National Institute of Arthritis and Musculoskeletal and Skin Diseases

CONGRESSIONAL JUSTIFICATION
FY 2024

Department of Health and Human Services
National Institutes of Health

NIH National Institute of Arthritis and Musculoskeletal and Skin Diseases

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DEPARTMENT OF HEALTH AND HUMAN SERVICES

NATIONAL INSTITUTES OF HEALTH

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)

FY 2024 Budget Table of Contents

General Notes

1. FY 2023 Enacted levels cited in this document include the effects of the FY 2023 HIV/AIDS transfer, as shown in the Amounts Available for Obligation table.
2. Detail in this document may not sum to the subtotals and totals due to rounding.

Cover Page: Swt1 in endothelial cells. This image depicts the nuclear protein Swt1 (pink), DNA (green), and a network of mitochondria surrounding the nuclear envelope (yellow) in human glomerular microvascular endothelial cells. Swt1 and mitochondria dysregulation have been linked to lupus predisposition and systemic lupus erythematosus, respectively. Understanding the role of Swt1 and mitochondria in cells and organs will help develop targeted approaches to ameliorate lupus manifestations. *Credit: NIAMS Systemic Autoimmunity Branch*

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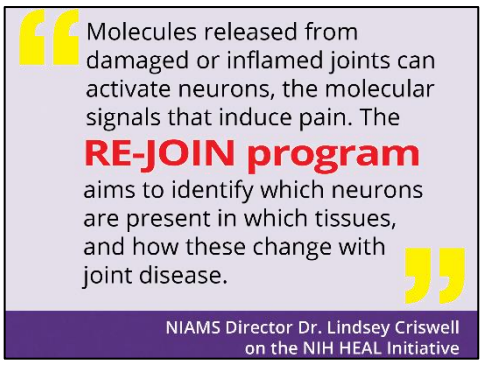
Director's Overview

NIAMS Director Lindsey A. Criswell, M.D., M.P.H., D.Sc.

The National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) is the primary Federal agency supporting biomedical research on diseases of the bones, joints, muscles, and skin. The NIAMS mission is to support research into the causes, treatment, and prevention of arthritis and musculoskeletal and skin diseases; the training of basic and clinical scientists to carry out this research; and the dissemination of information on research progress in these diseases.

In addition to the themes below, collaboration and team-based science are key NIAMS priorities. A flagship example is NIAMS involvement in the Accelerating Medicines Partnership® (AMP®) program, a public-private partnership managed by the Foundation for the NIH (FNIH). As discussed in the Program Portrait on the AMP in Autoimmune and Immune-Mediated Diseases (AMP® AIM), NIAMS is proud to lead AMP AIM with support from other National Institutes of Health (NIH) Institutes, Centers, and Offices (ICOs) and 14 public and private partners. NIAMS also spearheads the AMP Systems Biology of Inflammation (AMP® SBI) program that will encourage the comparison of shared pathways across different diseases, including Alzheimer's, Parkinson's, systemic lupus erythematosus (SLE), and rheumatoid arthritis (RA). AMP SBI will shed light on how chronic inflammation affects disease progression and response to therapy. It also advances new approaches for drug development based on the molecular causes of disease. Recently, investigators supported by the NIAMS-led AMP in RA and SLE (AMP® RA/SLE) discovered a key immune pathway that is active in the damaged kidneys of lupus patients. A molecule involved in this pathway could be useful for monitoring kidney health. Furthermore, interfering with this pathway in animal models of SLE yielded significant benefits, including prolonged survival, demonstrating the pathway's potential as a therapeutic target.



As part of its efforts with the NIH Helping to End Addiction Long-term (HEAL) Initiative, NIAMS leads the Restoring Joint Health and Function to Reduce Pain (RE-JOIN) Consortium. Through RE-JOIN, investigators are characterizing the nerve endings that infiltrate the many tissues that collectively form the joint and transmit the sensation of pain. Knowledge about the types and distribution of these nerve components in joint tissues will help us identify key receptors and mediators that give rise to pain, as well as provide novel targets for pain relief.

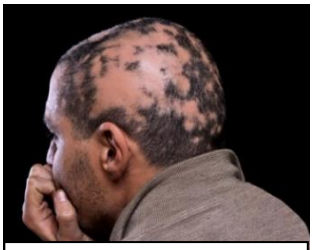
In 2021, a team of researchers supported by NIAMS and National Aeronautics and Space Administration (NASA) reported findings with important implications for both the spaceflight program and diseases of bone loss caused by reduced mechanical loading, such as immobilization. This study, funded through a program called BioMed-ISS, took advantage of

the unique microgravity environment on the International Space Station (ISS) to investigate how certain bone cells respond to weightlessness. Another FY 2021 finding related to bone health comes from a collaboration with the National Institute on Aging (NIA). Investigators showed that, after five years of treatment, continuing a type of osteoporosis medication called oral bisphosphonates for an additional five years does not further decrease patients' hip fracture risk.

Developing Targeted Preventions and Cures

Through its extramural Musculoskeletal Tissue Engineering and Regenerative Medicine Program, NIAMS supports basic and translational research on repairing, restoring, and regenerating diseased or injured tissues. The program encourages cross-disciplinary training for emerging scientists, as well as research collaborations across the biological and physical sciences. Although this program is focused on musculoskeletal tissues, the findings, especially those related to the use of stem cells and biomedical engineering, can have broader implications for many injury- and loss-of-function-related diseases. In FY 2022, NIAMS hosted a roundtable discussion on cell-based therapy for knee osteoarthritis (OA), which brought together research and clinical professionals in the field to discuss advances, ongoing research, and opportunities for additional investigation to develop targeted interventions for OA.

In June 2022, the Food and Drug Administration approved the first whole-body treatment for alopecia areata, an autoimmune disease in which the immune system attacks hair follicles and causes varying degrees of hair loss.[1] The newly approved drug, baricitinib, was found to effectively trigger substantial hair regrowth compared to placebo. Baricitinib is an inhibitor of a class of proteins known as Janus kinases and was previously approved for treating RA and some cases of Coronavirus Disease 2019 (COVID-19). NIAMS-funded research was instrumental in the development of Janus kinase inhibitors and previous translational research funded by NIAMS also established the framework for using Janus kinase inhibitors to combat hair loss in alopecia areata.



Individual with alopecia
Credit: IStock

Tackling the Undiscovered

To speed discovery within its mission areas, NIAMS is fostering cutting-edge precision medicine approaches, such as emerging technologies to analyze single cells and innovative methods for genomic analyses. These approaches, which were a major feature of AMP RA/SLE, have generated much data, which can be used to build sophisticated models of health and disease and develop personalized treatments. Other ongoing research explores single-cell and epigenomic analyses to better understand cell differences in healthy and diseased skin, trace cell changes during skin development, and develop single-cell analysis technologies for human skin biopsies.

Another critical way NIAMS will foster new discoveries is by capitalizing on opportunities in data science, big data, and bioinformatics. NIAMS has developed a data science strategy to address the needs of investigators and prepare for the implementation of the FY 2023 NIH data

[1] https://www.fda.gov/news-events/press-announcements/fda-approves-first-systemic-treatment-alopecia-areata

sharing and management policy.[2] For example, the NIAMS Intramural Research Program established the Discovery and Management of NIH/NIAMS Data (DiAMOND) information technology application. DiAMOND is being used to organize and document research data in a central location. It provides a data catalog with search capabilities to accelerate data finding and sharing and to reduce administrative burden for researchers.

Ensuring Health at All Stages of Life for All People

When combined, the diseases covered by the NIAMS mission areas affect tens of millions of Americans of all ages and cause tremendous suffering. Indeed, musculoskeletal diseases alone affect more than half of all adults in the United States, and nearly three out of four individuals aged 65 and over.[3] Most of the diseases covered by NIAMS are chronic and many are associated with chronic pain and disability. For example, low back pain ranked highest in terms of years lived with disability among all 369 conditions included in the Global Burden of Disease 2019 Study.[4] Further, many of the diseases in the NIAMS mission affect women and underserved populations disproportionately. The Institute plays a critical role in improving health for all by addressing health disparities within its purview.

OA is the most common type of arthritis,[5] and health disparities in OA treatment outcomes and access to care, which lead to poor health, have been documented. As a step toward addressing and ultimately eliminating these disparities, NIAMS, together with the National Institute on Aging (NIA) and National Institute on Minority Health and Health Disparities (NIMHD), held a virtual two-day workshop to better understand OA health disparities, how and why they develop, and how they can be addressed. Lessons learned from this workshop will help guide NIAMS in its efforts to better understand and reduce the disproportionate impact of diseases like OA. In other work addressing health disparities, NIAMS-supported extramural researchers found that in the year following an osteoporosis-related fragility fracture, postmenopausal Black women are more likely to face worse outcomes, including higher rates of death and higher likelihood of being placed in long-term nursing facilities. This work aligns with NIAMS's focus on "Health and Disease in Diverse Populations" as described in the NIAMS Strategic Plan for FYs 2020-2024.[6]

Inspiring the Next Generation of Scientists

NIAMS is committed to fostering a rich research environment that encourages investigators at all levels to take advantage of scientific opportunities and contribute to the emergence of new areas that can potentially advance the NIAMS mission. In 2020, NIAMS and NIH developed the Stephen I. Katz Early-Stage Investigator Research Project Grant to honor the tireless dedication

[2] grants.nih.gov/grants/guide/notice-files/NOT-OD-21-013.html

[3] The Burden of Musculoskeletal Diseases in the United States: Prevalence, Societal and Economic Cost (BMUS), 4th Edition

[4] J Orthop Translat. 2021 Sep 10; 32:49-58

[5] CDC.gov

[6] niams.nih.gov/sites/default/files/pdf/NIAMS-StrategicPlan-2020-2024-v1.pdf

of the late NIAMS director to empowering the next generation of scientists. The award supports an innovative project that represents a change in research direction for an early-stage investigator and for which no preliminary data exist. To date, NIAMS has made two Katz awards. One supports an early-stage investigator who is working to produce therapeutically potent skeletal muscle stem cells for treating muscle-associated trauma. The other award funds a researcher seeking to identify patients at high risk for autoimmune disease to reduce the time to autoimmune disease diagnosis and treatment.

