Science Advancement & Outreach
A DIVISION OF PETA

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Request for Information on the Tech Labs Initiative for the U.S. National Science Foundation's Directorate for Technology, Innovation and Partnerships

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I'm writing on behalf of Science Advancement and Outreach, the biomedical research policy division of People for the Ethical Treatment of Animals, to recommend that the Tech Labs initiative focuses on supporting full-time research, development and innovation (RDI) teams that are developing emerging, commercially viable non-animal technologies to address the failure of animal experimentation to translate into effective cures and treatments for human diseases.

Studies have shown that conducting experiments on animals to study human diseases is flawed and inefficient, diverting both financial and intellectual resources away from more predictive, human-relevant methods. The genetic, molecular, cellular, and physiological differences between species explain the many failures in extrapolating results from animal experiments to humans. This is reflected in several widely cited findings:

- 95% of new drugs fail in human clinical trials,[1] even though they passed both safety and efficacy testing in animals.
- 90% of basic research, much of it conducted on animals, fails to enter routine clinical use within 20 years.[2]
- An estimated 89% of preclinical studies, costing $48 billion annually, cannot be reproduced.[3]
- Animal tests fail to predict human drug side effects in 81% of cases.[4]

These persistent failures can be addressed by accelerating the development and adoption of non-animal, human-relevant technologies. These methods rely on human cells, tissues, and data and are therefore better suited to predicting human biological responses. For example, a human blood-vessel-on-a-chip system developed by Emulate in collaboration with Janssen Pharmaceuticals successfully predicted thrombosis caused by an anti-CD154 therapeutic antibody—an adverse effect that was not detected in animal studies, resulting in the drug advancing to clinical trials and subsequently causing serious harm in patients.[5]

Although the field of non-animal method (NAM) development is rapidly advancing, significant barriers remain—particularly, targeted funding to support scale-up, validation, and commercialization remains limited. The Tech Labs program is well-positioned to address these gaps by enabling NAM-focused teams to reach their full potential and deliver transformative technologies with real-world applications, improving translational success and contributing to the modernization of the drug development pipeline.

2. What, if any, substantive comparative advantage (as compared to standard grants and other existing NSF programs) could the NSF Tech Labs program model provide in efforts to accelerate and advance U.S. competitiveness – either across various key technologies or within a specific technology focus area?

Compared to standard grants and other existing NSF programs, the NSF Tech Labs program model is exactly what is needed to develop commercially viable, human-relevant, non-animal technologies for drug development. As outlined in the background of this RFI, the goal of the NSF Tech Labs initiative is to support interdisciplinary RDI teams focused on developing emerging technologies that can be commercialized in areas where translation of research into practical, real-world applications has historically been a challenge.

As noted above, there is an urgent need to develop NAMs to replace animal testing in drug development, given the high failure rate of drugs in human trials. Developing effective NAMs requires interdisciplinary teams composed of basic and preclinical researchers, clinical scientists, and industry partners working together to create technologies that accurately assess drug safety and efficacy prior to human use.

A major barrier to the development of NAMs has been the lack of sustained resources and cross-sector collaboration. Many researchers interested in adopting these methods report uncertainty about how to get started or who to collaborate with, particularly if no other faculty members at their institution are developing or using these technologies. Additionally, the lack of dedicated funding streams for NAMs has been widely cited as a significant concern.[6] The Tech Labs program directly addresses these challenges by providing targeted funding for teams that bring together researchers from academia, startups, industry, and other sectors. This model promotes flexibility and encourages researchers to form collaborations beyond their home institutions, which in turn has the potential to accelerate progress toward scalable, human-relevant methods with superior predictive power, strengthening U.S. competitiveness in biotechnology and drug development.

