Mid-point Update on the ORIP Strategic Plan 2021-2025

…and an overview of ORIP programs/activities

Franziska Grieder, DVM, PhD, Director ORIP/DPCPSI

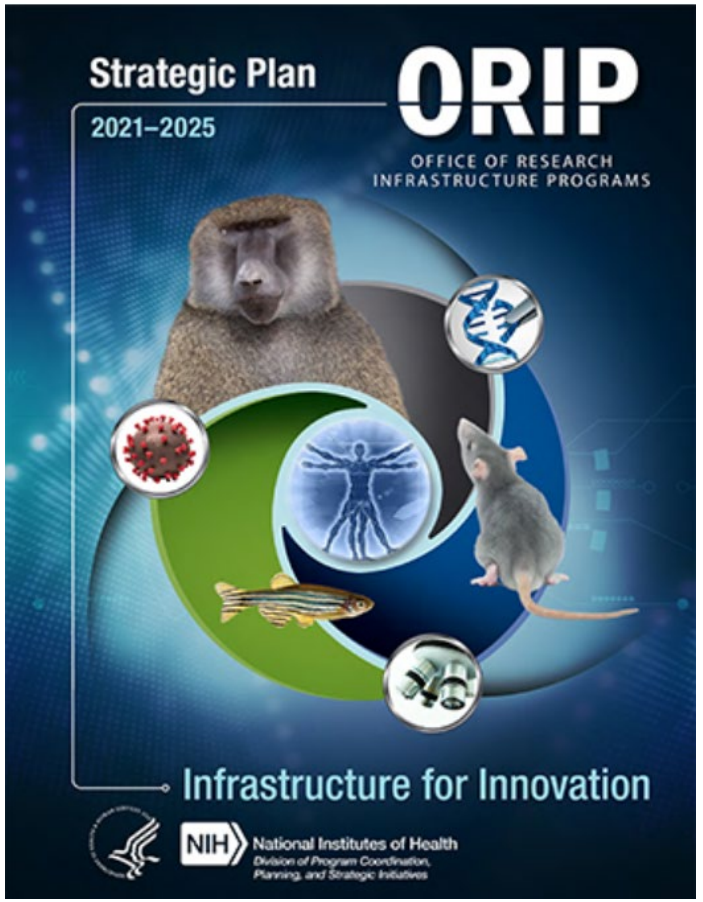
Council of Councils, January 25, 2024

Overview of the Current ORIP Strategic Plan (SP)

Organization of the SP in 4 Themes

Key points about ORIP programs

- SP developed during the COVID pandemic.
  - Significant work performed during the COVID pandemic.
- Progress analysis will be used for the planning process of the next ORIP Strategic Plan.
  - In August 2023, ORIP held an all-hands ORIP retreat to start planning for the ORIP 2026 – 2030 SP.
  - ORIP staff assumed ownership of specific Themes and Strategies to explore future directions.
- Two Council members agreed to serve as liaisons during the planning process – Drs. Kent Lloyd and Susan Sanchez.



Progress/Impact achieved under ORIP's Strategic Plan 2021-2025 as of Jan 2024

Overview of Examples Presented

- Animal Models
  - Achievements with rodents
  - Critical availability of NHPs
- Instrumentation
  - Broad access to shared instruments
  - Geographic distribution
- Training for Veterinary Scientists – unique NIH program
- Outreach – continually growing
  - SBIR/STTR program

Progress/Impact achieved under ORIP's Strategic Plan 2021-2025 Jan 2024

Overview of examples

- Animal Models
  - **Achievements with rodents**
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The Mutant Mouse Resource and Research Center (MMRRC) Consortium

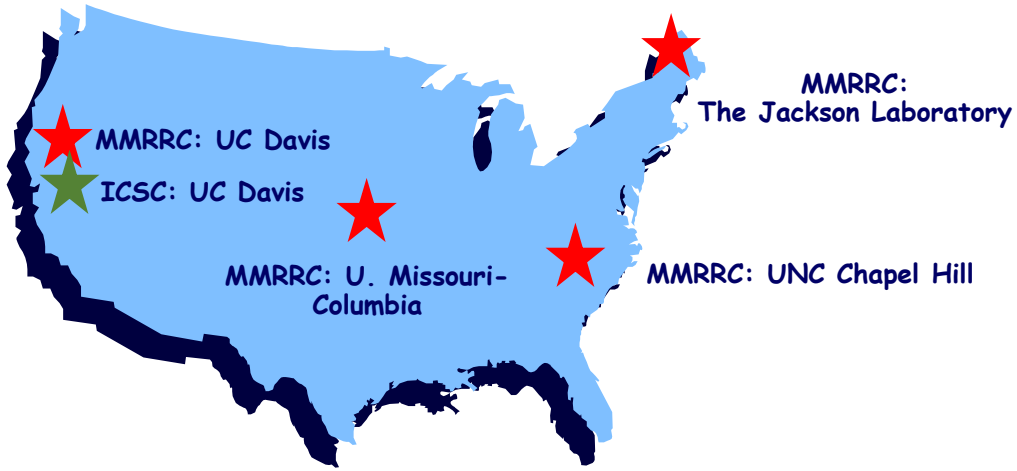

Kent Lloyd


Terry Magnuson


Craig Franklin


Cathy Lutz


Ian Korf



Mission: The NIH-ORIP sponsored mouse repositories (MMRRCs) cryopreserve and distribute genetically-engineered rodent strains and embryonic stem cell lines that provide great scientific value to the genetics and biomedical research communities.