NIAMS recognizes the challenges that investigators face as they transition to independent careers. In response, NIAMS provides recipients of its mentored career development clinician scientist awards an opportunity to apply for additional support to expand their current research objectives or branch out to a new pilot study. The goal is to help award recipients demonstrate their growth as independent investigators.

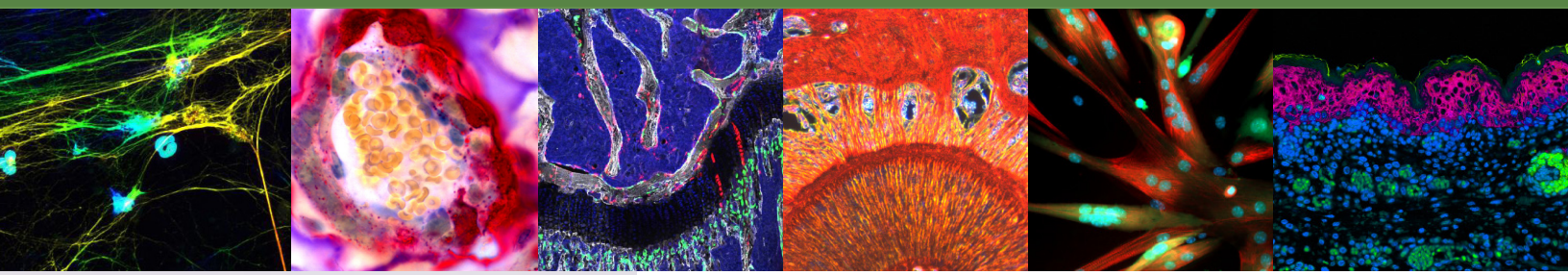
Additionally, NIAMS works closely with other NIH ICOs to leverage their unique strengths and foster a robust and diverse pipeline of researchers and clinician-scientists. The Institute participates in many trans-NIH initiatives. One recent example is an effort led by the NIH Office of Research on Women's Health (ORWH) to support a mentored research training experience for individuals with high potential who are re-establishing an active research career after an interruption for family responsibilities or other qualifying circumstances. NIAMS also is partnering with ORWH on a Team Science Leadership Scholars Program (LSP). The pilot enables investigators to develop skills needed to manage large team science projects and prepares them to mentor future generations of researchers.

Activities Enabled by FY 2017 - FY 2022 Investments

NIAMS is promoting research to better understand the mechanisms of acute and chronic pain, develop improved approaches to prevent and alleviate pain, and enhance health equity of all populations suffering from pain caused by diseases and conditions within its mission. For example, NIAMS has funded several centers that explore how musculoskeletal pain is processed. One Center of Research Translation is developing methods to help identify patients who do not respond well to traditional pain treatments. Another Center is facilitating collaborative multidisciplinary approaches to understand the mechanisms of musculoskeletal pain, and how these may overlap or differ between diseases. In other work, NIAMS-supported researchers demonstrated that patients who participated in just a few sessions of physical therapy before or after surgery had less pain and lower risk of long-term opioid use. This finding is critical given that a third of patients still experience pain after knee replacement surgery.

As noted previously, NIAMS is actively involved in the NIH HEAL Initiative, supporting innovative interdisciplinary research to enhance pain management and improve function without the risk of addiction associated with opioids. In addition to the RE-JOIN effort, NIAMS leads the Back Pain Consortium (BACPAC), a translational, patient-centric research effort to develop effective, personalized treatments for chronic low back pain. Through BACPAC, investigators supported by more than a dozen awards to research centers across the United States are characterizing the biological, biomechanical, psychosocial, and other processes that contribute to back pain. They also are identifying subtypes of patients who could benefit from different interventions to reduce pain.

National Institute of Arthritis and Musculoskeletal and Skin Diseases



Lindsey A. Criswell, M.D., M.P.H., D.Sc., became Director of NIAMS in February, 2021. Previously, she served as vice chancellor of research at the University of California, San Francisco, as well as professor of rheumatology, and professor of orofacial sciences. Her research focuses on the genetics and epidemiology of human autoimmune disease, particularly rheumatoid arthritis and systemic lupus erythematosus. She has mentored many students and junior faculty to independent research careers.

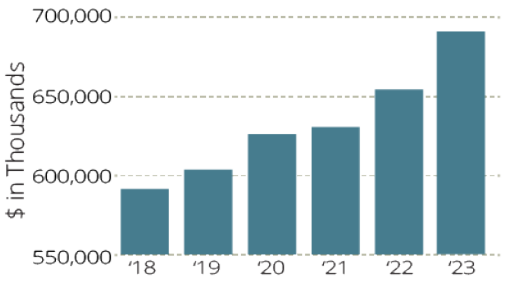
History & Mission

The National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) was established in 1986. Its mission is to support research into the causes, treatment, and prevention of arthritis and musculoskeletal and skin diseases; the training of basic and clinical scientists to carry out this research; and the dissemination of information on research progress in these diseases.

Arthritis and musculoskeletal and skin conditions affect people of all ages and racial and ethnic backgrounds. Combined, they affect tens of millions of Americans, cause tremendous human suffering and disability, and cost the U.S. economy billions of dollars in health care costs and lost productivity. NIAMS aims to foster a rich and adaptable research environment that enables scientists to capitalize on opportunities as they arise and stimulate new areas that are unexpected and transformative.

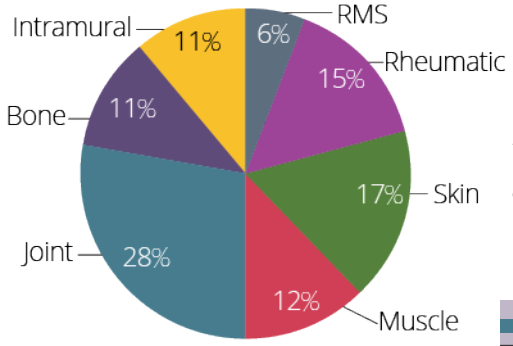
Facts & Figures

Funding History

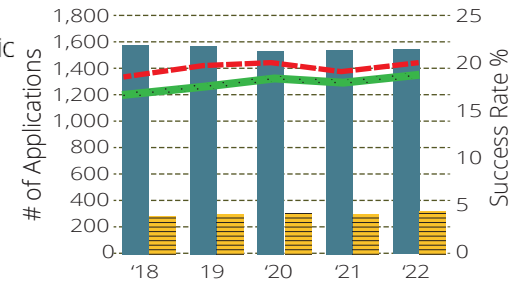


The FY2024 President's Budget request is $687,639,000.

FY 2022 Funding by Budget Activity



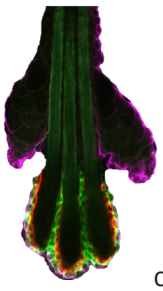
RPG Applications and Success Rate



NIAMS-Supported Research

NIAMS-funded researchers have uncovered **sex-based differences in immune cells** called neutrophils that may contribute to the striking increase in the risk of autoimmune disease in women compared to men. In the study, the differences appeared to be driven by sex hormones, such as estradiol.

NIAMS-supported researchers found, over a five-year period, that walking volume and intensity **does not increase the risk of knee replacement** for individuals with advanced knee osteoarthritis. Moderate intensity walking actually reduces the risk.



A NIAMS grantee-led research team discovered that over time, **hair follicle stem cells** escape from the follicles into the surrounding skin, leading to tissue degeneration during aging. The finding informs studies of stem cell quiescence in a variety of age-related diseases.

Researchers have uncovered a key factor causing bone defects in **osteogenesis imperfecta**, paving the way for potential development of new therapies for this condition that lacks any FDA-approved treatments.

National Institute of Arthritis and Musculoskeletal and Skin Diseases

Current Activities

As part of the NIH HEAL Initiative, NIAMS is leading the Back Pain Consortium (BACPAC), a translational, patient-centric research effort to develop effective, personalized treatments for chronic low back pain. BACPAC is characterizing the biological, biomechanical, psychosocial, and other processes that contribute to back pain. It is also identifying subtypes of patients who could benefit from personalized interventions.

Recognizing the promise of regenerative medicine for the treatment of knee OA, the importance of scientific rigor and patient safety, and the timing of new FDA guidance, NIAMS hosted the FY 2022 Cartilage Preservation and Restoration in Knee Osteoarthritis: Challenges, Gaps, and Opportunities Roundtable. The roundtable participants discussed regenerative medicine approaches for treating knee OA.

NIAMS is the clinical lead for the Molecular Transducers of Physical Activity Consortium (MoTrPAC), a trans-NIH initiative investigating the mechanisms through which physical exercise exerts its beneficial effects. In a recent study in rats, investigators identified thousands of shared and tissue- and sex-specific molecular alterations following an 8-week exercise program. Data will be posted for use by the scientific community on the MoTrPAC data hub once they are published.

The FY 2022 Health Disparities in Osteoarthritis Workshop, hosted with NIA and NIMHD, brought together experts in behavioral and biomedical science to address the personal, interpersonal, and societal influences that contribute to health disparities in osteoarthritis (OA).