4a. *Which types of teams and organizations should be considered eligible to apply for the NSF Tech Labs program? What restrictions on team eligibility should be in place to maximize speed and ensure novel impact?*

Eligibility for the NSF Tech Labs program should be limited to teams and organizations that do not use animals and are focused on developing NAMs to improve the translation of preclinical findings into effective therapies for human diseases. Restricting eligibility in this way would maximize speed and ensure novel impact by moving the program away from entrenched approaches that have repeatedly failed to translate to human health. Animal experimentation is inherently constrained by fundamental biological differences between species and by experimental environments that do not recapitulate the environmental contexts of human diseases. Decades of efforts to modify or "humanize" animal models have not overcome these limitations or improved translational success. In contrast, NAMs represent a rapidly advancing and underleveraged area of research with significant potential for innovation. Limiting eligibility to teams developing human-relevant methods would ensure that Tech Labs resources are directed toward new approaches rather than incremental refinements of outdated and ineffective models, accelerating progress and positioning the program to deliver transformative advances in biomedical research.

5. What opportunities do you see for synergy with research and development efforts that are or could be funded by industry or philanthropic organizations? What partnership structure would allow Tech Labs to leverage federal and private support for maximum benefit?

There are NAMs development teams that are funded, or well-positioned to be funded if given the opportunity, by industry or philanthropic organizations, that would still benefit substantially from the sustained, cross-sector support provided by the Tech Labs initiative. For NAMs development, an effective NSF partnership structure could involve collaboration among biotechnology companies, research universities, and research institutions. Under this model, the Tech Labs initiative could focus on supporting early-stage discovery and foundational research, while industry partners provide resources and

expertise for later-stage development, validation, and real-world application. This division of roles aligns with typical research practice: universities and research institutions often lead early discovery and method development, whereas industry partners are well-positioned to support scale-up, integration into existing pipelines, and downstream adoption. A governing committee composed of representatives from each participating organization could coordinate priorities, manage resources, and provide strategic oversight. Such a structure would enable Tech Labs to leverage complementary federal, industry, and philanthropic investments effectively, maximize efficiency, and accelerate the development and adoption of innovative NAMs.

6. What translational problems, challenges and/or bottlenecks could be addressed within 3-7 years with this program design? Answers can be broad or specific.

As discussed in the responses above, a major translational problem that could be addressed within a 3–7 year timeframe through the Tech Labs program is the development and validation of human-relevant, non-animal methods for testing new therapeutics in disease areas where preclinical drug development using animals has repeatedly failed to translate into effective treatments. While a growing number of NAMs are already being used in preclinical research—and some have contributed to drug candidates advancing into clinical trials[7,8]—these approaches have yet to reach their full potential due to fragmented funding, limited cross-sector coordination, and insufficient support for validation and scale-up.

One specific area where the Tech Labs model could have particularly high impact is women's health. Women's health conditions have historically been underfunded and understudied, despite the substantial burden associated with disorders such as infertility, endometriosis, adenomyosis, and menstrual-related conditions.[9] A central barrier to progress in this field is the continued use of research approaches that do not reflect human female biology. Fundamental differences in reproductive anatomy[10] and endocrinology[11] across species prevent the use of other animals for studying female human health. Animals commonly used in experiments, such as mice, do not menstruate, undergo menopause, or experience the hormonal transitions that define key stages of human reproductive health.[12,13]

As a result, human-based experimental systems are essential to advancing research in women's health. Promising efforts are already underway, including the development of human organ-on-chip models of menstruation[14] and other reproductive tissues,[15] as well as the use of human organoids and systems biology approaches to study conditions such as endometriosis and adenomyosis.[16,17] However, these initiatives remain largely siloed and under-resourced relative to their potential impact.

The Tech Labs program can address these bottlenecks by providing sustained, team-based support that enables collaboration among academic researchers, engineers, clinicians, and industry partners. Within a 3–7 year window, this model could support the maturation, validation, and scaling of human-relevant platforms for women's health, accelerating drug development timelines and improving translational success in an area of human biology where effective treatment options are urgently needed.

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