



Science Advancement & Outreach  
A DIVISION OF PETA

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## **Request for Information (RFI): Gathering feedback for the National Eye Institute 2026-2031 Strategic Plan**

Submitted online on April 15, 2026

*1. NEI invites feedback on significant scientific or technological advancements that may enable new opportunities in four core pillar framework areas (Foundational Science, Translational Science, Clinical & Population Science, and Training & Metascience).*

We are writing on behalf of Science Advancement and Outreach, the biomedical research policy division of People for the Ethical Treatment of Animals, to provide suggestions for improving the National Eye Institute Strategic Plan for 2026-2031.

Significant scientific and technological advancements in non-animal, human biology-based methods are poised to enable new opportunities across both foundational and translational science in eye and vision research. Artificial intelligence (AI) has already had a meaningful impact at the National Eye Institute (NEI), as highlighted in its most recent strategic plan, which referenced an FDA-approved AI system for detecting diabetic retinopathy. However, an expanding range of human-relevant approaches is rapidly emerging with transformative potential for eye disease research.

For example, patient-derived optic organoids combined with multi-omic analyses have uncovered a novel role for PAX6 in regulating SOX2 and Notch signaling during early eye development, providing mechanistic insight into PAX6-related ocular disorders (<https://doi.org/10.1016/j.bbadis.2025.167869>). Similarly, advances in retinal organoids are enabling deeper insights into retinal development and disease. These systems have been used to identify genes associated with glaucoma (<https://doi.org/10.1016/j.xgen.2022.100142>), optimize conditions to enhance retinal ganglion cell survival and function—enabling longer-term studies of neuronal maturation and connectivity (<https://doi.org/10.1016/j.stem.2025.12.013>), and model disease mechanisms such as nitric oxide-driven retinal cell death and metabolic disruption in Leber hereditary optic neuropathy (<https://doi.org/10.1016/j.ajpath.2025.05.006>). Platforms such as human corneal epithelium-on-a-chip systems are also enabling more precise modeling of conditions like dry eye syndrome (<https://doi.org/10.1038/s41598-024-54736-z>).

While NEI has initiated important efforts in this space, including the development of the AI algorithm POLARIS (<https://www.nih.gov/news-events/news-releases/nih-scientists-develop-digital-twin-eye-cells-understand-treat-age-related-macular-degeneration>) and collaboration with

the All of Us Research Program and the National Institute of Biomedical Imaging and Bioengineering on the Eyes on Health study (<https://allofus.nih.gov/article/all-of-us-research-program-launches-eyes-on-health-study>), there is substantial room for NEI to expand these efforts and fully leverage the transformative potential of human-based methods. NEI's next strategic plan should prioritize the development, validation, and funding of human biology–based systems for foundational and translational vision science.

2. *NEI invites feedback on current needs, gaps, opportunities, and emerging areas in research, health, and quality of life that NEI should consider addressing in four core pillar framework areas (Foundational Science, Translational Science, Clinical & Population Science, and Training & Metascience).*

A current gap in research that NEI should address for foundational and translational science is the continued reliance on animal experiments to study human eye diseases, despite the availability of numerous human biology–based methods that have the potential to advance the field significantly. For over 50 years, NEI has conducted and supported research on visual disorders, yet several blinding diseases, such as glaucoma and macular degeneration, still lack cures. A major reason for this stalled progress is the use of animals in experiments to study these diseases, as human ocular biology differs fundamentally from that of other species.

For example, when comparing the mouse retina to the human retina, the mouse eye lacks a macula or fovea, has a different distribution and number of rod and cone cells, and possesses a thinner Bruch's membrane (<https://doi.org/10.1371/journal.pone.0141597>; <https://doi.org/10.1371/journal.pone.0125631>; <https://doi.org/10.1016/j.preteyeres.2020.100844>). Additionally, distinct gene expression patterns relevant to age-related macular degeneration have been identified in the retinal pigment epithelium of mice and humans, including differences in oxidative stress pathways, tight junction proteins, and key regulator CFHR1 (<https://doi.org/10.1371/journal.pone.0141597>). Regarding light detection, mice have only two opsins compared to three in humans (<https://doi.org/10.7554/eLife.56840>).

Differences relevant to glaucoma research include morphological distinctions in the optic nerve head—such as the absence of a lamina cribrosa in mice—and differences in protein expression in the trabecular meshwork, including extracellular matrix and cytoskeletal components (<https://www.sciencedirect.com/science/article/pii/S2162098923006060>; <https://doi.org/10.1038/s41598-024-73057-9>). Humans also have more retinal ganglion cells with higher density and less diverse types than mice. Additionally, mice do not normally develop glaucoma, and genetic risk factors underlying severe glaucoma in humans fail to produce equivalent disease severity in mice (<https://doi.org/10.1016/j.tins.2024.09.010>).