Founded in 1999

The collection consists of **61,866 unique mutant alleles** (submissions include live mice, frozen germplasm, or ES cells).

https://www.mmrrc.org/

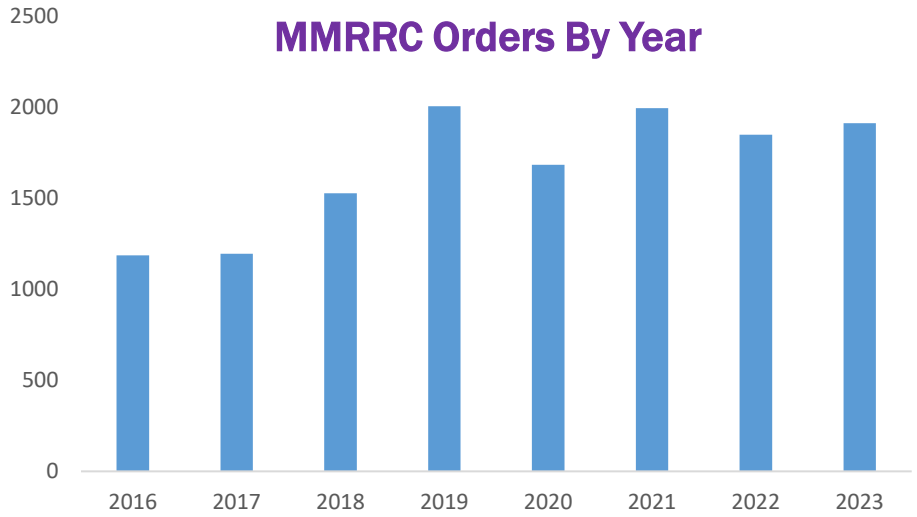
MMRRC
Mutant Mouse Regional Resource Centers supported by NIH

The MMRRCs have received **16,383 orders from 7,466 unique investigators at 3,492 research institutions** in the past 10 years

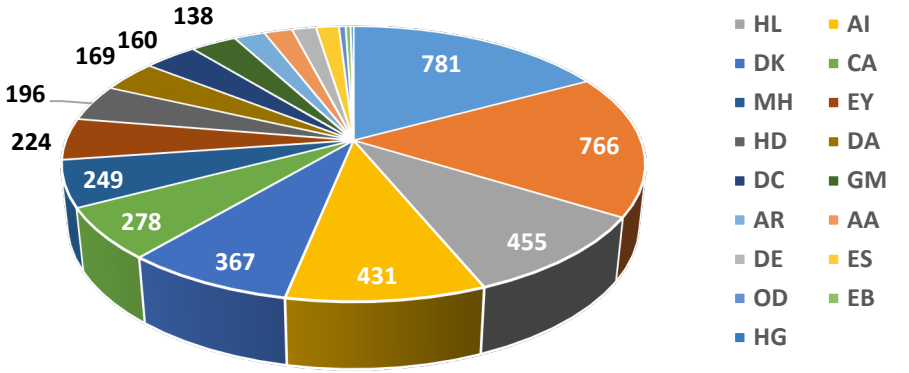
NIH National Institutes of Health
Office of Research Infrastructure Programs

MMRRC Progress and Impacts

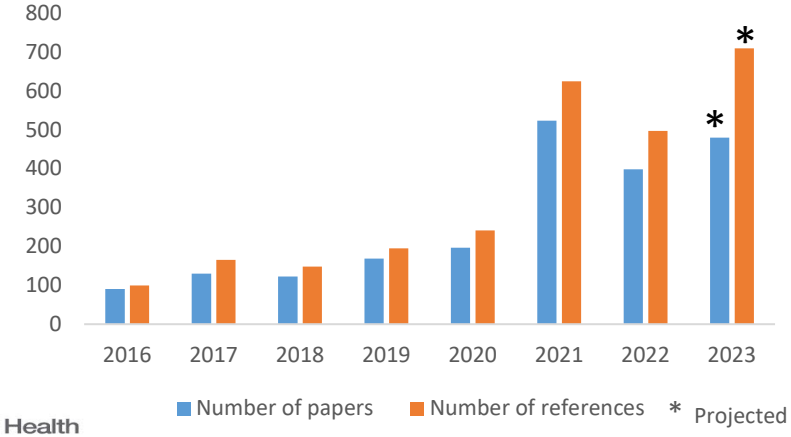
MMRRC Orders By Year



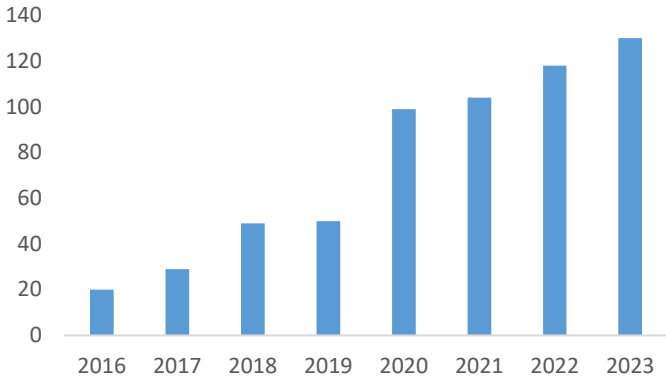
Orders by NIH Institutes and Centers (10 Years)



Number of Publications Referencing MMRRC Per Year



Number of Patents Citing MMRRC Papers Per Year



Contributions with support from mouse models

Contributions to COVID research (MMRRC contributions to meet emerging public health needs)

- The most widely used K18-hACE2 mouse strain, cryopreserved by The Jackson Laboratory, was made available to the community by using *in vitro* fertilizations technology developed with ORIP funding for MMRRC (technology was used in more than 400 publications during last 3 years).
- MMRRC created a COVID Web portal in May 2020, which became the most visited page on the Website.
- MMRRC created and provided to investigators new mouse models for anti-viral development and preclinical testing (23 new strains created, 15 already available via MMRRC catalog)