Future Activities

The NIAMS extramural **Musculoskeletal Tissue Engineering and Regenerative Medicine Program** supports basic and translational research on repairing, restoring, and regenerating diseased or injured tissues. By encouraging cross-training for emerging scientists, the program promises to produce findings that can inform approaches to many injury and loss-of-function related diseases. NIAMS also has assumed leadership of the Regenerative Medicine Innovation Project and is excited to advance this promising area of research.

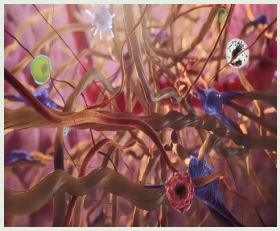
NIAMS leads the **Restoring Joint Health and Function to Reduce Pain (RE-JOIN) Consortium**. RE-JOIN aims to identify key receptors and mediators that induce pain by activating specific sensory nerves, and provide novel targets for reducing pain.

In FY 2022, NIAMS Funded

- **233** FTEs
- **27** IRP Principal Investigators
- **57** Early-Stage Investigator Awards
- **369** Funded Principal Investigators
- **693** Extramural Noncompeting RPGs
- **285** Extramural Competing RPGs
- **311** Extramural Full-Time Trainee Positions

Recent Accomplishments

Skin wound healing is an essential survival process, but understanding the mechanisms of chronic wounds has proved challenging. NIAMS-supported researchers uncovered a previously unknown role of a type of cells called **myofibroblasts** in skin wound repair. This finding has major implications for treating non-healing wounds, a leading global health issue.

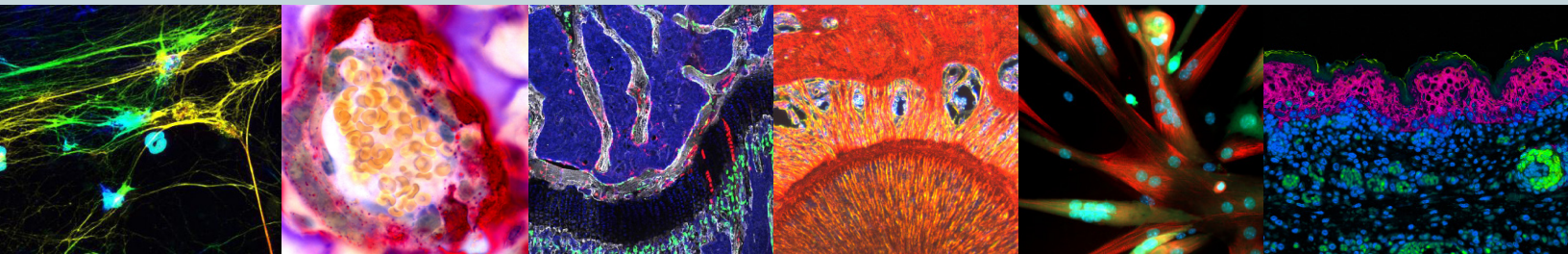


NIAMS-sponsored researchers investigated the effect of certain commonly used rheumatoid arthritis (RA) treatments on **RA patients who contracted COVID-19** and found that some drugs can alter the severity of COVID-19, depending on the point at which they are administered.

Facioscapulohumeral muscular dystrophy (FSHD) is a potentially devastating chronic disease caused by abnormal expression of the skeletal muscle gene DUX4. NIAMS-supported researchers found that using small molecules like micro-RNA (miRNA) to attenuate DUX4 expression could be an effective treatment option for FSHD. Researchers also developed a mouse model of DUX4 expression that mimics human FSHD pathology, which will facilitate more robust future research in this area.

Alopecia areata is an autoimmune disease that causes hair loss and affects more than 300,000 people in the U.S. each year. The FDA recently approved baricitinib as the first systemic treatment for alopecia areata. Baricitinib is a Janus kinase (JAK) inhibitor – a class of drugs originally developed through a partnership between NIAMS and industry.

Image strip (top to bottom): **Neutrophil extracellular traps**, Luz Blanco and Mariana J. Kaplan, NIAMS Systemic Autoimmunity Branch. **Bone development and healing**, Paul R. Odgren, University of Massachusetts Medical School, Worcester. **Osteochondroretricular stem cells**, Timothy C. Wang, Columbia University. **The periodontal complex**, Atsuhiro Nagasaki, NIAMS Laboratory of Oral Connective Tissue Biology. **Mouse muscle stem cells grown in culture**, Kevin A. Murach, Charlotte A. Peterson, and John J. McCarthy, University of Kentucky. **Skin from genetically modified mouse (Srf knockout)**, Tatiana Efimova and Maria Morasso, NIAMS Laboratory of Skin Biology.



Major Changes in the Budget Request

Major changes by budget mechanism and/or budget activity detail are briefly described below. Note that there may be overlap between budget mechanism and activity detail, and these highlights will not sum to the total change for the FY 2024 President's Budget request for NIAMS, which is $687.6 million, the same as the FY 2023 Enacted level. NIAMS continues to place a priority on support to early-stage investigators. Within this funding level, NIAMS will pursue its highest research priorities through strategic investments and careful stewardship of appropriated funds.

Research Project Grants (RPGs) (-$7.0 million; total $442.8 million):
NIAMS will support a total of 979 Research Project Grant (RPG) awards in FY 2024. Noncompeting awards will decrease by $6.6 million. Competing RPGs will increase by 1 award and $0.5 million.

Other Research (+$1.8 million; total $33.6 million):
NIAMS will support a total of 224 Other Research awards in FY 2024. Research Careers will increase by 14 awards and $1.8 million from the FY 2023 Enacted level.

Intramural Research (+$2.3 million; total $78.1 million):
NIAMS will increase funding for intramural research by 3.0 percent. These increases are distributed across all programmatic areas and basic, translational or clinical research.

NATIONAL INSTITUTES OF HEALTH

National Institute of Arthritis and Musculoskeletal and Skin Diseases

Budget Mechanism*

(Dollars in Thousands)

Mechanism	FY 2022 Final		FY 2023 Enacted		FY 2024 President's Budget		FY 2024 +/- FY 2023	
	Number	Amount	Number	Amount	Number	Amount	Number	Amount
Research Projects:								
Noncompeting	693	$295,289	753	$335,065	716	$328,482	-37	-$6,583
Administrative Supplements	*(74)*	$7,502	*(84)*	$8,500	*(83)*	$7,700	*-(1)*	-$800
Competing:								
Renewal	31	$15,914	23	$12,020	23	$12,093	0	$73
New	253	$98,688	190	$73,839	191	$74,286	1	$447
Supplements	1	$739	0	$0	0	$0	0	$0
Subtotal, Competing	**285**	**$115,341**	**213**	**$85,859**	**214**	**$86,379**	**1**	**$520**
Subtotal, RPGs	978	$418,132	966	$429,424	930	$422,561	-36	-$6,864
SBIR/STTR	47	$19,614	49	$20,455	49	$20,246	0	-$209
Research Project Grants	1,025	$437,746	1,015	$449,879	979	$442,807	-36	-$7,072
Research Centers								
Specialized/Comprehensive	41	$42,064	44	$46,481	44	$46,978	0	$497
Clinical Research	0	$0	0	$0	0	$0	0	$0
Biotechnology	0	$0	0	$0	0	$0	0	$0
Comparative Medicine	0	$50	0	$50	0	$50	0	$0
Research Centers in Minority Institutions	0	$0	0	$0	0	$0	0	$0
Research Centers	**41**	**$42,114**	**44**	**$46,531**	**44**	**$47,028**	**0**	**$497**
Other Research:								
Research Careers	162	$24,439	186	$27,864	200	$29,691	14	$1,827
Cancer Education	0	$0	0	$0	0	$0	0	$0
Cooperative Clinical Research	0	$0	0	$0	0	$0	0	$0
Biomedical Research Support	0	$0	0	$0	0	$0	0	$0
Minority Biomedical Research Support	0	$265	0	$265	0	$265	0	$0
Other	21	$3,222	24	$3,650	24	$3,650	0	$0
Other Research	**183**	**$27,926**	**210**	**$31,779**	**224**	**$33,606**	**14**	**$1,827**
Total Research Grants	1,249	$507,786	1,269	$528,189	1,247	$523,440	-22	-$4,749
Ruth L Kirschstein Training Awards:	FTTPs		FTTPs		FTTPs		FTTPs	
Individual Awards	72	$3,277	82	$3,819	82	$3,895	0	$76
Institutional Awards	239	$16,239	268	$18,636	268	$19,009	0	$373
Total Research Training	**311**	**$19,516**	**350**	**$22,455**	**350**	**$22,904**	**0**	**$449**
Research & Develop. Contracts	33	$21,552	35	$23,000	35	$23,750	0	$750
SBIR/STTR (non-add)	*(0)*	*($205)*	*(0)*	*($215)*	*(0)*	*($221)*	*(0)*	*($6)*
Intramural Research	124	$72,469	129	$75,876	133	$78,141	4	$2,265
Res. Management & Support	109	$36,550	113	$38,120	117	$39,404	4	$1,284
SBIR Admin. (non-add)		*($0)*		*($0)*		*($0)*		*($0)*
Construction		$0		$0		$0		$0
Buildings and Facilities		$0		$0		$0		$0
Total, NIAMS	**233**	**$657,873**	**242**	**$687,639**	**250**	**$687,639**	**8**	**$0**

* All items in italics and brackets are non-add entries.

NATIONAL INSTITUTES OF HEALTH

NATIONAL INSTITUTE OF ARTHRITIS AND MUSCULOSKELETAL AND SKIN DISEASES

For carrying out section 301 and title IV of the PHS Act with respect to arthritis and musculoskeletal and skin diseases, **[**$685,465,000**]***$687,639,000*.

