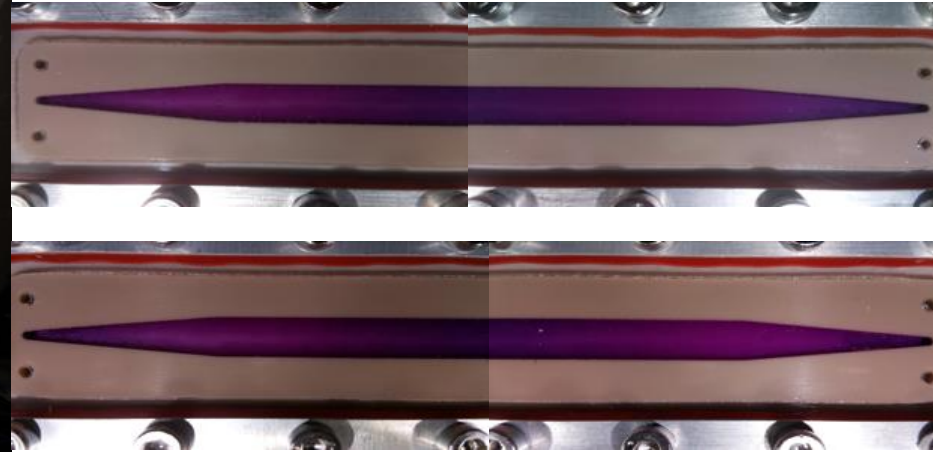
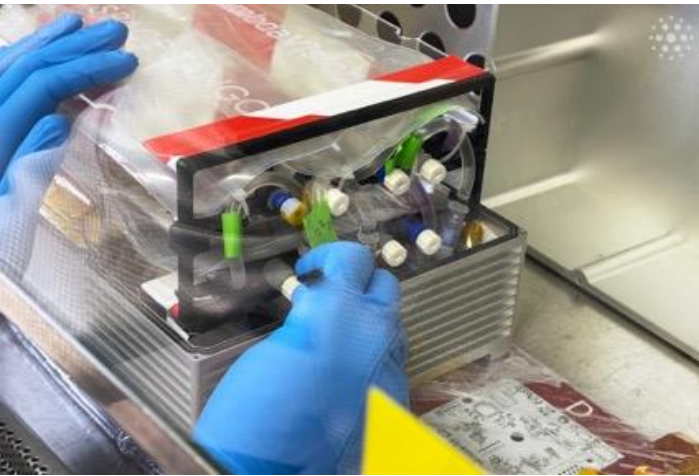
- Intended to restore vision to individuals blinded by retinal degenerative diseases
- Simple surgery
- Small, flexible, and long-lasting implant
- Replaces function of rods and cones

Bacteriorhodopsin Drug Substance



Adapted from De Queiros Silveira, G., et al.. Adv. Funct. Mater.. 2019, 29, 1904899

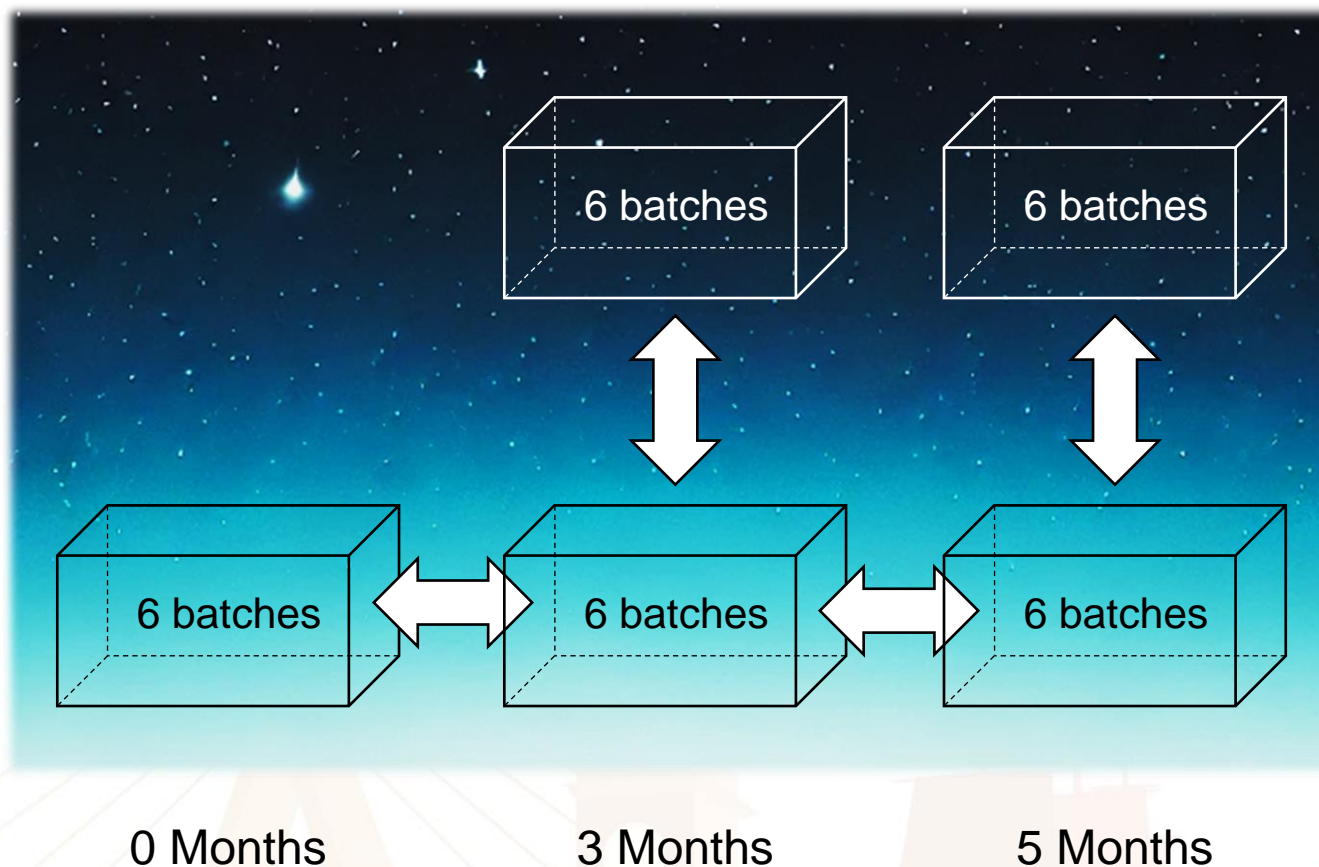
In-Space Manufacturing on the ISS



- ◆ Increased Uniformity of Thin Films
- ◆ Improved Performance and Stability
- ◆ Reduced Waste and Improved Scale