Contributions in the post-COVID area

- Enhancing archiving and recovery of animals/biomaterials as well as other related services for biomedical community
- Improving technologies for rapid production of large animal cohorts for testing new pathogens
- Coordinating activities with other NIH ICOs to develop animal models for testing prototype and priority pathogens

Ongoing contributions

- Training new scientists or retraining scientists from other fields to create and assess animal models for use in antiviral development and other health-related research areas
- Developing new approaches for colony testing, diagnostics, monitoring

Progress/Impact achieved under ORIP's Strategic Plan 2021-2025 Jan 2024

Overview of examples

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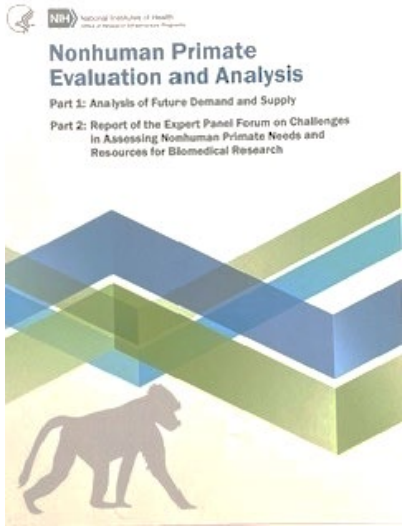
Ongoing Challenges - Insufficient availability of NHPs for biomedical research

2018 Nonhuman Primate Evaluation and Analysis



Links to reports on ORIP web site and below.

Part 1 and Part 2

2023 NASEM Report: State of the Science and Future Needs for Nonhuman Primate Model Systems: Report Release

NATIONAL ACADEMIES *Sciences Engineering Medicine*

Study Conclusions:

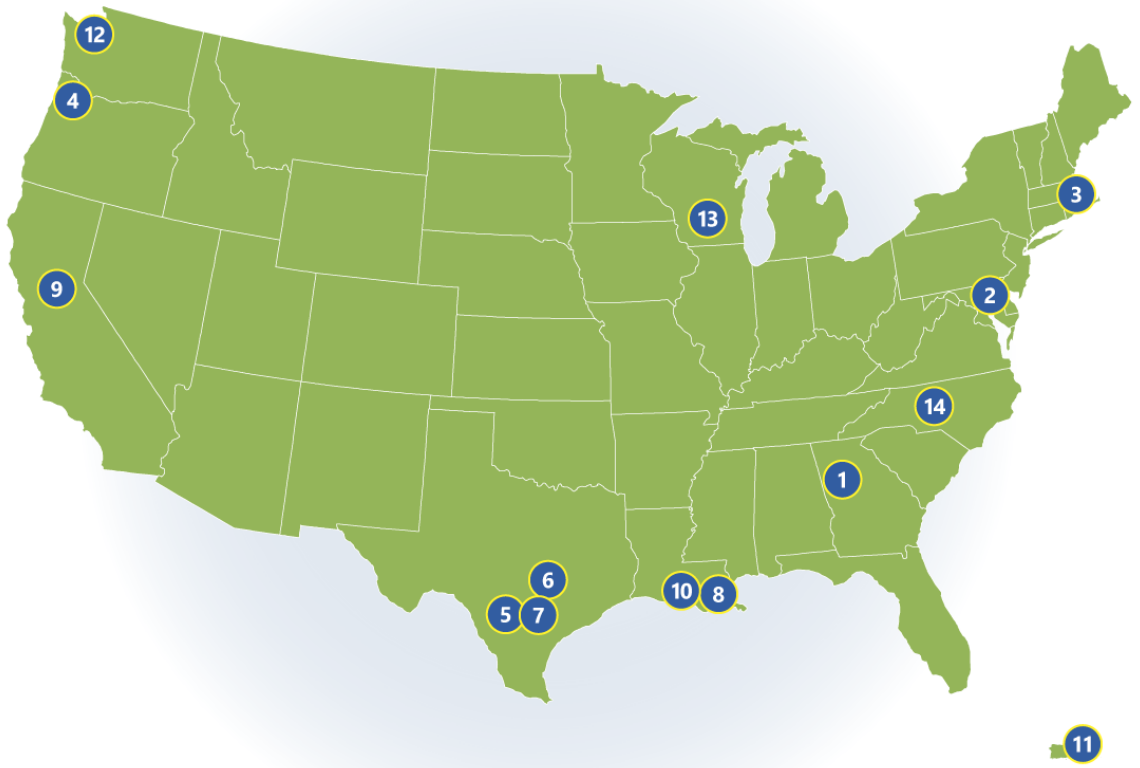
- Insufficient funding to support NHP resources
- Constraints of breeding and research space at NHP facilities
- Needs to support specialized staffing issues
- Challenges in transporting NHPs

Consequences:

- Delays in performing funded studies
- Challenges exacerbated by the pandemic

Nonhuman Primate (NHP) Research Resources

1. **Emory University**—Emory National Primate Research Center
2. **Johns Hopkins University School of Medicine**—Specific-Pathogen-Free Pigtail Macaque Breeding Colony for HIV Research Projects
3. **MassBiologics, University of Massachusetts Chan Medical School**—Nonhuman Primate Reagent Resource; Neotropical Primate Reagent Resource
4. **Oregon Health & Science University**—Oregon National Primate Research Center
5. **Texas Biomedical Research Institute**—Southwest National Primate Research Center
6. **The University of Texas MD Anderson Cancer Center**—Specific-Pathogen-Free Baboon Research Resource; Squirrel Monkey Breeding and Research Resource



7. **Trinity University**—New World Monkey Immunoreagent Resource
8. **Tulane University**—Tulane National Primate Research Center
9. **University of California, Davis**—California National Primate Research Center
10. **University of Louisiana at Lafayette**—Resource for Nonhuman Primate Immune Reagents
11. **University of Puerto Rico**—Caribbean Primate Research Center
12. **University of Washington**—Washington National Primate Research Center
13. **University of Wisconsin–Madison**—Wisconsin National Primate Research Center
14. **Wake Forest University School of Medicine**—Vervet Research Colony

Nonhuman primate research resources supported by ORIP.