NATIONAL INSTITUTES OF HEALTH
National Institute of Arthritis and Musculoskeletal and Skin Diseases

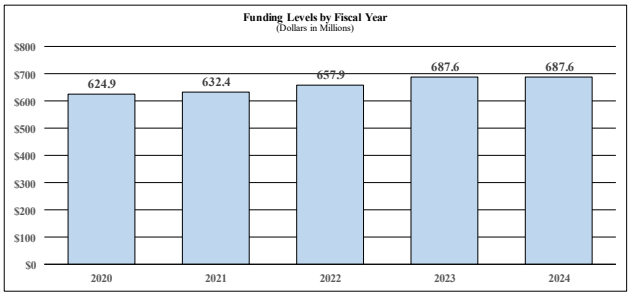
Summary of Changes
(Dollars in Thousands)

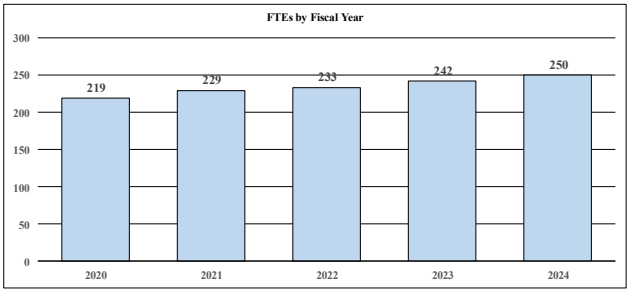
FY 2023 Enacted	$687,639
FY 2024 President's Budget	$687,639
Net change	$0

CHANGES	FY 2023 Enacted		FY 2024 President's Budget		Built-In Change from FY 2023 Enacted	
	FTEs	Budget Authority	FTEs	Budget Authority	FTEs	Budget Authority
A. Built-in:						
1. Intramural Research:						
a. Annualization of FY 2023 pay and benefits increase		$27,400		$29,230		$304
b. FY 2024 pay and benefits increase		$27,400		$29,230		$1,051
c. Paid days adjustment		$27,400		$29,230		$105
d. Differences attributable to change in FTE		$27,400		$29,230		$850
e. Payment for centrally furnished services		$11,349		$11,530		$182
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		$37,127		$37,380		$808
Subtotal						$3,299
2. Research Management and Support:						
a. Annualization of FY 2023 pay and benefits increase		$20,945		$22,428		$232
b. FY 2024 pay and benefits increase		$20,945		$22,428		$802
c. Paid days adjustment		$20,945		$22,428		$81
d. Differences attributable to change in FTE		$20,945		$22,428		$741
e. Payment for centrally furnished services		$3,363		$3,417		$54
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		$13,812		$13,558		$275
Subtotal						$2,185
Subtotal, Built-in						$5,484

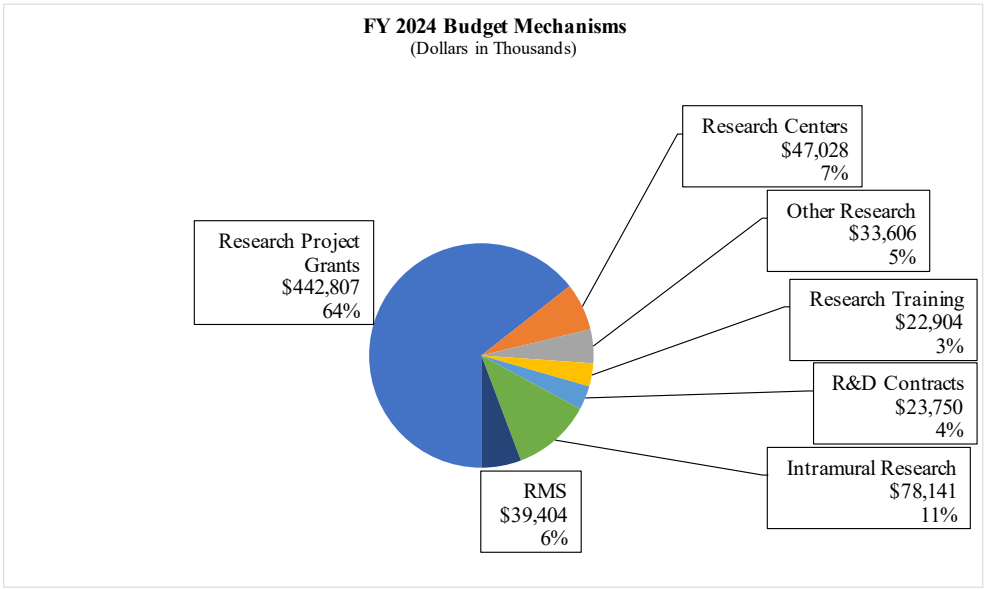
CHANGES	FY 2023 Enacted		FY 2024 President's Budget		Program Change from FY 2023 Enacted	
	No.	Amount	No.	Amount	No.	Amount
B. Program:						
1. Research Project Grants:						
a. Noncompeting	753	$343,565	716	$336,182	-37	-$7,383
b. Competing	213	$85,859	214	$86,379	1	$520
c. SBIR/STTR	49	$20,455	49	$20,246	0	-$209
Subtotal, RPGs	1,015	$449,879	979	$442,807	-36	-$7,072
2. Research Centers	44	$46,531	44	$47,028	0	$497
3. Other Research	210	$31,779	224	$33,606	14	$1,827
4. Research Training	350	$22,455	350	$22,904	0	$449
5. Research and development contracts	35	$23,000	35	$23,750	0	$750
Subtotal, Extramural		$573,644		$570,094		-$3,550
6. Intramural Research	129	$75,876	133	$78,141	4	-$1,034
7. Research Management and Support	113	$38,120	117	$39,404	4	-$900
8. Construction		$0		$0		$0
9. Buildings and Facilities		$0		$0		$0
Subtotal, Program	242	$687,639	250	$687,639	8	-$5,484
Total built-in and program changes						$0

History of Budget Authority and FTEs:





Distribution by Mechanism:



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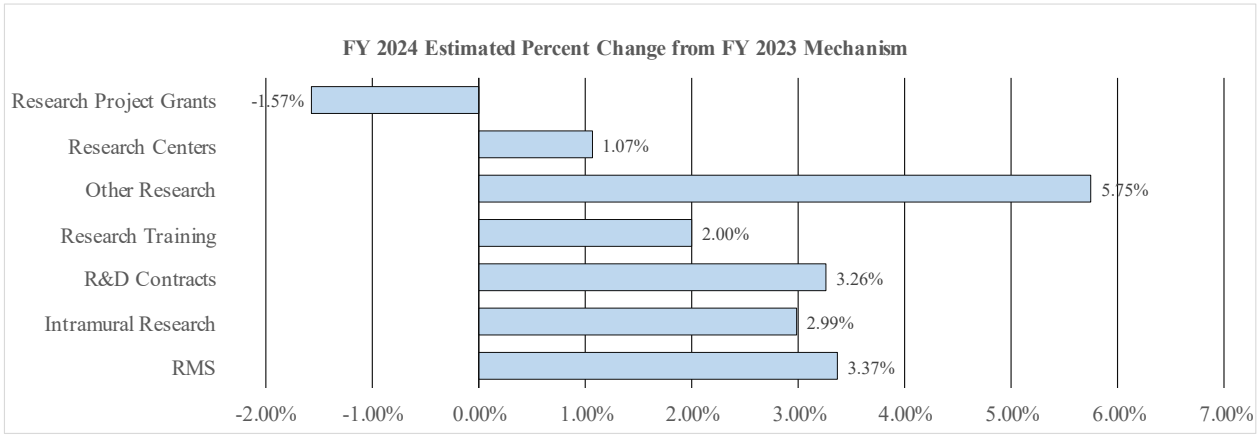
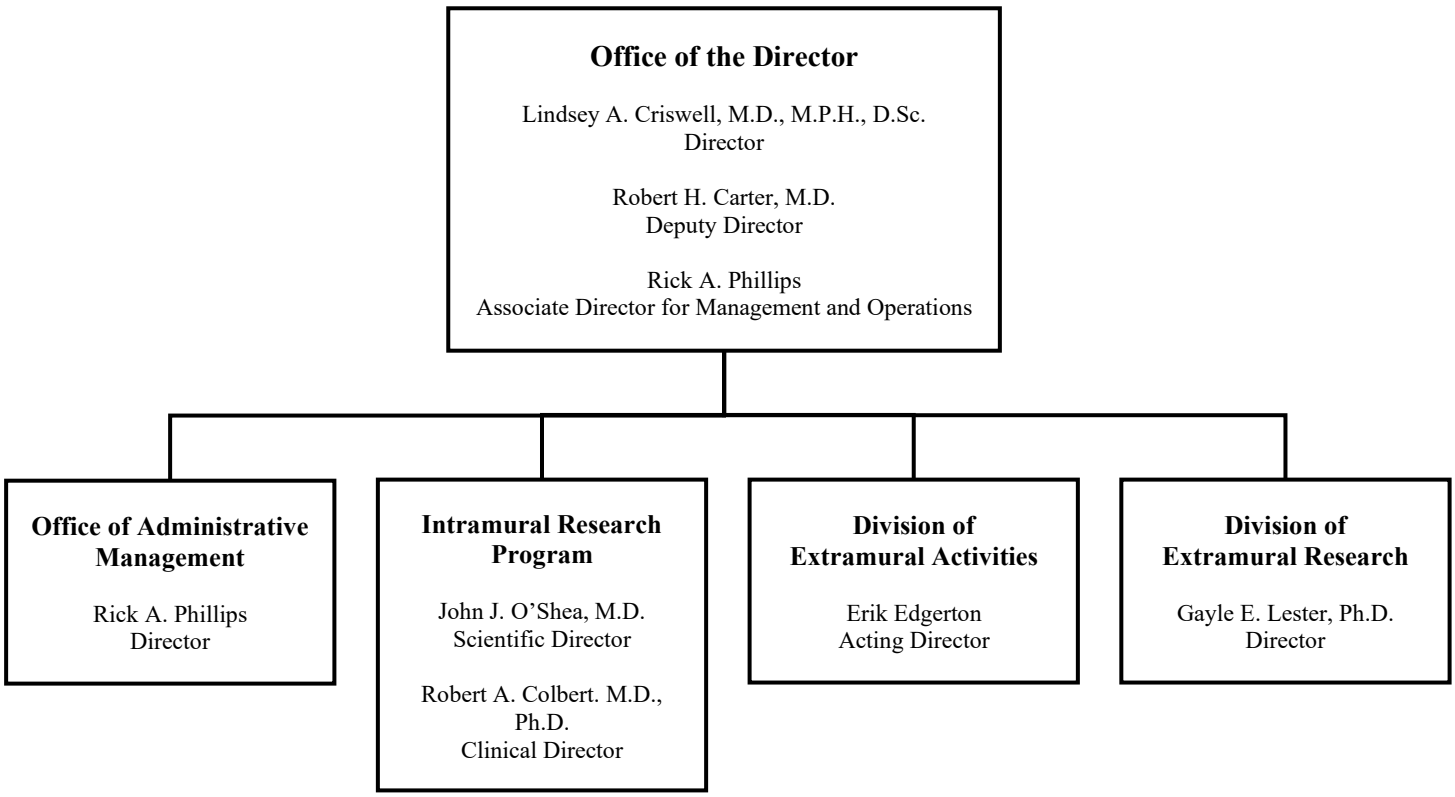


