Testimony of Ross M. Kedl, Ph.D.,
on behalf of The American Association of Immunologists (AAI),
Submitted to the House Appropriations Subcommittee on
Labor, Health and Human Services, Education, and Related Agencies,
Regarding the Fiscal Year 2022 Budget for the National Institutes of Health
May 19, 2021

The American Association of Immunologists (AAI), the nation's largest professional association of research scientists and physicians who are dedicated to understanding the immune system through basic, translational, and clinical research, respectfully submits this testimony regarding fiscal year (FY) 2022 appropriations for the National Institutes of Health (NIH). ***AAI recommends a regular appropriation of at least $46.1 billion for NIH for FY 2022**** to enable the agency to fund needed research to prevent dangerous infectious diseases and treat debilitating chronic illnesses, support meritorious scientists at all career stages, and ensure a robust research enterprise that maintains U.S. preeminence in biomedical science and innovation. Because the COVID-19 pandemic has posed difficult challenges, including lab closures and other interruptions, to many biomedical (particularly early career) scientists, NIH needs, and AAI strongly supports, an infusion of additional funding that would likely be considered outside of the annual appropriations process.

Illustrating the Importance of Understanding the Immune System: COVID-19

The COVID-19 pandemic has highlighted both the importance, and high stakes, of biomedical research. Our lives, health, security, and prosperity depend on scientific understanding and advances. What felt remote to many people – scientists toiling away unseen in their laboratories – has become urgent, everyday news. The surge of interest in immunology – and scientists' ability to meet this historic moment – have been bright spots in an otherwise tragic, painful, and unprecedented year, and rapidly developed vaccines to

* *President Biden's preliminary budget recommends a budget level of $51 billion for NIH, allocating $6.5 billion to the creation of a new agency, the Advanced Research Projects Agency-Health (ARPA-H), within NIH. Because AAI has not yet seen the full details of this proposal, we cannot comment on this budget level or proposed new agency at this time.*

prevent COVID-19 infection have been a historic success story. But SARS-CoV-2, the virus that causes COVID-19, continues to mutate, giving rise to new variants. We know that this is what viruses do, and we know that this is what our immune systems must be primed to fight. Despite excellent news on the vaccine front, the regular appearance of new variants, our paucity of therapeutics for those who contract COVID-19, and our lack of understanding of, and treatments for, Post-Acute Sequelae of SARS-CoV-2 infection (PASC, or "long COVID") all render as premature any declaration of victory. We must continue to invest robustly not only in a deeper understanding of how the immune system responds to this virus and these vaccines, but also in research devoted to the basic understanding of the immune system. Such research will help us both emerge from this pandemic and prevent – and more rapidly extinguish – any future ones.

But the study of immunology is about much more than infectious diseases. Research on the immune system has taught us how to harness it to kill malignant tumors and treat other chronic diseases (immunotherapy); how it prevents or exacerbates chronic conditions such as Alzheimer's, multiple sclerosis, and cardio-vascular disease; how it enables – or prevents – the successful transplantation of a lifesaving organ; and how it can protect its host from (natural or man-made) agents of bioterrorism.

How Basic Immunology Research Led to Rapid Approval of Vaccines and Treatments for COVID-19

In this pandemic era, there is no better way to illustrate the importance of a long-term commitment to biomedical research, and specifically to immunological research, than to describe how science achieved the near-impossible: the successful testing, manufacture, and distribution of multiple, highly effective and safe vaccines against COVID-19 in less than a year after the identification of the causative agent. The development of both treatments and vaccines for SARS-CoV-2 infection and COVID-19 was a result of decades of basic research, much of which was funded by, or performed at, NIH. This work includes understanding the virus, identifying good antigens for a vaccine, and defining immune system responses to infection.

SARS-CoV-2 is a member of the beta-coronavirus family responsible for two other recent outbreaks, SARS-CoV-1 (2003) and MERS (2012) and is related to the coronaviruses that cause 15-30% of common colds.

More than 50 years of research on this virus family has allowed us to understand key portions of the viral genome and viral life cycle, as well as the importance of the spike protein for infection. While work at NIH's National Institute of Allergy and Infectious Diseases Vaccine Research Center identified how to manipulate the spike protein so it could be used in a vaccine, work on other infectious diseases and some cancers facilitated the implementation of the mRNA platform into a ready-to-use state. After developing mRNA vaccines for 10-15 years, scientists launched some of the first clinical trials using the mRNA platform against Zika virus and influenza. As a result, the platform was ready to be quickly adapted to target the SARS-CoV-2 spike protein. In other work, scientists rapidly characterized immune responses in people who experienced SARS-CoV-2 infection. Patients with poor outcomes had over exuberant immune responses; blocking these responses with steroids improved survival. Immunologists also identified several immune molecules that are at too high levels (e.g., IL-6) or too low levels (e.g., interferon). Work is ongoing to understand what protective immunity looks like, including the types of antibodies and cellular immunity that prevent reinfection and characterize immunity after vaccination. These studies will support the generation of booster vaccines and give us insight into how well current vaccines protect against new viral variants. Finally, because of this longstanding research into coronaviruses, scientists can reasonably infer how long protective immunity will last following infection with, or vaccination against, SARS-CoV-2, giving the public confidence to resume their daily activities while providing the scientific community with a needed window in which to develop booster vaccines that will protect against circulating viral variants.