9 Missions to the ISS Established Manufacturing Feasibility

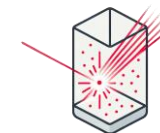
Protein Stability Study Design



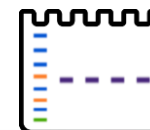
Analytical Methods



Spectroscopy



Dynamic Light Scattering



SDS-PAGE

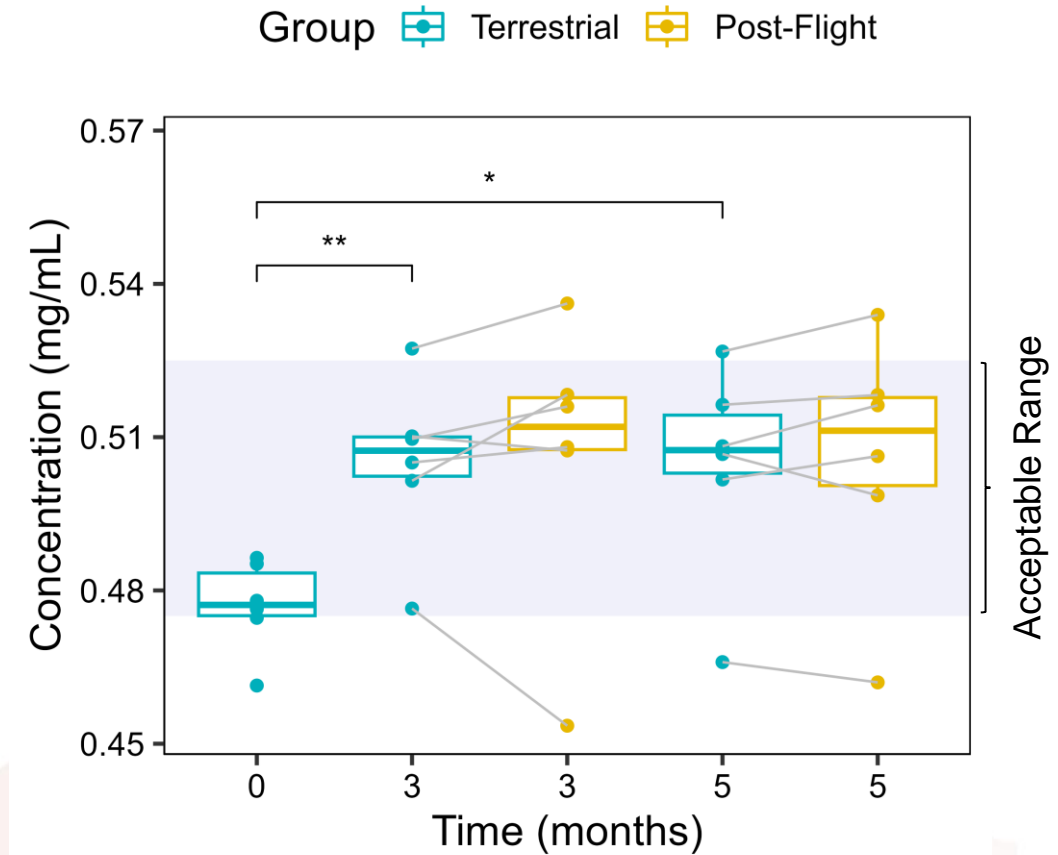
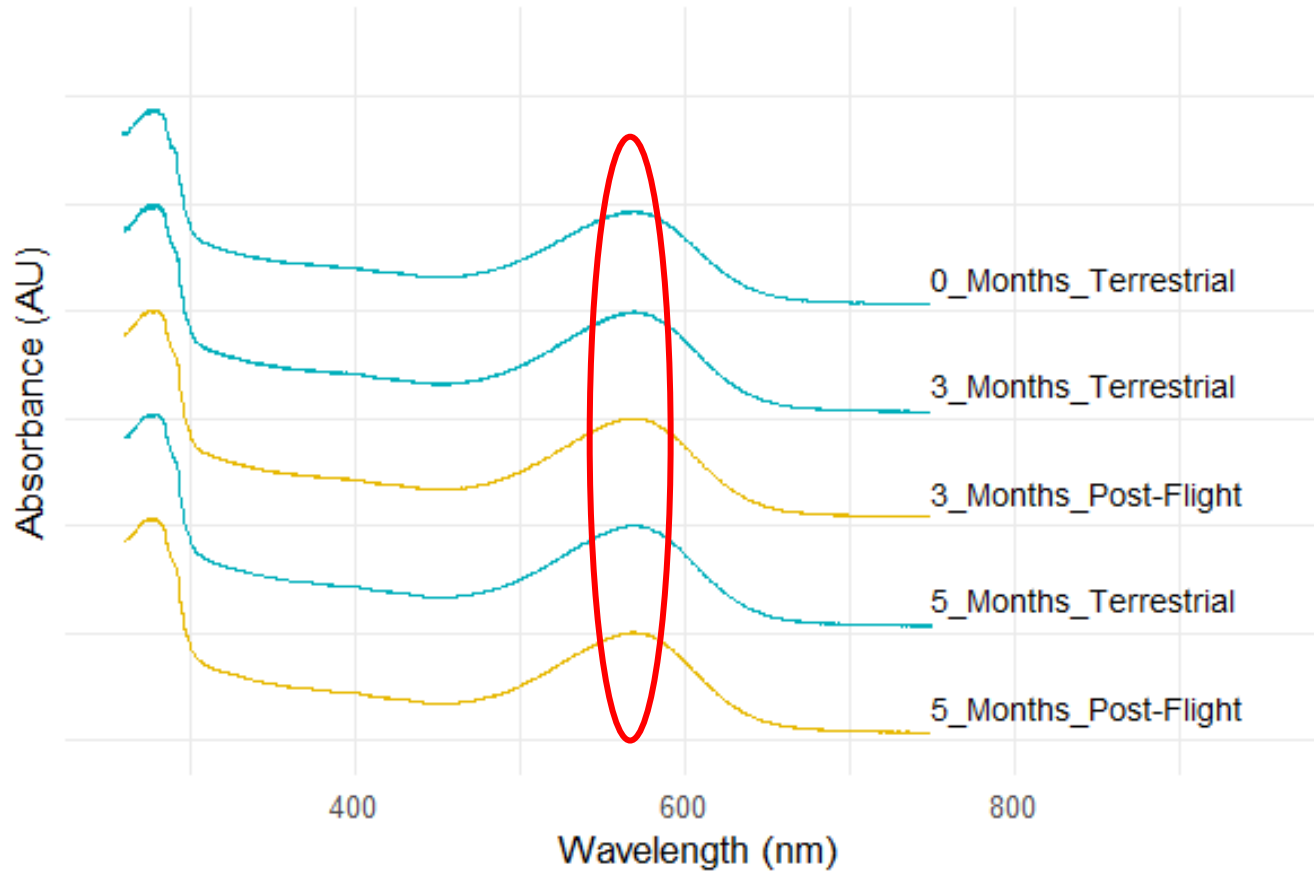