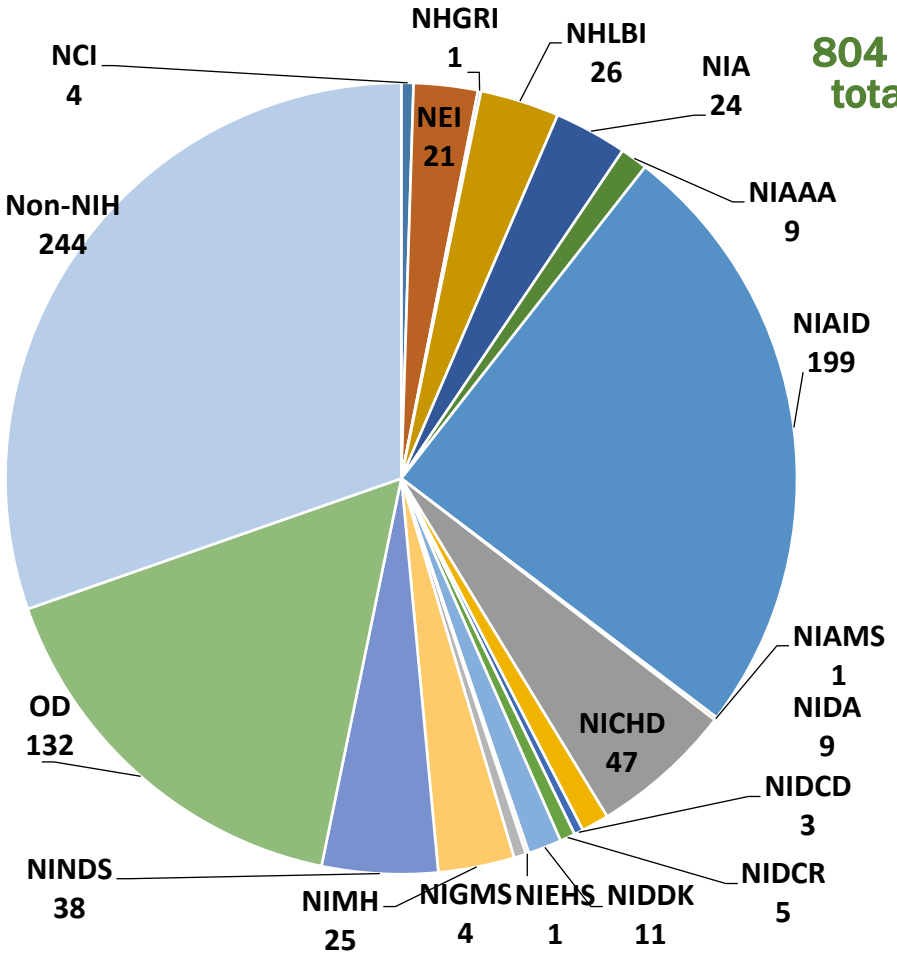
Seven National Primate Centers: Specialized centers providing NHPs, state-of-the-art facilities, equipment, core services, and scientific expertise to support biomedical and behavioral research

NPRC NATIONAL PRIMATE RESEARCH CENTERS
Causes | Preventions | Treatments | Cures

NIH National Institutes of Health
Office of Research Infrastructure Programs

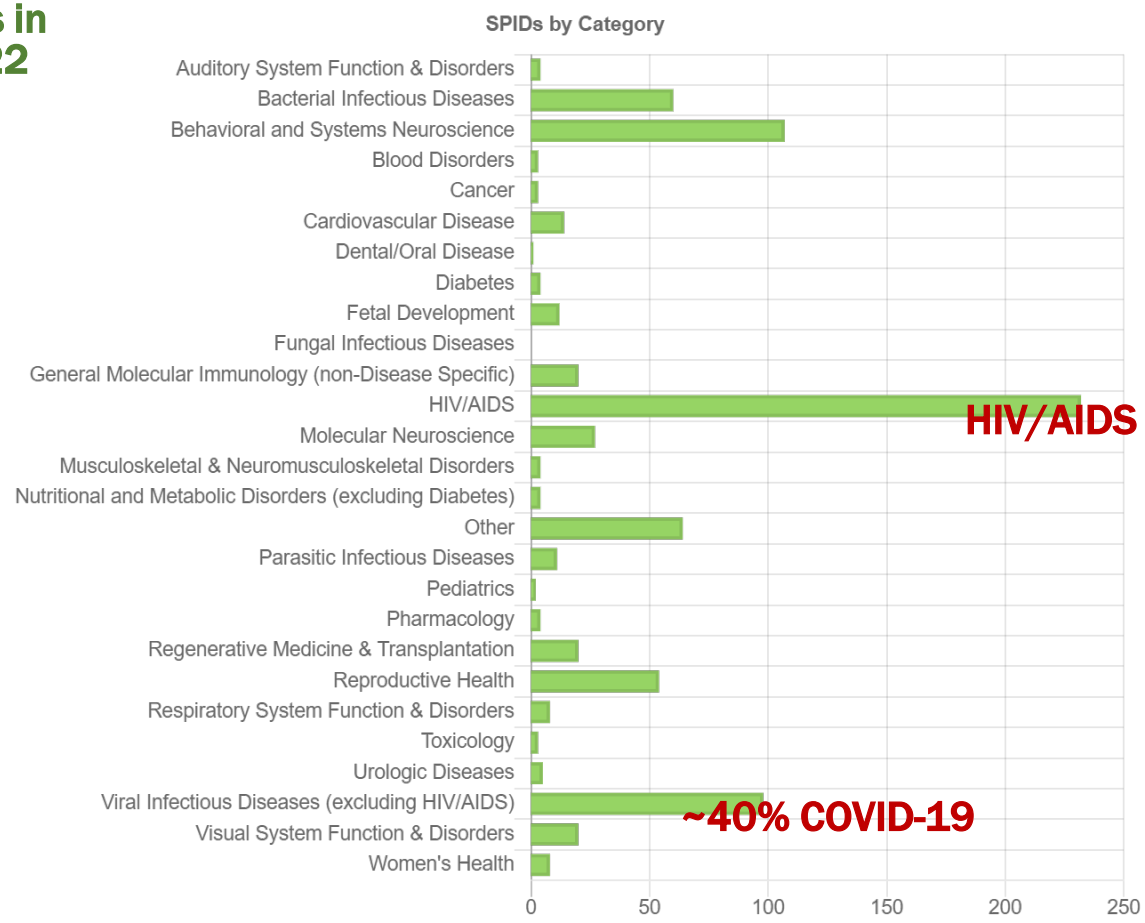
NPRCs Supports a Broad Range of Projects (FY2022)