National Institutes of Health
National Institute of Arthritis and Musculoskeletal and Skin Diseases
Organizational Chart



NATIONAL INSTITUTES OF HEALTH
National Institute of Arthritis and Musculoskeletal and Skin Diseases

Budget Authority by Activity *
(Dollars in Thousands)

	FY 2022 Final		FY 2023 Enacted		FY 2024 President's Budget		FY 2024 +/- FY 2023 Enacted	
Extramural Research	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**
Detail								
Systemic Rheumatic and Autoimmune Diseases		$98,826		$103,290		$102,650		-$639
Skin Biology and Diseases		$110,975		$115,988		$115,270		-$718
Bone Biology and Diseases		$74,191		$77,542		$77,062		-$480
Muscle Biology and Diseases		$80,796		$84,445		$83,923		-$523
Joint Biology and Diseases and Orthopaedics		$184,066		$192,380		$191,189		-$1,190
Subtotal, Extramural		**$548,854**		**$573,644**		**$570,094**		**-$3,550**
Intramural Research	**124**	**$72,469**	**129**	**$75,876**	**133**	**$78,141**	**4**	**$2,265**
Research Management & Support	**109**	**$36,550**	**113**	**$38,120**	**117**	**$39,404**	**4**	**$1,284**
TOTAL	**233**	**$657,873**	**242**	**$687,639**	**250**	**$687,639**	**8**	**$0**

* Includes FTEs whose payroll obligations are supported by the NIH Common Fund.

National Institute of Arthritis and Musculoskeletal and Skin Diseases

Authorizing Legislation: Section 301 and Title IV of the Public Health Service Act, as amended.

Budget Authority (BA):

	FY 2022 Final	FY 2023 Enacted	FY 2024 President's Budget	FY 2024 +/- FY 2023
BA	$657,873,000	$687,639,000	$687,639,000	$0
FTE	233	242	250	+8

Program funds are allocated as follows: Competitive Grants/Cooperative Agreements; Contracts; Direct Federal/Intramural and Other.

Overall Budget Policy:
The FY 2024 President's Budget request for NIAMS is $687.6 million, the same as the FY 2023 Enacted level.

Program Descriptions

Systemic Rheumatic and Autoimmune Diseases
This program includes research on the causes of rheumatic and autoimmune diseases, and studies of potential new approaches to manage, treat, and prevent them. Within this program, research into lupus and rheumatoid arthritis (RA) expands on recent evidence that bacteria in the gut may contribute to metabolic and immune abnormalities in those diseases. One study in a mouse model of lupus found that modulation of gut bacteria using antibiotics can either improve or exacerbate lupus-like symptoms, depending on the timing of antibiotic administration. Another study found that gut bacteria can influence how oral methotrexate, a common RA treatment, is metabolized, which could provide an earlier marker for determining whether a particular patient is likely to respond to methotrexate.

Lung disease is a common comorbidity associated with rheumatic diseases. NIAMS-supported researchers investigated whether the drug tocilizumab could delay the progression of systemic sclerosis-associated interstitial lung disease. They found that use of this treatment in early stages of the disease could greatly help in managing it. Researchers are also examining how to reverse lung scarring – a key feature of scleroderma-related lung disease – through inhibition of the DPP4 gene. This work has great potential benefits for patients as there are currently no effective treatments for reversing ongoing scarring in scleroderma.

This program also supports efforts to identify undiscovered aspects of the genetics of autoimmunity. For example, NIAMS grantees examined the effect of all known lupus genetic

variants on gene expression levels, providing the first direct genome-wide measurement of the full set of genetic variants that contribute to lupus risk. Other work used single-cell genomics to create gene expression profiles in systemic sclerosis patients' skin and blood in order to identify therapeutic targets.

Budget Policy:
The FY 2024 President's Budget request for this program is $102.7 million, a decrease of $0.6 million or 0.6 percent compared with the FY 2023 Enacted level. Program plans for FY 2024 include continued support for the Accelerating Medicines Partnership Autoimmune and Immune-Mediated Diseases (AMP AIM) program. AMP AIM focuses on the cellular and molecular interactions that lead to inflammation and autoimmune diseases, and builds on earlier research programs focused on diseases such as rheumatoid arthritis, and systemic lupus erythematosus.

Through the Centers of Research Translation (CORT) program, NIAMS will continue two projects. The first focuses on pathways that contribute to the establishment and amplification of systemic lupus erythematosus and seeks to develop assays and tools to monitor these pathways and help stratify patient care. The second project will focus on pathways in systemic sclerosis, taking a bioinformatics and systems biology approach to develop targeted therapeutics.

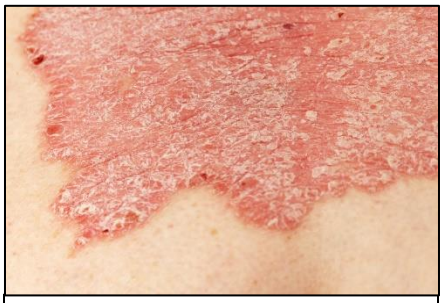
Program Portrait: AMP AIM

To accelerate the development of new therapies, NIH, the Foundation for NIH, nine pharmaceutical companies, and five non-profit organizations partnered to launch the Accelerating Medicines Partnership Autoimmune and Immune-Mediated Diseases (AMP AIM) program in December 2021. This public-private partnership will advance the discovery of cellular and molecular disease mechanisms and therapeutic targets for a variety of autoimmune and immune-mediated diseases, focusing on rheumatoid arthritis (RA), lupus, psoriasis, psoriatic arthritis, and Sjögren's disease.

AMP AIM builds on the success of the earlier AMP in RA and lupus program, which identified key cells and pathways that drive inflammation and tissue damage in RA and lupus. As many autoimmune diseases share common inflammatory pathways, clinical features, and may respond to the same treatments, AMP AIM focuses on the interactions between cells at the sites of disease to identify mechanisms that are shared across diseases, as well as disease-specific pathways.

AMP AIM will expand and strengthen the datasets created by the AMP RA/lupus program. The AMP AIM Research Network consists of complementary and highly interactive research groups that leverage novel, high-dimensional, research tools to enable more in-depth analyses. Beyond the technical innovations, patient engagement, including patient input into the design of research questions and patient-reported outcomes, is essential to maximize clinical impact. Finally, the data will be shared with the research community to further facilitate the development of new and effective therapies for people with autoimmune diseases.

Skin Biology and Diseases
This program supports research on the properties and functions of healthy skin, the causes of skin disease, and new approaches for skin disease prevention and treatment. Research supported by the program seeks to identify the biological mechanisms that lead to aberrant skin inflammation, an important underlying cause of diseases like atopic dermatitis and psoriasis. For example, a NIAMS-funded study in mice found evidence that immune system interactions with the nervous system are important for



Psoriasis on the skin. *Credit: IStock*

Program Portrait: Human Skin Microbiome

Human skin hosts diverse ecosystems including bacteria, viruses, and fungi, collectively called the skin microbiome. These microorganisms exist in a complex environment with immune cells, skin cells, and other factors, and play an essential role in maintaining health. NIAMS-supported research is exploring how alterations in the skin microbiome are associated with inflammation, disease, and changes in the immune system.

NIAMS researchers, in collaboration with scientists at NHGRI and in the United Kingdom, combined a traditional laboratory cultivation approach with metagenomic sequencing to create a reference collection of the skin microbiome from 19 body sites. This new catalog, called the Skin Microbial Genome Collection, consists of more than 600 bacterial species, more than 6,900 viruses, and some fungi, including newly discovered species. Another NIAMS group demonstrated that disruption of a signaling pathway, called ADAM10-Notch, alters the balance of skin bacteria, leading to inflammation that destroys hair follicles (see Intramural Program Description). In other work, NIAMS researchers demonstrated that just one course of antibiotics can trigger lasting changes to skin bacteria, with more antibiotic-resistant bacteria appearing on the skin.

