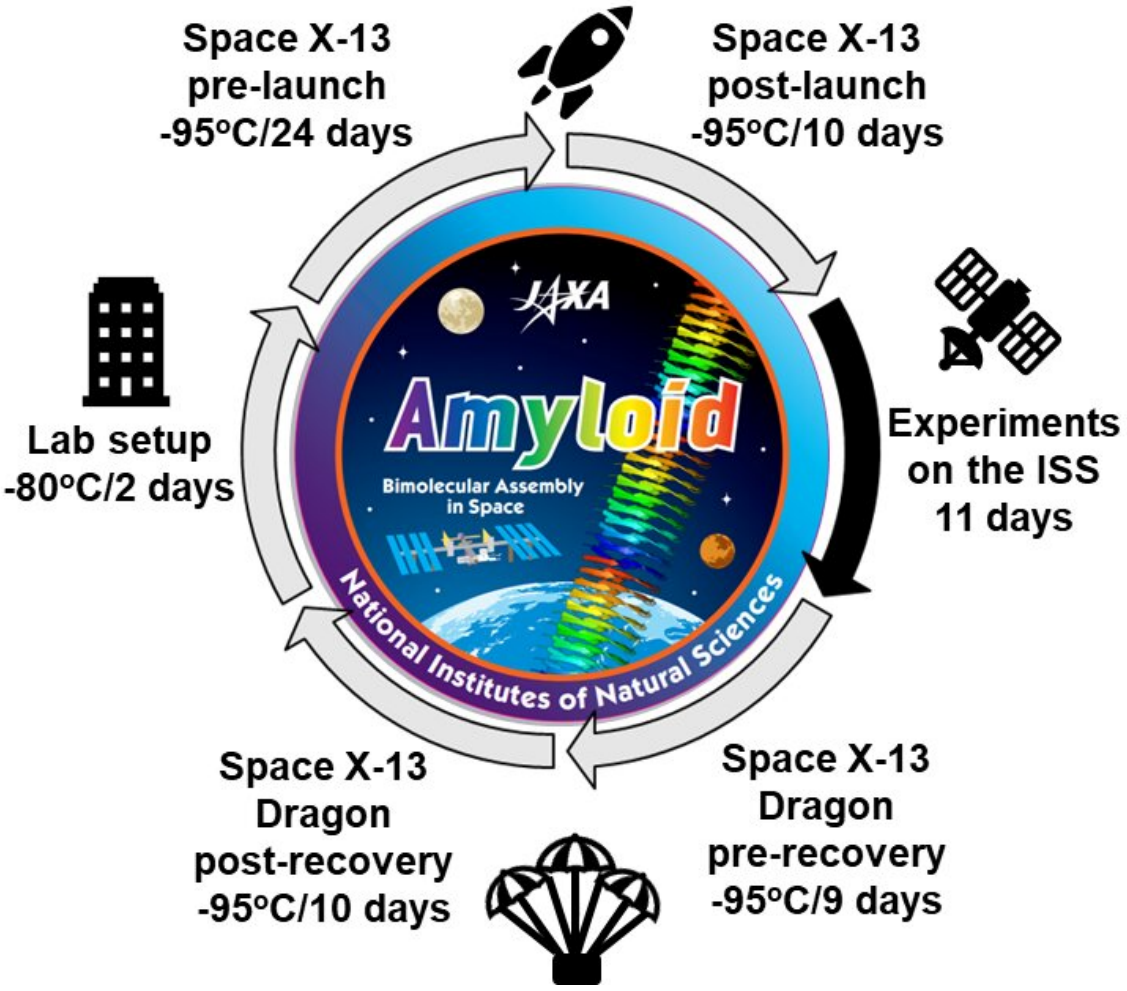
Amyloid formation on the International Space Station

June 16 2020

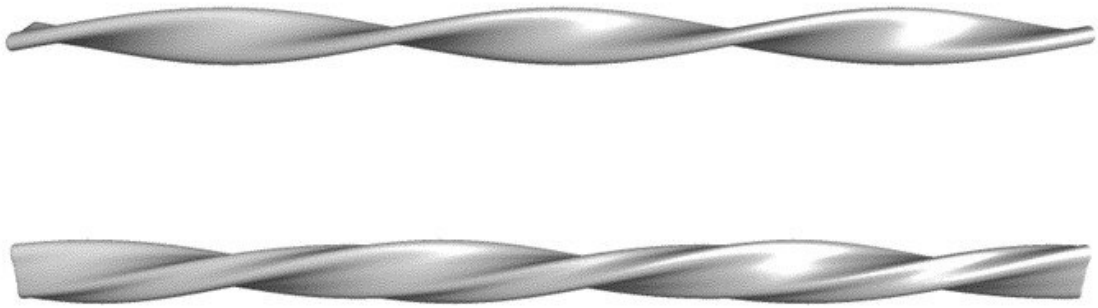


Decal of the project and timeline of the space experiment performed on the ISS. Credit: JAXA/NINS

Amyloids, abnormal fibrillar aggregates of proteins, are associated with various disorders such as Alzheimer's disease. Therefore, an in-depth understanding of the mechanisms of amyloid formation is critical for developing clinical strategies and drugs against these diseases. However, accumulating evidence suggests that amyloid formation processes and the consequent morphology of fibrils can be affected by various environmental factors. This is an obstacle for the integrative understanding of the mechanisms underlying amyloid formations. As gravity causes convectional perturbations in the microenvironments surrounding amyloid fibrils in solution, it may unavoidably affect the processes of molecular assembling.

To test this possibility, the collaborative research team of Japan, involving Exploratory Research Center on Life and Living Systems (ExCELLS), Institute for Molecular Science (IMS), and National Institute for Physiological Sciences (NIPS) of National Institutes of Natural Sciences, Nagoya City University (NCU), and Japan Aerospace Exploration Agency (JAXA), characterized amyloid formation under microgravity conditions using the International Space Station (ISS).

They compared the fibril formation of Alzheimer's disease-related amyloid β (Aβ) proteins on the ISS with that on the Earth and found that the process of Aβ fibrillization significantly slowed down in the microgravity environment. Furthermore, distinct morphologies of Aβ fibrils were formed on the ISS. Therefore, the project highlights the utility of the ISS as an ideal experimental environment for investigating the mechanisms of amyloid formation without uncontrollable perturbations caused by gravity, thereby providing fundamental insights into the pathological amyloid formation.



Distinct morphologies of Aβ fibrils formed under microgravity conditions. Credit: JAXA/NINS

More information: Maho Yagi-Utsumi et al, Characterization of amyloid β fibril formation under microgravity conditions, *npj Microgravity* (2020). DOI: 10.1038/s41526-020-0107-y

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