<u>Vaccines Against Other Infectious Diseases and Newly Emerging Threats</u>

Vaccines remain the most effective method of disease prevention. Vaccination against more than two dozen viral, bacterial, and fungal diseases prevents about 2.5 million deaths globally and reduces the severity of illness for millions of people annually.[1] As the world's population grows and as travel enables people to become even more interconnected, we will continue to experience the very real threat of new emerging pathogens causing a deadly pandemic. Lessons we learn from developing and administering vaccines against

SARS-CoV-2 will be essential to protecting against other infectious diseases and a future pandemic.

Last year, I testified that there was no approved vaccine against SARS-CoV-2, but that NIH-funded research conducted on other causative pathogens in recent epidemics, including SARS and MERS, had made possible the rapid development of vaccine candidates against SARS-CoV-2.[2] Since then, three vaccine candidates have received an Emergency Use Authorization (EUA) from the Food and Drug Administration (FDA), and one will be considered soon for licensure.[3] AAI is confident that previously conducted research, together with new research now being urgently pursued, will result in additional vaccines and treatments to prevent and/or reduce both the lethality of, and long-term symptoms caused by, COVID-19.

NIH: The Essential Role of the Nation's Leading Biomedical Research Agency

As the nation's major funding agency for biomedical research, NIH is an indispensable scientific leader both in the U.S. and around the world. The steward of nearly $43 billion in federal funds, NIH distributes more than 80% of its budget via a competitive peer review process to more than 300,000 researchers at ~2,500 universities, medical schools, and other research institutions across the nation and internationally.[4] About 10% of its budget supports ~6,000 additional researchers and clinicians who work at NIH facilities around the country.[5] By funding these researchers and laboratories, NIH not only advances scientific achievement, it also helps strengthen state and local economies; in 2020, NIH funding supported more than 536,000 jobs and accounted for $91 billion in economic activity across the U.S.[6] The basic research that NIH funds is an essential and irreplaceable part of the biomedical research pipeline; data show that it contributed to all 210 of the new drugs approved by the FDA from 2010-2016.[7]

NIH plays an essential role in responding to emerging health threats; throughout the coronavirus pandemic, NIH leaders and researchers have provided critically needed scientific advice to the President, Congress, and the American public while also utilizing their expertise to help develop a vaccine and treatments. NIH also regularly apprises our nation's leaders about other scientific advancements and research priorities, and its unparalleled peer review process fosters the wise distribution of taxpayer dollars.

Continued Funding Increases Needed to Rebuild and Grow NIH Capacity

Leadership by this subcommittee has helped Congress provide generous increases to the NIH budget over the last six years. Although these increases have helped restore much of the purchasing power that NIH lost after years of inadequate budgets and erosion from biomedical research inflation, NIH's purchasing power remains below its 2003 peak funding level. Meaningful budget growth will help close this gap and allow NIH to invest not just in important research priorities across its Institutes and Centers, but also in the research workforce. While NIH should continue to support meritorious senior scientists, it is urgent to ensure that we will have sufficient mid- and early career scientists ready to take on increasingly complex scientific challenges. We must provide NIH with the resources needed to provide a dynamic research environment that allows for the training, development, and support of our next generation of researchers, doctors, professors, and inventors – and give them the confidence to pursue these careers.

Conclusion

AAI greatly appreciates the subcommittee's strong support for NIH and urges a regular appropriation of at least $46.1 billion for FY 2022. This funding level will help NIH grow its ability to invest in critically important research, including vital immunologic research, support meritorious scientists at all career stages, and help scientists discover new ways to prevent, treat, and cure deadly and debilitating diseases that afflict people in the U.S. and throughout the world.

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[1] https://www.who.int/immunization/global_vaccine_action_plan/GVAP_doc_2011_2020/en/
[2] https://www.niaid.nih.gov/diseases-conditions/coronaviruses
[3] https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/covid-19-vaccines; https://www.pfizer.com/news/press-release/press-release-detail/pfizer-and-biontech-initiate-rolling-submission-biologics
[4] https://www.nih.gov/about-nih/what-we-do/budget; https://report.nih.gov/award/index.cfm
[5] https://irp.nih.gov/about-us/research-campus-locations
[6] https://www.unitedformedicalresearch.org/wp-content/uploads/2021/03/NIHs-Role-in-Sustaining-the-U.S.-Economy-FINAL-3.23.21.pdf
[7] https://directorsblog.nih.gov/2018/02/27/basic-research-building-a-firm-foundation-for-biomedicine/