Differential Scanning Calorimetry

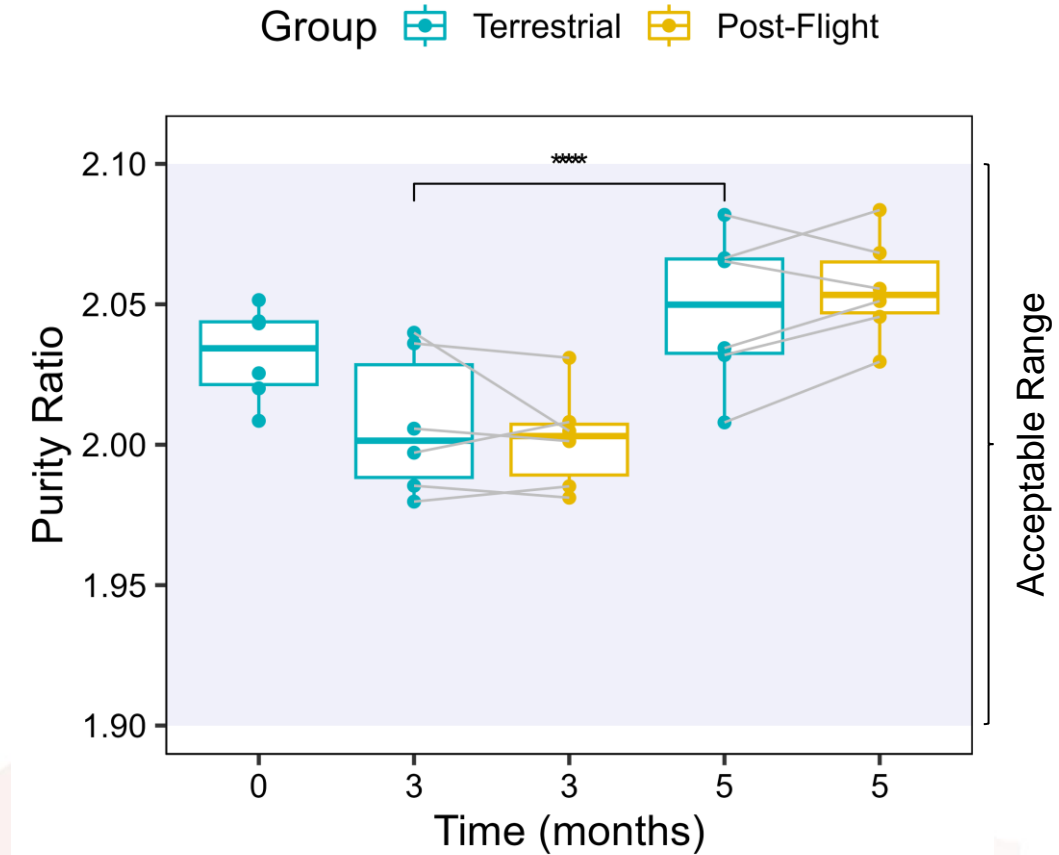
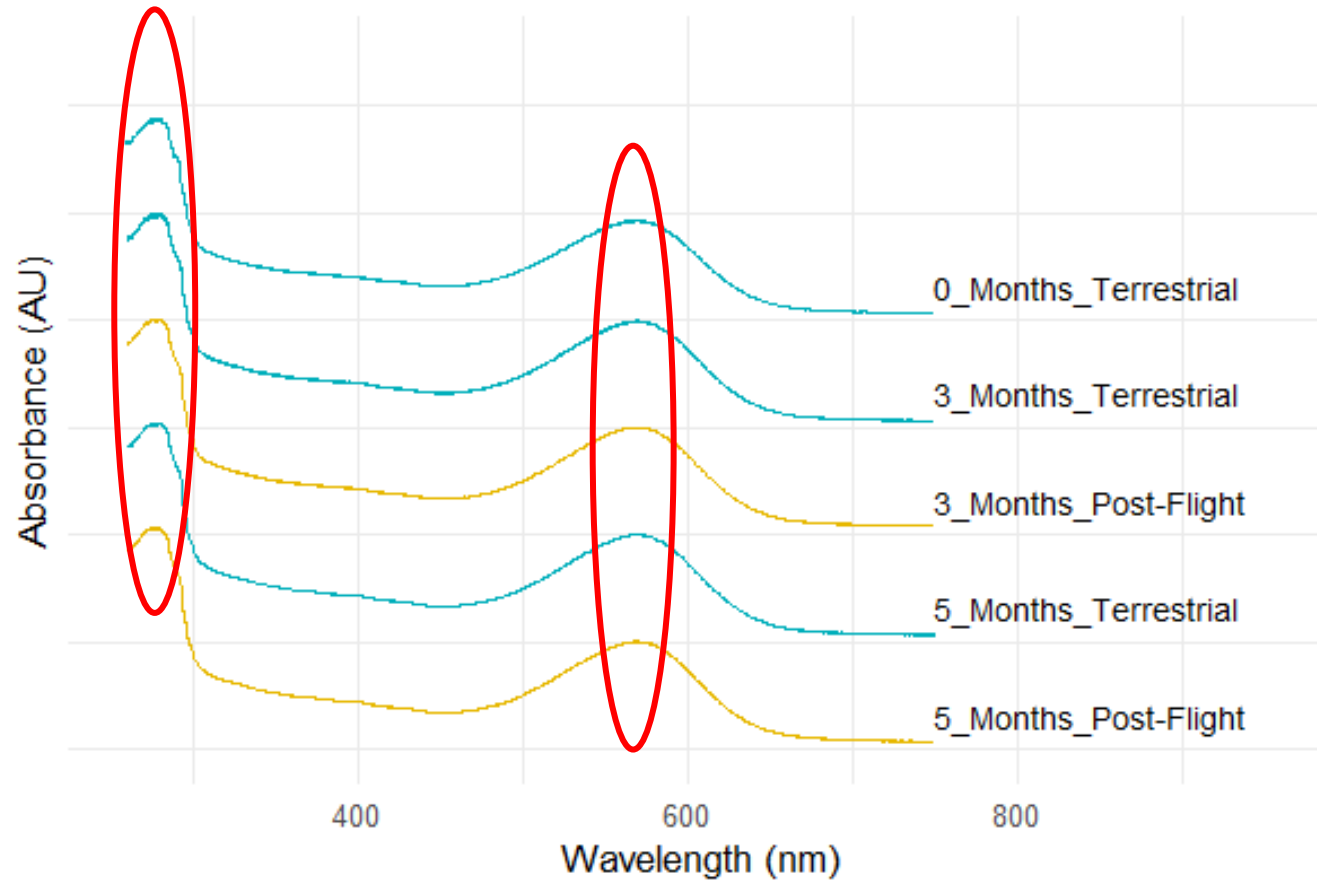


