

## Fact Sheet: University of Minnesota Institute for Engineering in Medicine and academic collaborators receive \$26M for engineering research center

The National Science Foundation awarded the University of Minnesota [Institute for Engineering in Medicine](#) \$26 million to create the Engineering Research Center (ERC) for Advanced Technologies for the Preservation of Biological Systems (ATP-Bio).

### Societal impact

ATP-Bio aims to achieve major bioengineering breakthroughs by developing and deploying the technology to “stop biological time” through temperature control – that is, to “biopreserve” or “cryopreserve” numerous biological systems. This will result in major societal impact:

- a. Revolutionize transplantation and other biological therapies by preserving and banking cells, tissues, and organs.
- b. Radically accelerate and shrink the cost of drug discovery and other medical research by preserving microphysiological systems (i.e. “organs-on-a-chip”) and organ slices.
- c. Feed the world sustainably by supplying cryopreserved embryos of important protein sources like fish, shrimp, and shellfish.
- d. Protect against mass casualty events by enabling indefinite banking of skin, tissues, and biological dressings.
- e. Radically expand medical research and protect biodiversity by enabling indefinite banking of key genetic lines of coral, zebrafish, and hundreds of other species.
- f. Improve physical trauma and battlefield treatment and pave the way for space travel by stabilizing bodies for hours or days until they can be successfully treated.
- g. Translate new preservation technologies into key global industries including regenerative medicine, organ and tissue transplantation, aquaculture, and pharmaceuticals.
- h. Expand the biopreservation workforce to support and grow these new preservation technologies within academia and global industries.
- i. Foster a culture of inclusion in our faculty, staff, students and stakeholders that upholds social justice, gender equality, diversity, and accessibility and promotes convergent team science.

## ATP-Bio Research Pillar

- a. ATP-Bio scientific research will center around “testbeds”, which are ATP-Bio's primary envisioned products, including cellular therapies, microphysiological systems, tissues and organs, and the preservation of aquaculture organisms.
- b. ATP-Bio scientific research is organized into three Thrust Areas: biological engineering, multi-scale thermodynamics of water, and uniform warming.
- c. ATP-Bio education research will focus on ways to strengthen STEM identity in students – especially girls and under-represented minorities – that results in the pursuit of STEM career pathways.

## ATP-Bio Engineering Workforce Development Pillar

We aim to build a more robust and diverse STEM workforce pipeline for the rapidly growing biopreservation industry.

- a. **Grades 6-10.** We will develop in-class engagement projects with local middle schools and high schools and offer research fellowships to teachers at these schools so that they can incorporate biopreservation science in their curricula. All of our partner schools have student populations with > 60% minorities under-represented in STEM fields.
- b. **Grades 11-12.** We will offer summer research internships in ATP-Bio labs.
- d. **Undergraduate.** Over the first five years of ATP-Bio, we will offer dozens of research internships in ATP-Bio labs and develop “bridge” research internships for community and state college STEM students who are transferring to ATP-Bio core institutions. We will also work with our industry collaborators to develop industry internships for undergraduates.
- e. **Graduate and Postdoc.** ATP-Bio will sponsor dozens of graduate students and postdoctoral researchers in ATP-Bio labs. In addition to intense biopreservation-related research and training, we aim for each graduate student and postdoc to engage in at least one industry-related research project while they are a part of ATP-Bio.
- f. **Industry collaborators.** ATP-Bio will incorporate industry collaborators in all areas of research and ATP-Bio meetings, symposia, and conferences.

## ATP-Bio Diversity and Culture of Inclusion Pillar

- a. We aim to increase the diversity of students and professionals in STEM fields and to strengthen the inclusivity of ATP-Bio labs and ATP-Bio events.
- b. We will work to establish connections and best practices to build our culture with Equity and Diversity programs on all core campuses and with our ATP-Bio industry partners.
- c. Our culture will build skills and tools for ATP-Bio faculty, students, staff and stakeholders to engage in social justice, conflict resolution, equal opportunity, and affirmative action.

## ATP-Bio Innovation Ecosystem Pillar

- a. Industries using biopreservation have a current market size over \$350B and are expected to grow rapidly over the next two decades. Improved biopreservation will help accelerate this growth. These industries include regenerative medicine, organ and tissue transplantation and research, and aquaculture.
- b. We currently have over 50 companies committed to collaborate with ATP-Bio. These include biomedical companies, aquaculture companies and organizations, organ and tissue procurement organizations, venture capital firms, scientific societies, and industrial societies.
- c. We will have an approved blanket IP sharing policy among the core institutions within 90 days of the award. We will use both exclusive and non-exclusive licensing strategies to translate our technologies to our companion companies and beyond.

## ATP-Bio Ethics and Public Policy

- a. We will guide ethical development and deployment of ATP-Bio technologies by conducting embedded ethics analyses with research teams, developing plausible use cases and anticipatory governance approaches to ATP-Bio technologies, and publishing ethics and policy analyses.
- b. We will advance ethics in ATP-Bio research by augmenting standard review (i.e. IRB and IACUC), identifying and analyzing ethical issues across the institutions involved in our research, and providing a forum for ATP-Bio participants to raise ethical questions related to research.
- c. We will collaborate on training ATP-Bio participants in ethics through use of a web portal for resources, featured ethics and policy events and discussions, development of trainings and courses, and opportunities for trainees to participate with Ethics and Policy leaders in analysis of the challenges, appropriate societal adoption, and anticipated impact of ATP-Bio technologies.