NIH and Non-NIH Funded Projects Supported by NPRCs



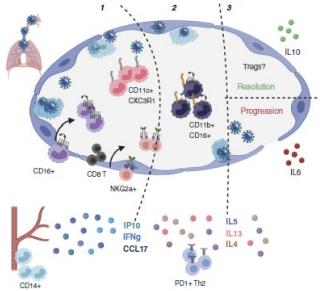
804 projects in total in 2022

Areas of Research Supported by NPRCs



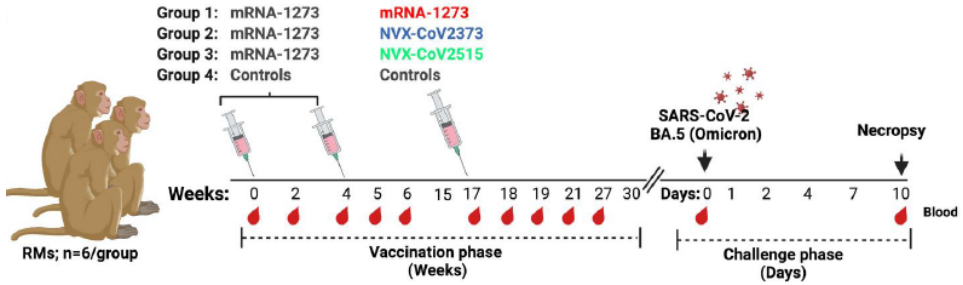
COVID-19 Related Contributions of ORIP-Supported NHP Centers

Infection



- Cellular events and SARS-CoV-2 infection. *Nature Comm. 2020*
- African green monkey model of COVID-19 related acute respiratory distress. *Am J Pathol . 2021*
- *In vivo* probe to track SARS-CoV-2 Infection. *Front. Immunol. 2021*

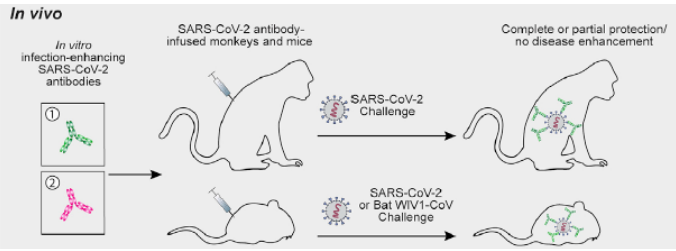
Vaccines and Boosts



- Protection against rechallenge after SARS-CoV-2 infection. *Science 2020*
- BNT162b vaccines. *Nature 2021*
- mRNA-1273 and Novavax. *Sci. Immunol. 2023*
- mRNA-1273 or mRNA-omicron boost. *Cell 2022*
- Replicating mRNA vaccine. *PLOS Pathogens 2022*

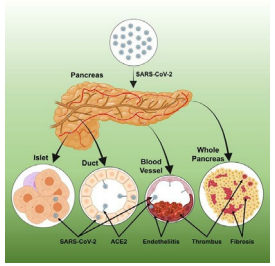
Data Sharing: The SARS-CoV-2 Open Research Portal since 2020