pH

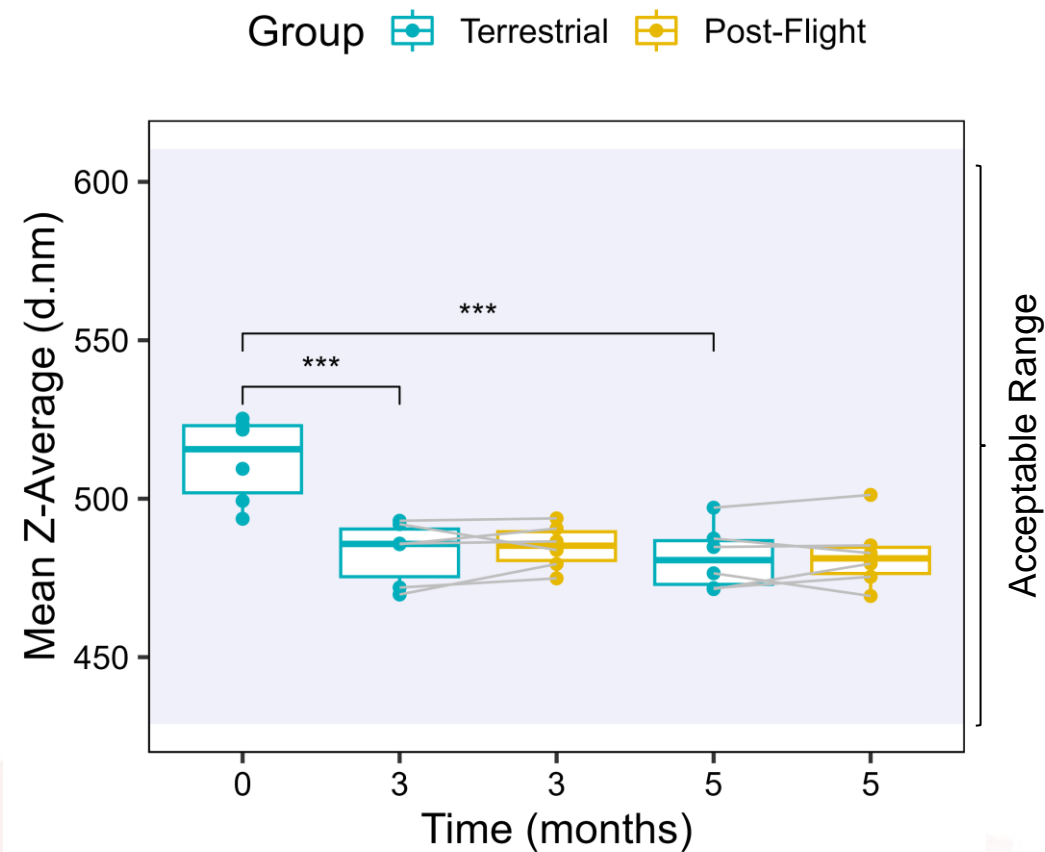
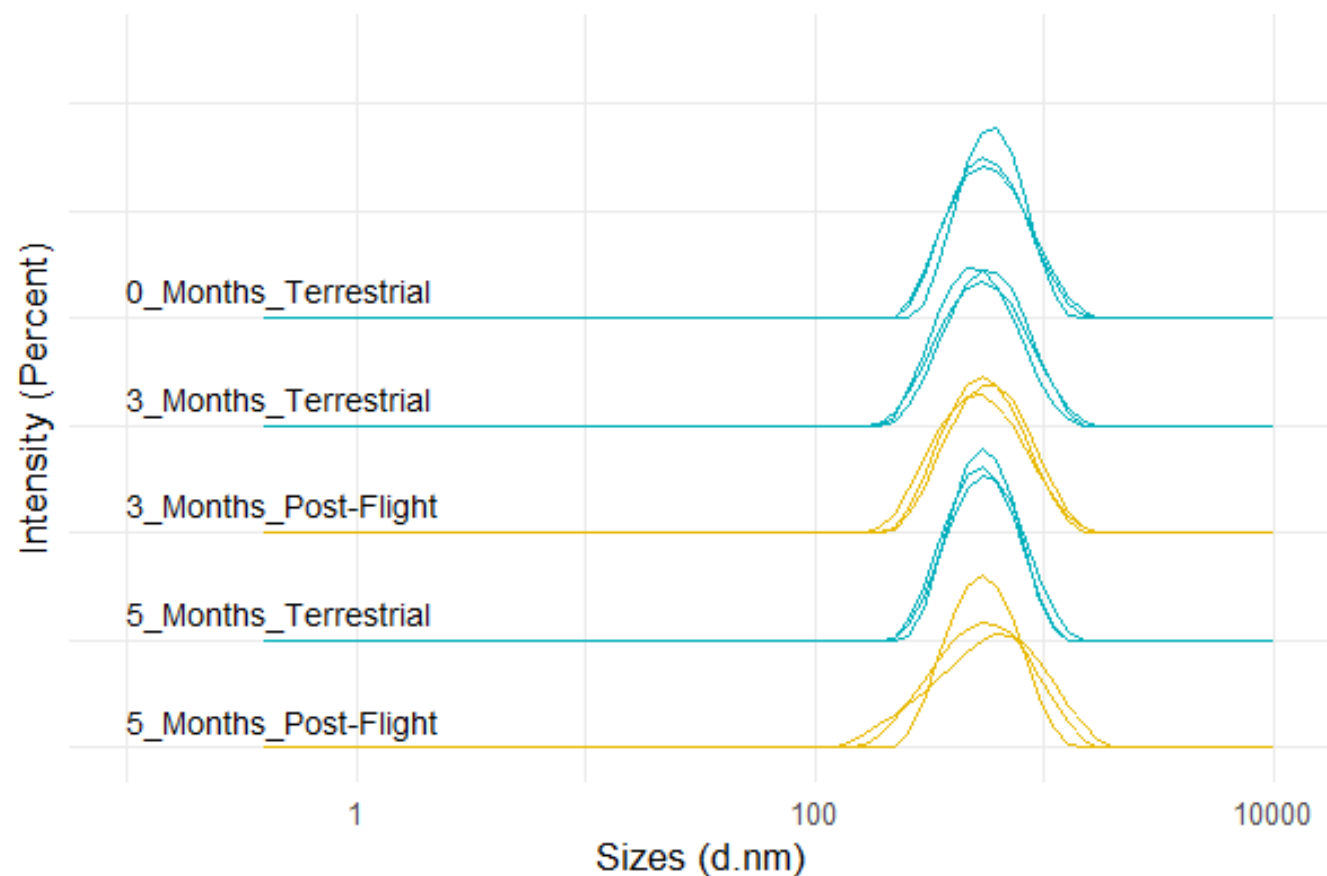
Concentration