Because healthy microbiomes across individuals and body sites vary, research is just starting to identify the differences between healthy and diseased microbiomes. Early studies suggest that restoring beneficial bacteria in people with eczema could reduce inflammation and mitigate symptoms. This supports the idea that the microbiome can be harnessed as a therapeutic to alleviate inflammation, promote wound healing, or even suppress certain skin cancers.

maintaining normal skin function and controlling inflammation. This finding adds to the growing appreciation of the role of neuroimmune interactions in skin disease and, if the findings are also observed in humans, could lead to novel therapies.

Another NIAMS-funded group investigated a phenomenon called "inflammatory memory," a process by which cells seem to "remember" prior instances of inflammation and respond more quickly during subsequent encounters with inflammatory stimuli. The researchers identified a two-step mechanism that drives inflammatory memory in the skin, which may offer new ways to control chronic inflammation. Other translational research using a mouse model of psoriasis found that blocking a protein receptor called TWEAK in skin cells decreased skin inflammation, overgrowth of epidermal cells, and expression of genes associated with psoriasis, which are all features of psoriasis in humans. The results suggest that the TWEAK receptor is a potential target for future psoriasis treatment. Other work has found a basis for a specific form of inflammation that occurs in some rare inherited disorders such as trichohepatoenteric syndrome, which is clinically characterized by, among other symptoms, primary immunodeficiency and skin and hair abnormalities. In this condition, the loss of a specific molecule disrupts normal cell function, leading to inflammation. Importantly, this form of inflammation arises through a mechanism not seen in autoimmune diseases that affect the skin such as psoriasis and cutaneous lupus erythematosus.

Budget Policy:

The FY 2024 President's Budget request for this program is $115.3 million, a decrease of $0.7 million or 0.6 percent compared with the FY 2023 Enacted level. Program plans for FY 2024 include continued participation in the AMP AIM program. The AMP AIM program's emphasis on the cellular and molecular interactions that lead to diseases such as psoriasis and psoriatic arthritis will help to improve treatment for psoriatic spectrum diseases and enhance the participation of dermatology and skin biology researchers in the AMP program.

The program also plans to continue supporting two projects through the Centers of Research Translation (CORT) program. The first seeks to identify the mechanisms of organ-specific autoimmunity. Using cutting edge "multiomics" tools, researchers will investigate how skin cells contribute to autoimmunity in vitiligo and similar autoimmune diseases. The second project will explore how lipid metabolism and the skin microbiome interact in healthy skin as well as in skin affected by inflammation. This research may result in targeted acne treatments focused on the microbiome, and may provide useful insights into other skin diseases where the microbiome plays a role, as described in the program portrait, Human Skin Microbiome.

Bone Biology and Diseases

This program supports projects focused on bone health and disease that can impact individuals at many stages of life. Projects range from fundamental research into the genetic and cellular mechanisms involved in the build-up and breakdown of bone to epidemiologic studies of lifestyle factors that can preserve bone health. One area of research supported by this program focuses on osteoporosis, a common condition in which the bones become weak and brittle, increasing the risk of fractures. Glucocorticoid treatment is the second most common cause of osteoporosis. Using genetic mouse models, NIAMS-supported researchers found that overexpressing the gene WNT7B in bone-forming cells called osteoblasts can recover bone loss caused by long-term glucocorticoid treatment.

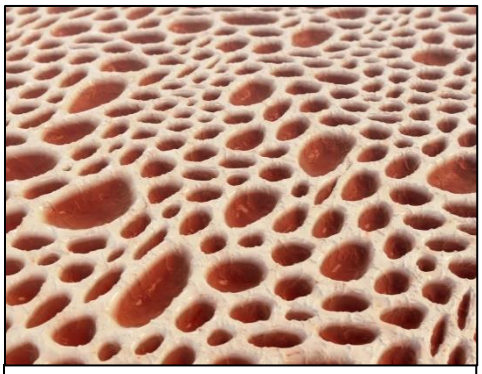


Image of bone tissue. *Credit: IStock*

Other NIAMS-funded work examined the relationship between fracture risk and an abnormal heart rhythm called atrial fibrillation. The study showed an association between atrial fibrillation and increased fracture risk specific to osteoporosis-related fractures, an especially important finding given that the incidence of atrial fibrillation increases with age. Another study found that acute myeloid leukemia (AML) cells are able to exploit the molecular circuitry of bone-forming cells to promote disease progression. Blocking this pathway in mice inhibited AML progression, a finding that helps to establish several potential therapeutic targets outside of AML cells themselves.

The program also supports research related to trauma and surgery. For instance, a group of NIAMS-supported investigators demonstrated the important role of sensory nerves and signaling in abnormal bone formation in soft tissue. Specifically, the research team found that sensory nerves contribute to heterotopic ossification (HO), the abnormal growth of bone in muscle and soft tissue, which can sometimes occur after severe soft tissue traumas, battlefield blast injuries, and orthopaedic surgeries. This finding identifies a potential target for preventing post-traumatic soft tissue HO formation and its associated loss of functional mobility.

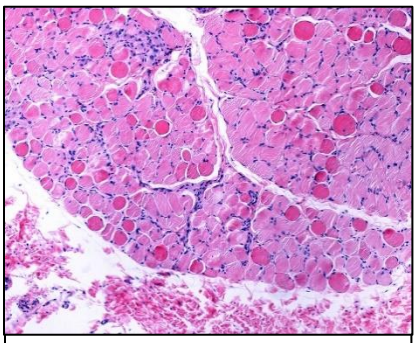
Budget Policy:

The FY 2024 President's Budget request for this program is $77.1 million, a decrease of $0.5 million or 0.6 percent compared with the FY 2023 Enacted level. NIAMS, together with NIA

and the NIH Office of Disease Prevention, hosted a 2019 Pathways to Prevention workshop on the Appropriate Use of Drug Therapies for Osteoporotic Fracture Prevention to address issues regarding osteoporotic fractures. NIAMS has collaborated with other Institutes to address the recommendations from the workshop and will continue to do so in FY 2024. Program plans include supporting work that leverages existing large databases and cohorts to better understand the risks and benefits of long-term osteoporosis therapy, and the effect of drug holidays on disease progression.

Muscle Biology and Diseases

This program supports studies to explain the muscle's role in health and, ultimately, to treat or prevent skeletal muscle diseases and disorders such as muscular dystrophies, muscle ion channel diseases, inflammatory myopathies, disuse atrophy, skeletal muscle injury, and loss of muscle mass and strength associated with aging and disease. This program is one of many at NIAMS focused on health at all stages of life. For example, a group of researchers studying muscle regeneration discovered a molecular pathway that may someday be leveraged to prevent age-related weakness. Using a mouse model, a group of NIAMS-supported researchers examined the role of certain skeletal muscle cells during extended periods of inactivity, as is seen following illness or injury. The research team found that healthy muscle cells produce antioxidants that protect muscle mass from oxidative stress and that these antioxidants can improve the health of muscles upon the resumption of activity.



Duchenne muscular dystrophy in muscle fiber. *Credit: IStock*

The NIAMS muscle research portfolio also emphasizes muscular dystrophies. Researchers have created a Duchenne muscular dystrophy model based on molecular resonance imaging that can be used to monitor disease progression and response to treatment. This model is sensitive enough to distinguish between boys who received steroid treatment and those who did not. Further, researchers studying muscle cells isolated from mice found a protein that keeps muscle stem cells viable in culture, and aim to translate this finding into a cell-based therapy for patients.

Budget Policy:

The FY 2024 President's Budget request for this program is $83.9 million, a decrease of $0.5 million or 0.6 percent compared with the FY 2023 Enacted level. Program plans for FY 2024 include support for two Senator Paul D. Wellstone Muscular Dystrophy Research Centers that promote collaborative basic, translational, and clinical research, and provide important resources for muscular dystrophy researchers nationwide. One center, funded through 2025, is organized around the central theme of preserving skeletal and cardiac muscle function in muscular dystrophies by delineating disease-modifying targets and developing therapeutic strategies.

Joint Biology and Diseases and Orthopaedics

This program funds a broad range of basic, translational, and clinical research centered on the interplay among the body's muscles, bones, and connective tissues. For example, NIAMS-funded investigators identified the muscle cell subpopulations contributing to bone repair in mice, a finding that may potentially lead to therapeutic approaches for severe bone injuries in

which muscle is also damaged. Similarly, studies in rodent models are uncovering a link between muscle communications with nerves that, when disrupted, contribute to the muscle wasting seen following anterior cruciate ligament (ACL) injuries. Such work is important for identifying therapeutic targets that may mitigate the muscle atrophy typically seen in young athletes with ACL tears.

Other scientists are examining how biological components outside the muscles, bones, and joints influence orthopaedic conditions or their repair. For instance, a research team examined the knees of patients who had ACL or meniscus injuries and found that the fluid surrounding the damaged knees contained similar immune cells to those found in patients with advanced osteoarthritis (OA) and rheumatoid arthritis. This finding suggests these cells play important roles in the joint changes that lead to the post-traumatic OA development that often follows these injuries. Another group, interested in using a specific type of fat called beige fat to improve muscle function after rotator cuff surgery, determined that fat precursor cells called fibroadipogenic progenitors (FAPs) promote muscle regeneration. The team also showed that increased rotator cuff tear size strongly inhibits the regenerative tendencies of FAPs, highlighting the importance of addressing tears while they are small. Still other researchers identified a connection between the bacteria that live in the gut and a mouse's ability to heal following cartilage injury. Together with other studies, the regeneration-associated microbiome groups identified here suggest the possibility of treating or preventing OA by manipulating the gut microbiome.