Development of Treatments



- SARS-CoV-2 infection-enhancing and neutralizing antibodies. *Cell 2021*

Long Covid



- SARS-CoV-2 infection and new-onset diabetes. *JCI Insight 2021*

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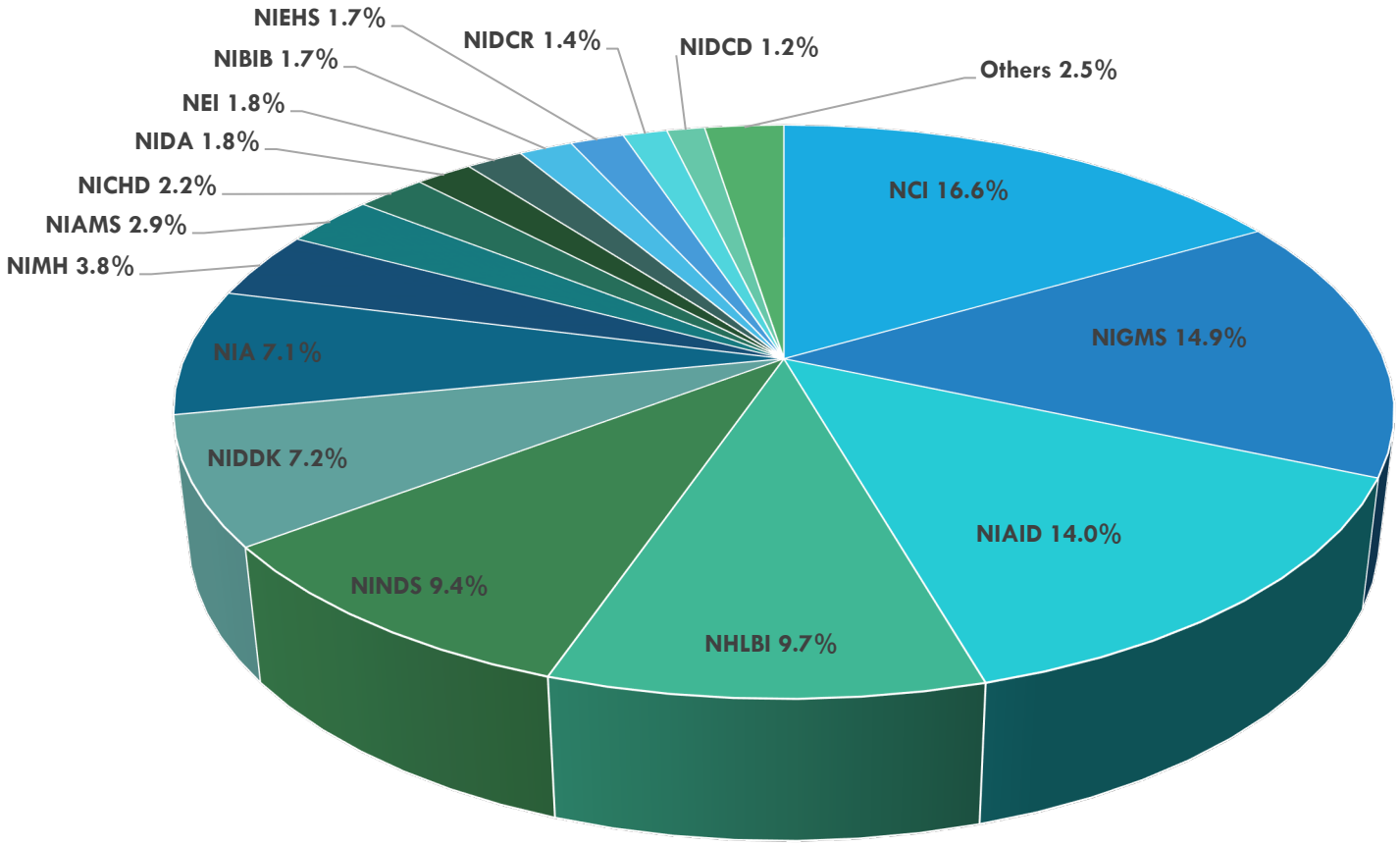
Shared Instruments Support All Areas of NIH Research

Support for acquisition of modern scientific instrumentation across NIH interests