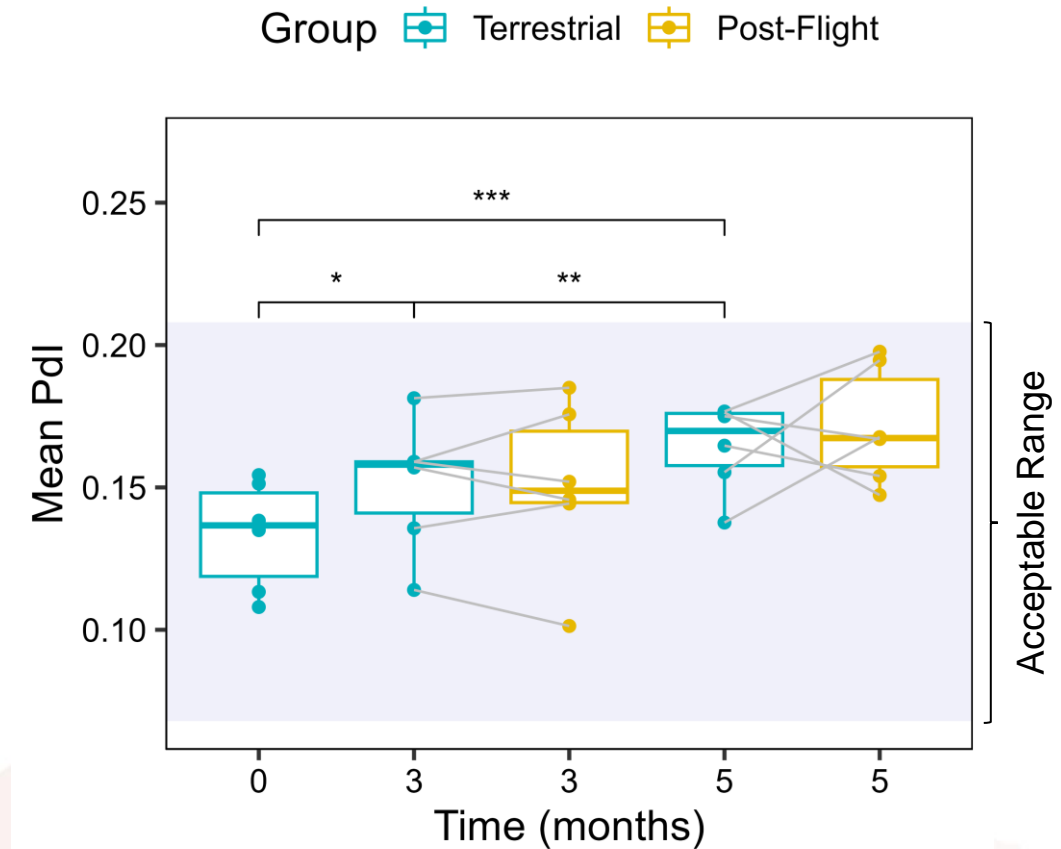
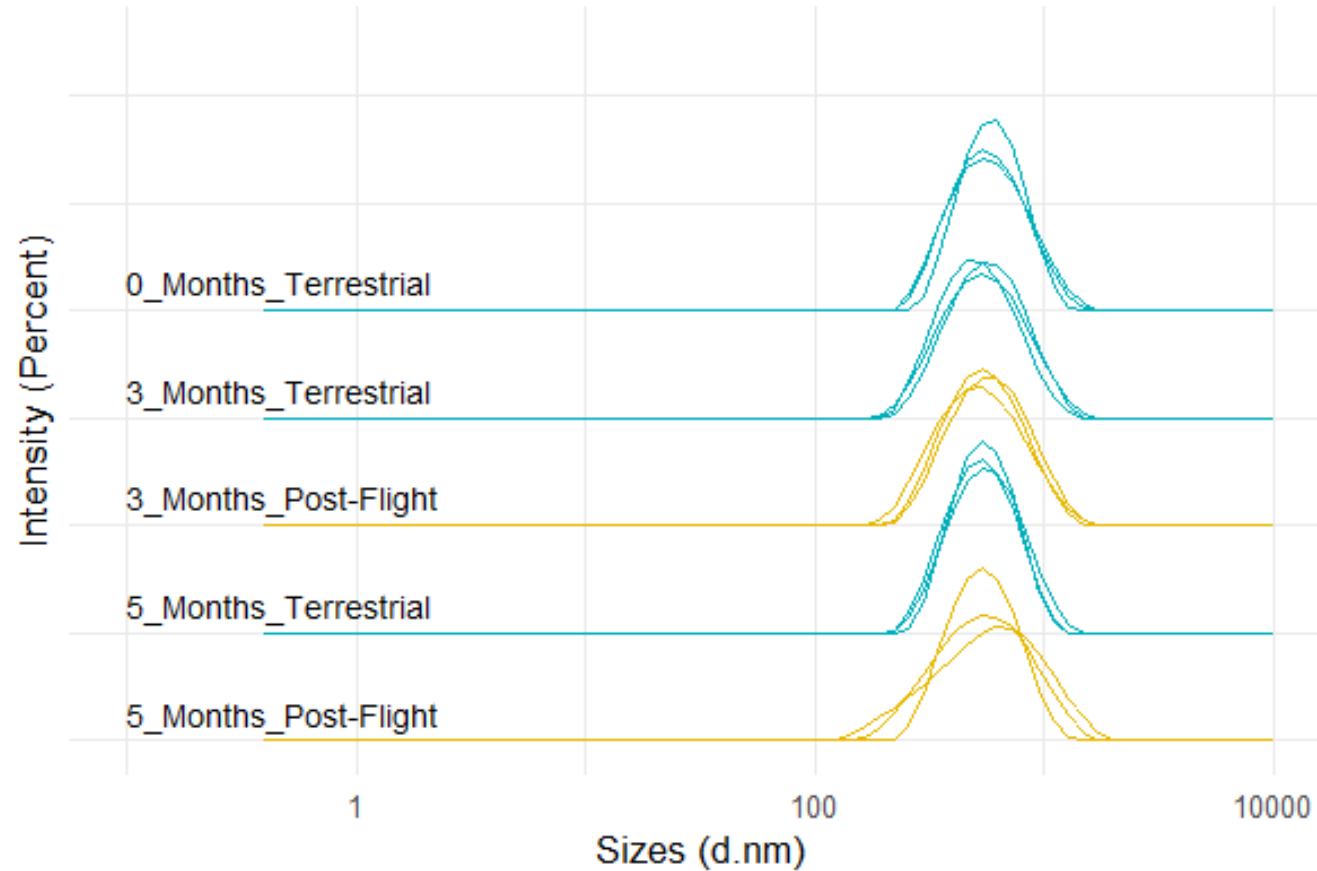
Purity



