IJSEP Experiment Guide:
Using Biological Materials

Experiments in space are exciting — and working with biological materials makes them even more interesting! But to design a safe and successful experiment for the **International Journey Spaceflight Experiments Program (IJSEP)**, there are some important things you need to know.

This guide explains how to **store, activate, and preserve biological samples** for your IJSEP experiment.

🚀 1. Understanding the Mission Timeline

Your experiment will travel from your school to the **International Space Station (ISS)** and back.
Here's what happens:

- **Launch preparation and transport to ISS:** about **3 weeks**.
- **Experiment time in orbit: 4–6 weeks**.
- **Return to Earth: 1–3 days**, plus extra time for shipping back to your team.

Because this whole trip takes several weeks, **living organisms can't stay active the entire time** — they would use all their nutrients and die before reaching space.

🌱 2. Use Dormant (Inactive) Forms of Organisms

It's best to use biological samples that can "sleep" until the right moment.

Examples:

- **Seeds** that start growing only after water is added.
- **Bacteria spores or dried microorganisms** that "wake up" when nutrients or water are added.
- **Freeze-dried (lyophilized) cells or tissues**, which can be rehydrated later.

💡 **How to design your experiment:**
Example of how you can load your FME tube:

- **Compartment A:** the dry or dormant sample.
- **Compartment B:** the activating solution (like water or nutrient medium).
  When the astronaut opens the clamp, the two mix and the experiment begins!
- **Compartment C:** a fixative / preservative / stabilizer solution.

If you need help choosing the best dormant form, activator or fixative, talk to a **local university or research lab**. Scientists can guide you safely.

🧴 3. Stopping or Preserving the Experiment

Before returning to Earth, you may need to **stop or slow down** your biological experiment to keep results stable.
You can do this by adding either:

- **Fixatives** – chemicals that kill and preserve cells, keeping them close to their natural shape.
- **Growth inhibitors** – substances (often antibiotics) that stop cell growth without killing the sample.
- **Stabilizers** – protective compounds (such as *trehalose*) that help preserve proteins and other biomolecules by preventing damage during drying, freezing, or transport.

Examples:

Purpose	Type	Example
Preserve structure	Fixative	10% Neutral Buffered Formalin (contains formaldehyde)
Preserve RNA	Fixative	RNAlater (non-toxic)
Stop bacterial growth	Inhibitor	Rifampicin + Cephalexin
Stop cell growth	Inhibitor	Puromycin
Preserve proteins and biomolecules	Stabilizer	Trehalose (protects proteins, enzymes, and vesicles during drying or freezing)

⚠️ Fixatives can be **toxic or hazardous**. Teams must handle them carefully and may need help from a local lab. Growth inhibitors are usually safer but still need caution.

🧪 4. Important Safety Rules

IJSEP follows strict safety standards for all experiments.

You **cannot** use materials that are:

- Radioactive
- Perfumes or strong odors
- Hydrofluoric acid, acetone, or other dangerous solvents
- Magnetic materials, beryllium, or cadmium
- Biological samples with **Biosafety Level 2 or higher** (only non-pathogenic samples are allowed)
- Anything that produces **excess heat, gas, or pressure** when mixed

  → *See the document "IJSEP Experiment Guide: Materials That Cannot Be Used in Experiments" for the complete list of prohibited materials.*

⚠️ Check your materials with the **IJSEP Science Team** before finalizing your proposal.

🧬 5. Work with Local Scientists

Partnering with a local research lab or university is a great idea!

Scientists can help you:

- **Choose** the right biological sample and how to keep it dormant
- **Find** the best activating solution
- **Select** safe fixatives or inhibitors
- **Design** how to analyze the results after the experiment returns

Even better — many labs already have these materials, so you won't need to buy them.

🧫 6. If You Need to Buy Materials

Some trusted vendors that provide biological materials for educational or research use are:

- Sigma-Aldrich / Merck
- Thermo Fisher Scientific
- Lonza
- Nova Analítica
- Êxodo Científica
- Synth

Note: Some companies only sell to research institutions, not schools - another reason to collaborate with a local lab!

📑 7. Writing About Biologicals in Your IJSEP Proposal

When describing your experiment, make sure to explain:

1. **How you will store your samples** before launch (e.g., dormant form).
2. **How you will activate** them in space (e.g., adding water or nutrients).
3. **How you will stop or preserve** the experiment before return (e.g., fixative, inhibitor or stabilizer).
4. **How you will analyze** the results on Earth.

✅ It's a good idea to test small versions of your experiment on Earth before submission — that's exactly what real scientists do!

🌎 8. Final Tips

- Choose safe, non-toxic materials.
- Use small, contained samples.
- Think carefully about timing (activation and preservation).
- Ask for expert help when needed.

Remember: **IJSEP experiments are student-led** — teachers and scientists can guide you, but you are the scientists in charge!