Much of the Institute's regenerative medicine research portfolio is in the Joint Biology and Diseases and Orthopaedics program. In one such study, investigators addressed the clinical complexity of reattaching tendon to bone following injury. They developed a gradient of adhesive material consisting of viscous gel that binds tendon tissue, and a dry film that binds to bone. These two materials could potentially be used in combination with the sutures that are already part of surgical repair. The next step toward bringing this to clinical care will be showing that it can improve outcomes in animal models. In other work, investigators used quantitative sensory tests and psychological variable assessments to identify an association between pain and pressure sensitivity and certain psychological qualities in patients with knee OA. Importantly, the significant disparity between structural damage shown on imaging tests and the pain experience reported by patients suggests that individual variation in pain cannot be solely attributed to structural damage, which suggests personalized pain management based on these newly discovered phenotypes would be beneficial.

Budget Policy:
The FY 2024 President's Budget request for this program is $191.2 million, a decrease of $1.2 million or 0.6 percent compared with the FY 2023 Enacted level. Program plans for FY 2024 include building on findings from a NIAMS-led July 2022 workshop on research gaps that, if addressed, could reduce the health disparities in the severity of and appropriate treatment for osteoarthritis. Other potential activities include encouraging the research community to explore opportunities to preserve and restore cartilage in the context of knee OA.

NIAMS IRP senior investigator Dr. Heidi Kong performs a non-invasive collection of skin samples with the assistance of Sheila Phang, a research nurse. *Credit: NCI*

Intramural Research Program

The NIAMS Intramural Research Program (IRP) conducts innovative basic, translational, and clinical research relevant to the NIAMS mission, and trains investigators in related careers. Its basic researchers and physician-scientists study the genetics, etiology, pathogenesis, and treatment of rheumatic, autoimmune, inflammatory, bone, skin, and muscle diseases. In a recent study, NIAMS researchers identified a biological signaling pathway, known as ADAM10-Notch, that plays a key role in maintaining a proper balance among beneficial bacteria that reside within hair follicles. When this pathway was disrupted, the balance of bacteria in the skin was altered, leading to an inflammatory response that destroyed hair follicles and caused irreversible hair loss reminiscent of scarring alopecia in humans. Also related to the skin microbiome, scientists in the NIAMS IRP demonstrated that standard antibiotics treatment can result in long-lasting changes in the bacteria found on human skin. This translational study found that just a single standard antibiotic treatment contributed to antibiotic-resistant bacteria appearing on the skin and damaging the skin microbial communities. Even more damage occurred at higher doses. These results, along with others highlighted in the Program Portrait about NIAMS-supported research on the microbiome, are examples of the NIAMS investment in efforts to explore how the host shapes, and in turn may be shaped by, the skin microbiome.

Research within the NIAMS IRP supports the goal of ensuring health at all stages of life for all people, including through the program's focus on addressing health disparities. NIAMS intramural scientists recently reported an unexpectedly high rate of statin-associated autoimmune myopathy among American Indians. Although statins reduce the risk of cardiovascular disease and have an acceptable side-effect profile, taking them can sometimes cause the body to produce antibodies against its own proteins, creating a muscle-wasting disorder or myopathy that may worsen even after the medication is discontinued. These results indicate the need for better screening, alternative therapeutics for these patients, and future studies to understand the mechanisms underlying this apparent health disparity.

Recently, NIAMS intramural scientists, together with the National Human Genome Research Institute (NHGRI), led an international team of researchers toward the discovery of a new, adult-onset inflammatory disease—now named the VEXAS (vacuoles, E1 enzyme, X-linked, autoinflammatory, somatic) syndrome—caused by a mutation in the *UBA1* gene located on the X chromosome. In a recent analysis, researchers identified a specific variant of the *UBA1* gene and the development of transfusion dependence as risk factors for decreased survival in VEXAS syndrome. In another study, researchers retrospectively analyzed patients receiving Janus kinase (JAK) inhibitors for the treatment of VEXAS syndrome and found that ruxolitinib was more effective than other JAK inhibitors. These results suggest that different genetic profiles of the disease may require targeted treatment approaches.

Finally, the NIAMS IRP seeks to maintain and enhance scientific workforce diversity by recruiting stellar early to mid-career researchers with a demonstrated commitment to improving diversity, and supporting them as they transition to independent research positions. Leveraging the NIH Independent Research Scholar program, which focuses on improving workforce diversity, the NIAMS IRP successfully recruited three Independent Research Scholars in the last year. The program will continue to educate, create awareness, and recommend and implement policy changes to address structural racism in the biomedical sciences at all career stages.

Budget Policy:
The FY 2024 President's Budget request for this program is $78.1 million, an increase of $2.3 million or 3.0 percent compared to the FY 2023 Enacted level. Program plans for FY 2024 include capitalizing on recent improvements in light imaging technology and expansion in high-performance computing capabilities to drive scientific discovery. The program also will build on enhanced genomic sequencing capabilities and genetic counseling services to identify the genetic causes of childhood lupus. In addition, with the recent recruitment of a pediatric dermatologist to the clinical staff, the NIAMS IRP will continue to expand research in skin diseases that affect children, such as alopecia areata. The program will also continue to implement policy and guidance in compliance with the NIH 2023 Data Management and Sharing policy.

Program Portrait: Pediatric Clinical and Translational Research in the NIAMS Intramural Program

A significant portion of the NIAMS IRP research focuses on pediatric populations. For instance, the Pediatric Translational Research Branch works to better understand the etiology and pathogenesis of early onset arthritis. The Juvenile Myositis Pathogenesis and Therapeutics Unit investigates the pathogenesis and novel treatments in juvenile dermatomyositis (JDM)—a chronic autoimmune inflammatory disease that results in progressive muscle weakness and skin rashes. In a recent clinical study, NIAMS intramural researchers examined whether the Janus kinase (JAK) inhibitor baricitinib could help children with chronic, treatment-resistant JDM. The results showed that all participants responded to the treatment and showed improvement in skin rash and/or muscle strength and inflammation, which was sustained for more than a year.

The Translational Genetics and Genomics Unit dissects the mechanisms that underlie inflammatory and autoimmune disease, with a particular interest in genetically complex diseases, such as systemic juvenile arthritis. On behalf of the International Childhood Arthritis Genetics Consortium (INCHARGE) and Childhood Arthritis and Rheumatology Research Alliance (CARRA), investigators in the Unit showed that changes in a section of the genome related to immune cell function are strongly associated with an increased risk for the condition. The Lupus Genomics and Global Health Disparities Unit seeks to better understand the pathogenesis of lupus by including diverse populations of pediatric lupus patients in their studies. Additionally, researchers in the Cutaneous Microbiome and Inflammation Section study the natural history of pediatric alopecia areata, including epidemiology, associated co-morbidities, and response to therapy.

These NIAMS intramural researchers, together with their colleagues across the NIH and collaborators around the world, strive to conduct outstanding translational and clinical research that bridges the bench and bedside and improves the lives of children and adults who suffer from the many diseases within the NIAMS purview.

Research Management and Support (RMS)
The RMS budget supports the scientific, administrative management, and information technology activities associated with NIAMS' day-to-day operations. In FY 2022, NIAMS managed 1,249 research grants and centers, as well as 33 research and development contracts and 311 individual and institutional full-time research training positions. NIAMS supported 606 clinical research studies, including 106 clinical trials. In FY 2022, NIAMS led a workshop for more than 80 people that focused on health disparities in osteoarthritis and hosted two roundtables, one on the molecular mechanisms

responsible for inflammation resolution and one on the research challenges, gaps, and opportunities related to cartilage preservation and restoration in knee osteoarthritis. Data science, data management, and data-driven decision making are among the Institute's highest priorities. These priorities are reflected in the FY 2022 development and launch of a new software tool, called Discovery and Management of NIH/NIAMS Data (DiAMOND), which supports the NIAMS IRP's compliance with the NIH Data Management and Sharing Policy and accelerates discovery by improving access to high-value datasets.

Budget Policy:
The FY 2024 President's Budget request for this program is $39.4 million, an increase of $1.3 million or 3.4 percent compared with the FY 2023 Enacted level. Program plans for FY 2024 include the development of the Institute's strategic plan for FYs 2025-2029. Activities will consist of hosting listening sessions with approximately 100 members of the extramural community and the public, and convening working groups with NIAMS staff and Advisory Council members.

NATIONAL INSTITUTES OF HEALTH
National Institute of Arthritis and Musculoskeletal and Skin Diseases

Appropriations History

Fiscal Year	Budget Estimate to Congress	House Allowance	Senate Allowance	Appropriation
2015	$520,189,000			$521,665,000
Rescission				$0
2016	$533,232,000	$528,137,000	$544,274,000	$542,141,000
Rescission				$0
2017 [1]	$541,662,000	$555,181,000	$564,131,000	$557,851,000
Rescission				$0
2018	$417,898,000	$566,515,000	$576,178,000	$586,661,000
Rescission				$0
2019	$545,494,000	$593,663,000	$605,383,000	$605,065,000
Rescission				$0
2020	$520,829,000	$634,637,000	$637,097,000	$624,889,000
Rescission				$0
2021	$568,480,000	$635,263,000	$645,237,000	$634,292,000
Rescission				$0
2022	$680,186,000	$679,410,000	$675,106,000	$655,699,000
Rescission				$0
2023	$676,254,000	$676,395,000	$686,025,000	$685,465,000
Rescission				$0
2024	$687,639,000			

[1] Budget Estimate to Congress includes mandatory financing.