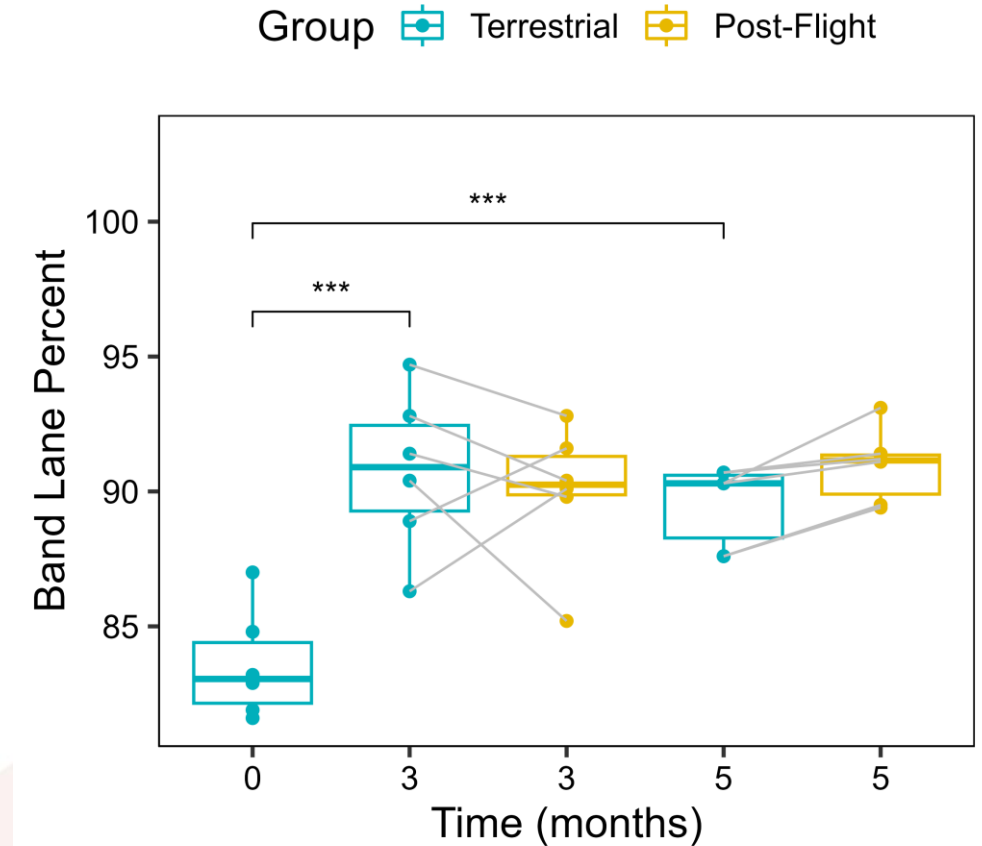
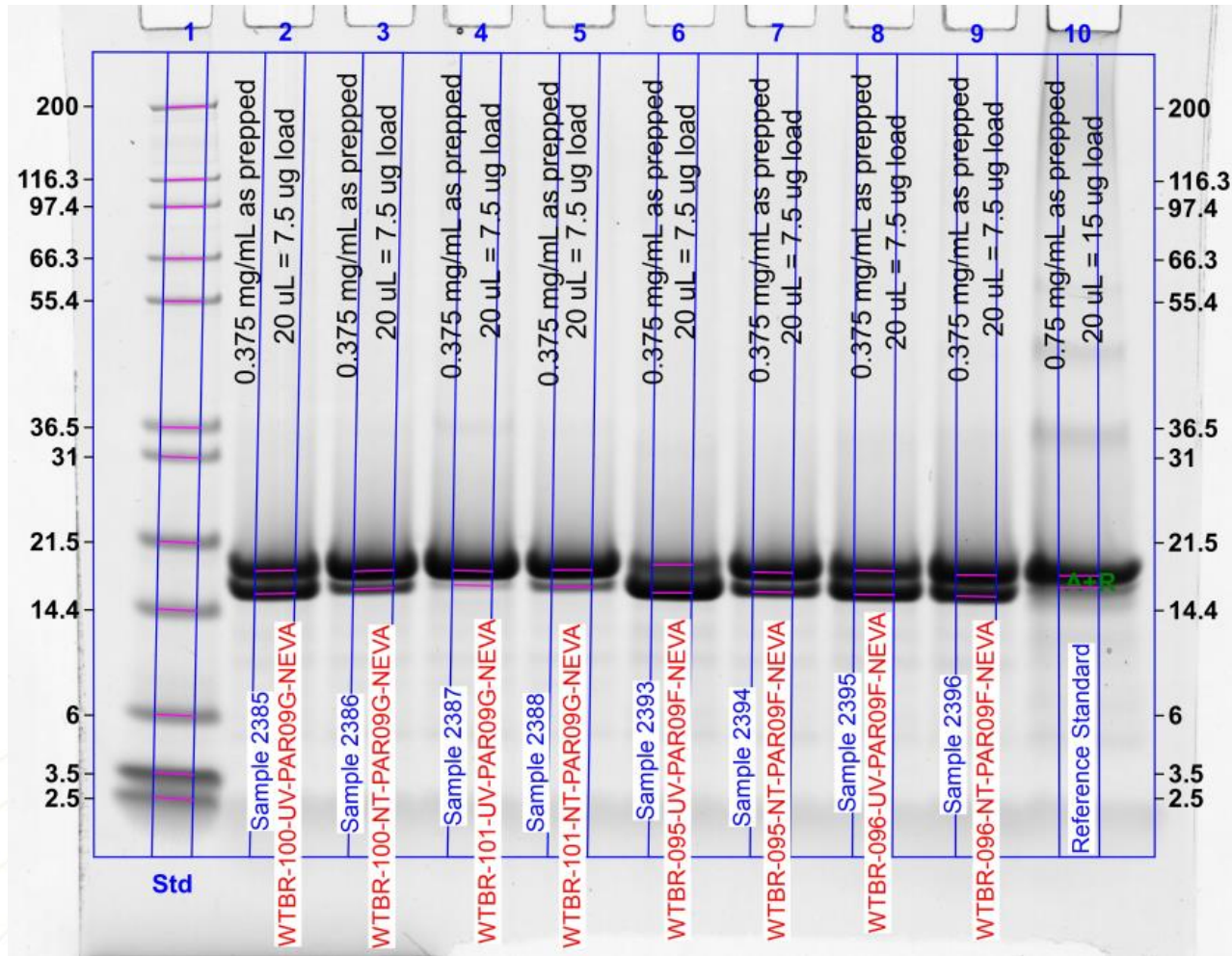
Particle Diameter