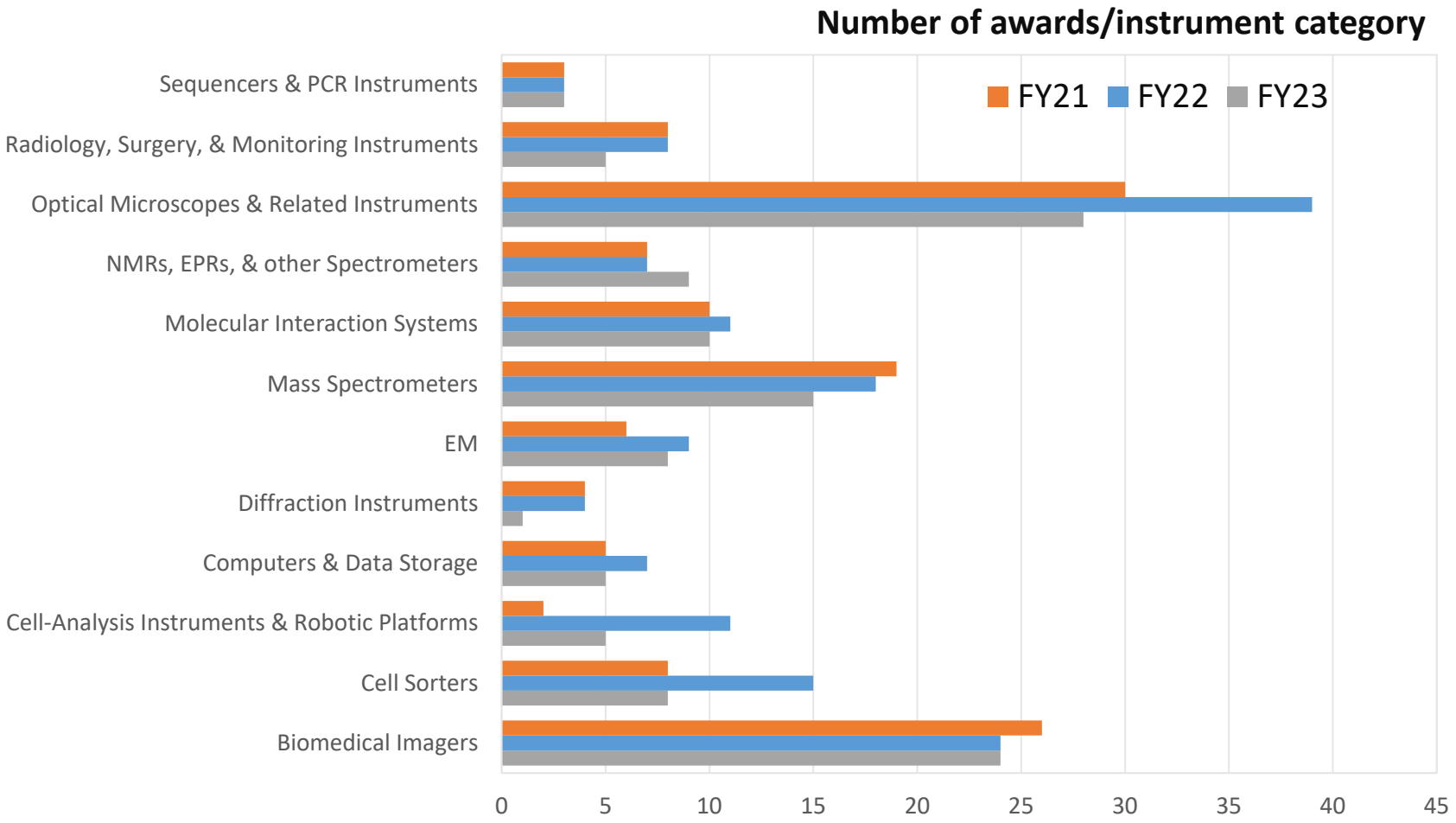
FY21-FY23



Others: NIAAA, OD, NCCIH, NHGRI, NCATS, NIMHD, NLM, NINR, FIC

Instrumentation awards by instrumentation category

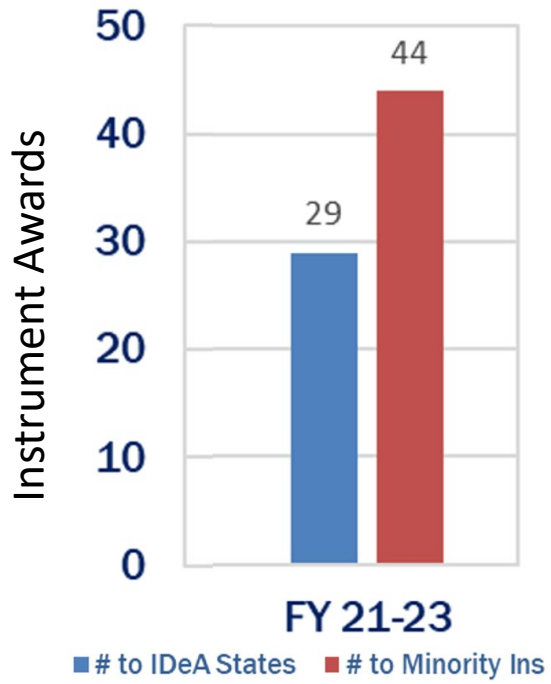
Support for acquisition of modern scientific instrumentation



Geographic Distribution of S10 Awards 2021 - 2023

Geographic Distribution of S10 Awards 2021 - 2023

Supporting modern scientific instrumentation to resource limited institutions



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ORIP's Training Support for Veterinary Scientists

Veterinary scientists as translational researchers

- Offer a unique perspective through their:
  - Understanding of comparative biology
  - Ability to assess the value of various animal models and related resources for study of specific diseases, provided specialized expertise
- Play an increasingly important role in public health (pandemic, zoonoses)

ORIP supports training and career development programs for veterinary scientists

Institutional Training Grants (average numbers and trainees, 2016-2023)

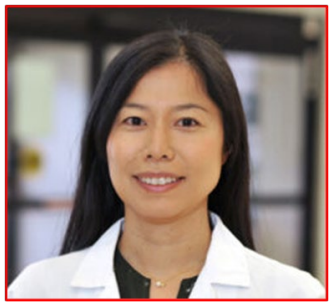
- T35 – 18 grants supporting 163 trainees; T32 – 14 grants supporting 58 trainees
- K01 - Special Emphasis Research Career Award (SERCA) - Mentored career development award for veterinarians 35 grants with 13 awardees subsequent obtaining NIH grants (to date). Awardees have produced 297 publications, with awardees listed as first (49) or senior (73) author.

Training and Career Development Outcomes

Faces of Success

Yoko Ambrosini, DVM, MPVM, PhD, DACVIM (SAIM): Assistant Professor, Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Washington State University

K01 SERCA award (2021-2025)
3 research publications (1 first author, 1 senior author)
1 R21 Award (2022-2024)



Yoko Ambrosini

Aaron Ericsson, DVM, PhD: Assistant Professor, University of Missouri-Columbia

ORIP T32 training grant (2008-2010) and **K01 SERCA award (2017-2021)**
43 publications in PubMed, 7 first author,12 senior author
U42 Award (2022) to support the MMRRC, University of Missouri-Columbia.

Aaron Ericsson

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Collaborations and Awareness of ORIP-supported resources

- Collaborations supporting specific programs
  - NHP resources – Co-funding (OAR, NIA, NIAID, others); Semi-annual program meetings; NIH-wide working group
  - Rodent resources - Co-funding (NIDDK, NHLBI, NIEHS, NIDCD, NEI, NIAID, NCI, NIDA, NIAAA, NINDS)
  - Zebrafish - Co-funding (NICHD)
  - Shared Instrumentation/Equipment - Co-funding (NIGMS, NIMH, NIA, OAR, ORWH)
- Outreach activities by program staff
  - Program site visits - virtual or in-person; targeting single program or consortium
  - Programmatic resource meetings - engaging ICO representatives, federal partners, journal editors
  - Training grant Directors and Trainees meetings - engaging training directors and trainees
- Raising awareness of ORIP-supported resource and outreach
  - Publication highlighting research resource and link to public health needs
  - Produced and posted on web videos highlighting ORIP programs (S10, Biological General Repository for Interaction Datasets, Monarch)
  - ORIP Outreach YouTube Channel

Small Business for Research Infrastructure

With the goal of modernizing the research infrastructure of laboratories and animal research facilities, the projects below benefited from ORIP's Small Business Programs, SBIR and STTR.