NATIONAL INSTITUTES OF HEALTH
National Institute of Arthritis and Musculoskeletal and Skin Diseases

Authorizing Legislation

	PHS Act/ Other Citation	U.S. Code Citation	2023 Amount Authorized	FY 2023 Enacted	2024 Amount Authorized	FY 2024 President's Budget
Research and Investigation	Section 301	42§241	Indefinite	$687,639,000	Indefinite	$687,639,000
National Institute of Arthritis and Musculoskeletal and Skin Diseases	Section 401(a)	42§281	Indefinite		Indefinite	
Total, Budget Authority				$687,639,000		$687,639,000

NATIONAL INSTITUTES OF HEALTH

National Institute of Arthritis and Musculoskeletal and Skin Diseases

Amounts Available for Obligation [1]

(Dollars in Thousands)

Source of Funding	FY 2022 Final	FY 2023 Enacted	FY 2024 President's Budget
Appropriation	$655,699	$685,465	$687,639
OAR HIV/AIDS Transfers	$2,174	$2,174	$0
Subtotal, adjusted budget authority	$657,873	$687,639	$687,639
Unobligated balance, start of year	$0	$0	$0
Unobligated balance, end of year (carryover)	$0	$0	$0
Subtotal, adjusted budget authority	**$657,873**	**$687,639**	**$687,639**
Unobligated balance lapsing	-$30	$0	$0
Total obligations	$657,843	$687,639	$687,639

[1] Excludes the following amounts (in thousands) for reimbursable activities carried out by this account:
FY 2022 - $4,756 FY 2023 - $4,952 FY 2024 - $5,163

NATIONAL INSTITUTES OF HEALTH
National Institute of Arthritis and Musculoskeletal and Skin Diseases

Budget Authority by Object Class[1]
(Dollars in Thousands)

		FY 2023 Enacted	FY 2024 President's Budget	FY 2024 +/- FY 2023
Total compensable workyears:				
	Full-time equivalent	242	250	8
	Full-time equivalent of overtime and holiday hours	1	1	0
	Average ES salary	$195	$205	$10
	Average GM/GS grade	12.9	12.9	0.0
	Average GM/GS salary	$135	$143	$7
	Average salary, Commissioned Corps (42 U.S.C. 207)	$105	$111	$5
	Average salary of ungraded positions	$164	$172	$9
	OBJECT CLASSES	**FY 2023 Enacted**	**FY 2024 President's Budget**	**FY 2024 +/- FY 2023**
	Personnel Compensation			
11.1	Full-Time Permanent	$19,574	$21,022	$1,448
11.3	Other Than Full-Time Permanent	$11,222	$11,980	$758
11.5	Other Personnel Compensation	$1,235	$1,303	$67
11.7	Military Personnel	$442	$466	$24
11.8	Special Personnel Services Payments	$3,952	$4,168	$216
11.9	**Subtotal Personnel Compensation**	**$36,425**	**$38,938**	**$2,513**
12.1	Civilian Personnel Benefits	$11,836	$12,633	$797
12.2	Military Personnel Benefits	$83	$87	$5
13.0	Benefits to Former Personnel	$0	$0	$0
	Subtotal Pay Costs	**$48,344**	**$51,658**	**$3,314**
21.0	Travel & Transportation of Persons	$356	$365	$9
22.0	Transportation of Things	$162	$166	$4
23.1	Rental Payments to GSA	$0	$0	$0
23.2	Rental Payments to Others	$0	$0	$0
23.3	Communications, Utilities & Misc. Charges	$129	$132	$3
24.0	Printing & Reproduction	$0	$0	$0
25.1	Consulting Services	$19,300	$19,438	$138
25.2	Other Services	$13,985	$13,784	-$201
25.3	Purchase of Goods and Services from Government Accounts	$46,579	$47,099	$520
25.4	Operation & Maintenance of Facilities	$422	$432	$10
25.5	R&D Contracts	$3,309	$3,854	$545
25.6	Medical Care	$164	$171	$7
25.7	Operation & Maintenance of Equipment	$4,671	$4,783	$112
25.8	Subsistence & Support of Persons	$0	$0	$0
25.0	**Subtotal Other Contractual Services**	**$88,430**	**$89,561**	**$1,132**
26.0	Supplies & Materials	$5,297	$5,244	-$53
31.0	Equipment	$2,717	$2,617	-$101
32.0	Land and Structures	$0	$0	$0
33.0	Investments & Loans	$0	$0	$0
41.0	Grants, Subsidies & Contributions	$542,195	$537,886	-$4,308
42.0	Insurance Claims & Indemnities	$0	$0	$0
43.0	Interest & Dividends	$1	$1	$0
44.0	Refunds	$0	$0	$0
	Subtotal Non-Pay Costs	**$639,295**	**$635,981**	**-$3,314**
	Total Budget Authority by Object Class	**$687,639**	**$687,639**	**$0**

[1] Includes FTEs whose payroll obligations are supported by the NIH Common Fund.

NATIONAL INSTITUTES OF HEALTH

National Institute of Arthritis and Musculoskeletal and Skin Diseases

Salaries and Expenses

(Dollars in Thousands)

Object Classes	FY 2023 Enacted	FY 2024 President's Budget	FY 2024 +/- FY 2023
Personnel Compensation			
Full-Time Permanent (11.1)	$19,574	$21,022	$1,448
Other Than Full-Time Permanent (11.3)	$11,222	$11,980	$758
Other Personnel Compensation (11.5)	$1,235	$1,303	$67
Military Personnel (11.7)	$442	$466	$24
Special Personnel Services Payments (11.8)	$3,952	$4,168	$216
Subtotal, Personnel Compensation (11.9)	**$36,425**	**$38,938**	**$2,513**
Civilian Personnel Benefits (12.1)	$11,836	$12,633	$797
Military Personnel Benefits (12.2)	$83	$87	$5
Benefits to Former Personnel (13.0)	$0	$0	$0
Subtotal Pay Costs	**$48,344**	**$51,658**	**$3,314**
Travel & Transportation of Persons (21.0)	$356	$365	$9
Transportation of Things (22.0)	$162	$166	$4
Rental Payments to Others (23.2)	$0	$0	$0
Communications, Utilities & Misc. Charges (23.3)	$129	$132	$3
Printing & Reproduction (24.0)	$0	$0	$0
Other Contractual Services			
Consultant Services (25.1)	$18,876	$19,004	$128
Other Services (25.2)	$13,985	$13,784	-$201
Purchase of Goods and Services from Government Accounts (25.3)	$28,321	$28,822	$500
Operation & Maintenance of Facilities (25.4)	$422	$432	$10
Operation & Maintenance of Equipment (25.7)	$4,671	$4,783	$112
Subsistence & Support of Persons (25.8)	$0	$0	$0
Subtotal Other Contractual Services	**$66,275**	**$66,825**	**$550**
Supplies & Materials (26.0)	$5,305	$5,252	-$52
Subtotal Non-Pay Costs	**$72,227**	**$72,740**	**$513**
Total Administrative Costs	**$120,571**	**$124,398**	**$3,827**

NATIONAL INSTITUTES OF HEALTH
National Institute of Arthritis and Musculoskeletal and Skin Diseases

Detail of Full-Time Equivalent Employment (FTE)

Office	FY 2022 Final			FY 2023 Enacted			FY 2024 President's Budget		
	Civilian	Military	Total	Civilian	Military	Total	Civilian	Military	Total
Office of the Director									
Direct:	57	-	57	59	-	59	61	-	61
Total:	57	-	57	59	-	59	61	-	61
Division of Extramural Research									
Direct:	52	-	52	54	-	54	56	-	56
Total:	52	-	52	54	-	54	56	-	56
Intramural Research Program									
Direct:	121	3	124	126	3	129	130	3	133
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	121	3	124	126	3	129	130	3	133
Total	230	3	233	239	3	242	247	3	250
Includes FTEs whose payroll obligations are supported by the NIH Common Fund.									
FTEs supported by funds from Cooperative Research and Development Agreements.	0	0	0	0	0	0	0	0	0
FISCAL YEAR	**Average GS Grade**								
2020	12.7								
2021	12.9								
2022	12.9								
2023	12.9								
2024	12.9								

NATIONAL INSTITUTES OF HEALTH
National Institute of Arthritis and Musculoskeletal and Skin Diseases

Detail of Positions[1]

GRADE	FY 2022 Final	FY 2023 Enacted	FY 2024 President's Budget
Total, ES Positions	1	1	1
Total, ES Salary	$186,878	$195,000	$205,140
General Schedule			
GM/GS-15	25	25	26
GM/GS-14	34	35	36
GM/GS-13	63	65	67
GS-12	23	25	27
GS-11	13	13	13
GS-10	0	0	0
GS-9	3	3	3
GS-8	1	1	1
GS-7	5	5	5
GS-6	0	0	0
GS-5	0	0	0
GS-4	0	0	0
GS-3	0	0	0
GS-2	0	0	0
GS-1	0	0	0
Subtotal	167	172	178
Commissioned Corps (42 U.S.C. 207)			
Assistant Surgeon General	0	0	0
Director Grade	0	0	0
Senior Grade	2	2	2
Full Grade	0	0	0
Senior Assistant Grade	1	1	1
Assistant Grade	0	0	0
Subtotal	3	3	3
Ungraded	80	84	86
Total permanent positions	170	175	181
Total positions, end of year	251	260	268
Total full-time equivalent (FTE) employment, end of year	233	242	250
Average ES salary	$186,878	$195,000	$205,140
Average GM/GS grade	12.9	12.9	12.9
Average GM/GS salary	$129,132	$135,368	$142,539

[1] Includes FTEs whose payroll obligations are supported by the NIH Common Fund.