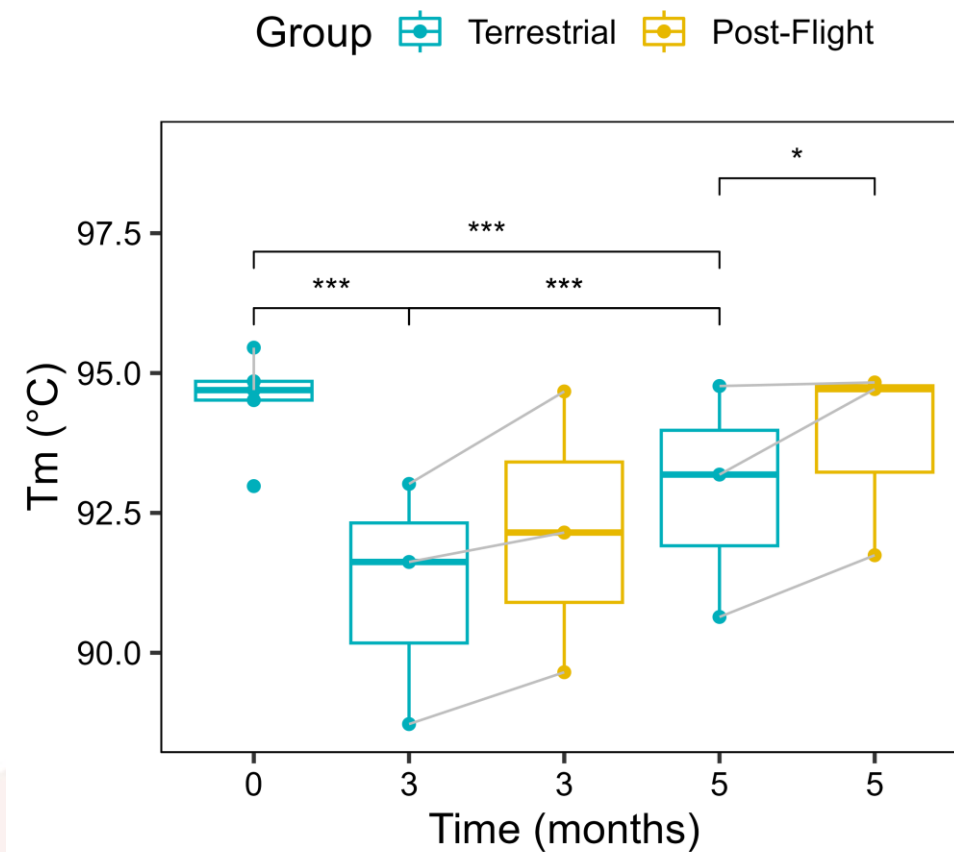
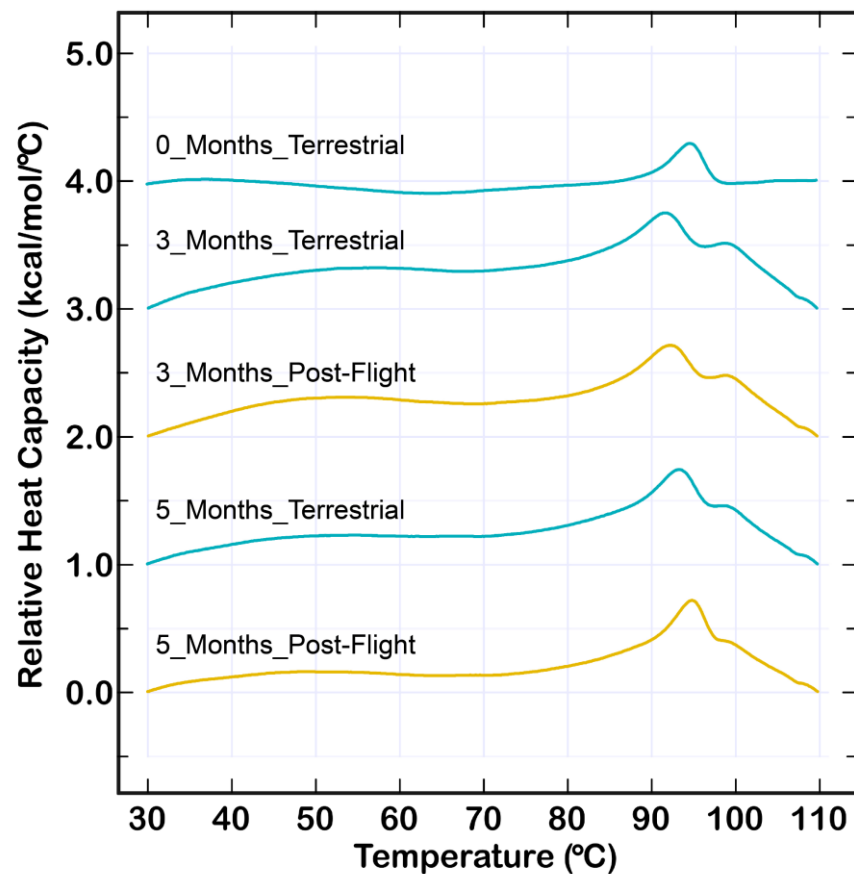
Solution Homogeneity