Supported Technologies to benefit ORIP's Resources:

*MARTINEAU & ASSOCIATES
NEMAMETRIX, INC.
RAMONA OPTICS, INC.

VIZMA LIFE SCIENCES, INC.
TRICORDER ARRAY TECH, LLC
PHOTOSOUND TECHNOLOGIES, INC.

*FANNIN PARTNERS, LLC

ASCENT BIO-NANO TECHNOLOGIES, INC.

FLYSORTER, LLC

Research Highlights:

ORIP Small Business Program (SBP):
https://orip.nih.gov/small-business

NIH SBP Success Stories:
https://seed.nih.gov/portfolio/stories

Mid-Course Update of the ORIP Strategic Plan 2021-2025

- Conclusion of the accomplishment updates
- Open to questions and suggestions

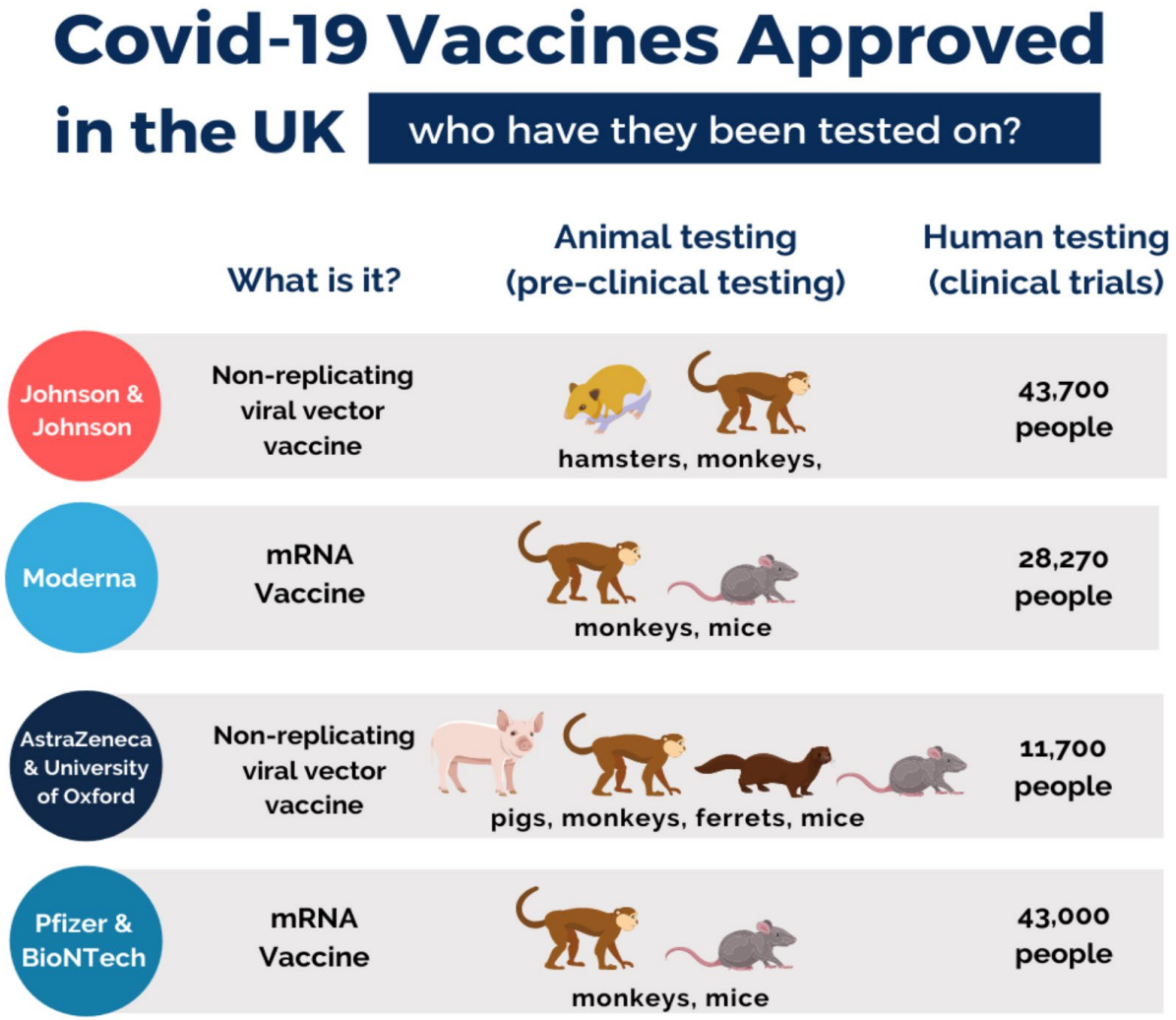
…but before I entertain question and comments, I would like to acknowledge my ORIP colleagues who have managed these extramural programs which I described and reported on. Without their continued effort, none of this progress would be possible.

Thank you ORIP!

The End

Animal models for testing vaccines

>80% of Nobel awards in Physiology and Medicine have an animal component.



https://www.understandinganimalresearch.org.uk/why/human-diseases/covid-19-animal-research

Infographic from Understanding animal research. UK data 2020