Currently, NEI administers 510 projects, accounting for \$262,737,510 in federal funding, for projects involving animal experimentation (<https://reporter.nih.gov/search/WGtnxfRut0G4KeAnXRRE6Q/projects/charts>). NEI should not renew funding for these experiments and should include a statement in the next strategic plan

reflecting its unwillingness to fund them in the future. Instead, the plan should prioritize human biology–based systems for foundational and translational vision science, as discussed above.

3. *NEI invites feedback that addresses alignment with the NIH Unified Strategy, which includes artificial intelligence, real-world data platforms, new approach methodologies (NAMs, including organoids, complex microphysiological or stem cell-based systems, digital twins, in chemico and in silico approaches that mimic human tissue, and biomedical data to facilitate discovery, testing, and refinement of new therapies), replication and reproducibility, nutrition, solution-oriented approaches in health disparities research, training future biomedical scientists, and others.*

We support alignment of NEI with the NIH Unified Strategy around the following priorities: establishment of the Office of Research Innovation, Validation, and Application (ORIVA); inclusion of non-animal methods (NAMs) considerations in all new funding opportunities; and training programs that prepare future physicians and scientists to lead American preeminence in biomedical research in the 21st century.

Once established, NEI should collaborate with ORIVA to develop, validate, and scale the use of NAMs in eye and vision research. These methods, which use human cells, tissues, and clinical data, provide more accurate predictions of drug responses and disease mechanisms than do animal experiments (<https://doi.org/10.1038/s43856-022-00209-1>; <https://doi.org/10.1002/advs.202103241>). Additionally, human ocular biology differs fundamentally from that of any other species, making it impossible to translate findings from animal eyes to human eye diseases. Continuing to fund and conduct animal experiments slows scientific progress, misdirects research efforts, and wastes resources. NIH recognizes the need to advance science using the most translationally relevant approaches and is establishing ORIVA to bring these human-based methods to their full potential. It is crucial that the NEI assists NIH in this endeavor, as this will ensure that NEI is able to fulfill its mission of eliminating vision loss and improving the quality of life for patients with blinding diseases.

NEI should ensure that new funding opportunities prioritize NAMs. Although NIH recently announced a \$150 million investment in human-based research (<https://www.nih.gov/news-events/news-releases/nih-invests-150-million-human-based-research-reduce-use-animal-models>), this remains small relative to typical annual NIH spending on animal experiments (<https://www.ncbi.nlm.nih.gov/books/NBK100123/>). Limited investment in NAMs restricts the ability to refine, validate, and scale these methods. By prioritizing NAMs in funding opportunities, NEI can accelerate adoption and drive innovation in eye and vision research.

NEI training programs should focus exclusively on non-animal methods to equip scientists with the skills needed to maintain the U.S.'s position as a global leader in biomedical research. NAMs often require expertise not only in traditional cell biology but also in bioengineering and, in some cases, computational biology. Because these approaches are relatively new, training opportunities remain limited, costly, and often inaccessible to smaller institutions and early-career researchers.

NEI could collaborate with academic and research institutions to develop training grants, continuing education programs, and early independence awards for early-career investigators. By making training in non-animal methods more accessible and collaborative, NEI can reduce animal use, foster interdisciplinary integration, and ensure that U.S. researchers remain globally competitive in advanced biotechnology and AI-driven health solutions.

*4. Are there additional perspectives, innovative ideas, or considerations we should be aware of to ensure the success of this initiative?*

In addition to alignment with the NIH unified strategy, NEI should incorporate priorities from our biomedical science policy framework, Research Modernization NOW (<https://www.peta.org/wp-content/uploads/2025/11/Research-Modernization-NOW-FULL.pdf>), to improve the overall quality and rigor of the science it supports. Specifically, NEI should conduct or commission systematic reviews of the research models it uses and funds in each disease area. Systematic reviews critically evaluate the breadth of available studies and can assess the effectiveness of animal use. By examining the internal, external, and construct validity of the models used in eye and vision research, they could help prevent unnecessary duplication and poorly designed studies that waste taxpayer dollars (<https://doi.org/10.1093/ilar/ilu042>; <https://brill.com/edcollbook-oa/title/35072>). Several U.S. funding entities, including NIH, are members of the Ensuring Value in Research Funder Forum (EViR), an international collaboration addressing waste in clinical and preclinical research. EViR advocates for research to be funded only if existing systematic reviews are available (<https://evir.org/our-principles-2/>). Resources for conducting systematic reviews are openly accessible (<https://clinical-brain-sciences.ed.ac.uk/camarades/tools-resources/systematic-review-animal-studies>; <https://doi.org/10.1258/la.2011.011087>), with some even provided by NIH (<https://www.nihlibrary.nih.gov/services/evidence-synthesis>). By conducting systematic reviews, NEI can ensure that its limited publicly-funded resources support only robust, high-quality, and valuable eye and vision research.