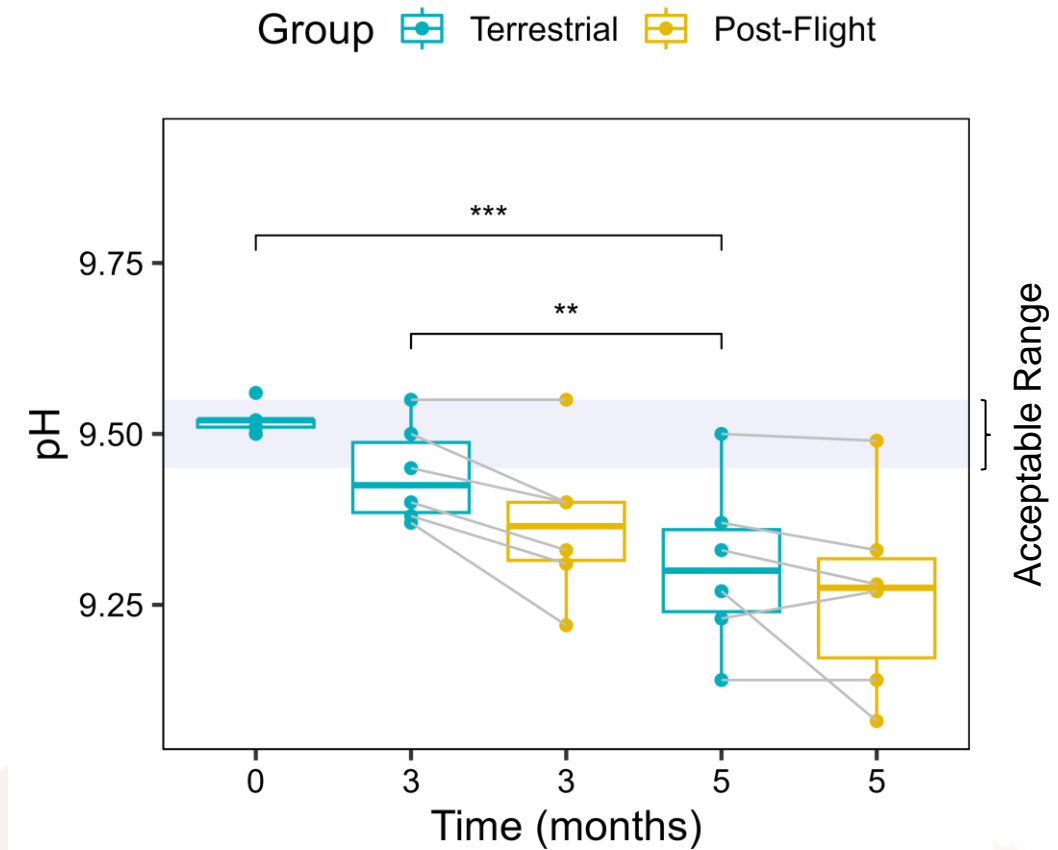
Protein Fragmentation



Thermal Stability



pH



Conclusions

- Time has an impact on all measured drug substance properties
- Majority of values remained within acceptable ranges
- The LEO environment does not appear to have a negative impact on the function or stability of the drug substance.

Ongoing Analysis

- Incorporate additional variables into the linear mixed model
 - Radiation
 - Temperature
 - Humidity



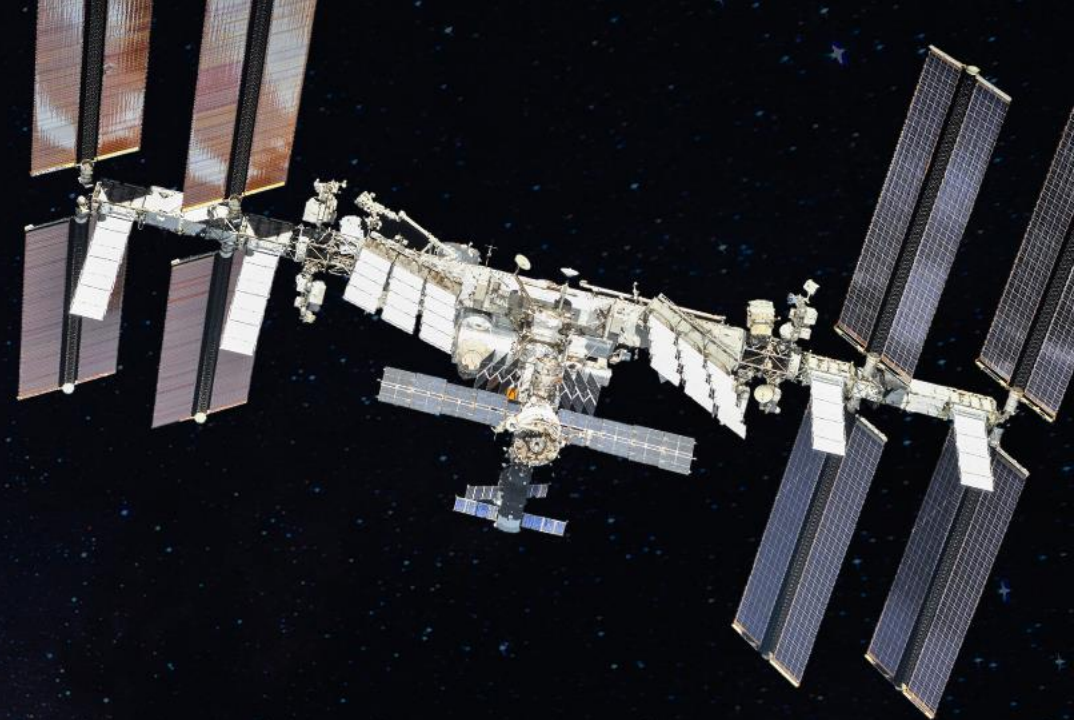
NASA



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2024 Technical Sessions



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