OPPORTUNITIES
Research and Training Programs for 2015-2016
NIAID Division of Intramural Research
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INTRODUCTION

Training the Next Generation of Scientists
GREETINGS from the Division of Intramural Research (DIR) at the National Institute of Allergy and Infectious Diseases (NIAID).

For more than 60 years, DIR has brought together exceptional scientists to conduct basic and clinical research in immunology, allergy, and infectious diseases. DIR researchers have discovered new pathogens, deciphered immune system functions, identified mechanisms underlying immunological diseases, and developed FDA-approved vaccines and therapies.

Today, amazing technological advances in imaging, structural biology, and the “-omics” are helping DIR researchers gain a much deeper understanding of the immune system and host-pathogen interactions. As a result, we are on the precipice of game-changing discoveries in several areas and making exciting progress in our mission to develop new and improved diagnostics, drugs, and vaccines.

Training has long been a central theme at DIR, and we continue to seek the best and brightest talent to help us fulfill our mission. We offer a broad spectrum of laboratory and clinical research opportunities for applicants at various stages in their careers. Our programs include summer internships, postbaccalaureate and postdoctoral training experiences, and accredited medical fellowships in allergy and immunology and in infectious diseases.

The training environment in DIR is rich with opportunities to work side-by-side with renowned scientists and with colleagues from every part of the world. DIR investigators are leaders in their fields and recognized by several prestigious awards. Our international programs offer trainees the chance to gain invaluable field experience in settings where malaria, tuberculosis, and tropical diseases are endemic.

DIR trainees have access to outstanding research facilities, including high-containment laboratories; advanced instrumentation; a robust animal program; and the NIH Clinical Center, the world’s largest hospital devoted exclusively to clinical investigation.

But what really sets DIR apart is our focus on the individual trainee. We invest in your career development through mentored research experiences, skill-building workshops, grant-writing seminars, special interest groups, scientific lectures, and individual counseling. Our goal is to make you highly competitive for tenure-track positions at NIAID and at other top-tier research institutions across the country and around the world.

We hope that you will take the time to learn more about DIR laboratories and investigators and that you will consider our training programs as you plan the next step in your scientific career.

L: Kathryn C. Zoon, Ph.D., Director, Division of Intramural Research, NIAID
R: Karyl Barron, M.D., Deputy Director, Division of Intramural Research, NIAID
ABOUT DIR

SINCE ITS BEGINNINGS in 1887, when it was a one-person lab housed in the attic of the Staten Island Marine Hospital in New York, the National Institutes of Health (NIH) has grown to 27 institutes and centers and a budget of more than $30 billion. The National Institute of Allergy and Infectious Diseases (NIAID) is one of the largest institutes at NIH.

The Division of Intramural Research (DIR) is a major component of NIAID. Our purpose is to make scientific discoveries that promote the development of new vaccines, therapeutics, and diagnostics that improve human health. In pursuit of this goal, DIR’s research goals are as follows:

- Expand knowledge of immune-system components and functions.
- Define mechanisms responsible for abnormal immune functions, such as immunodeficiency, allergy, and autoimmunity.
- Understand the biology of infectious agents (viruses, bacteria, fungi, and parasites) and the host response to infection.
- Develop strategies to prevent and treat immunologic, allergic, and infectious diseases.

DIR scientists study all aspects of infectious diseases, including causative agents, vectors, and pathogenesis in human and animal hosts. Clinical research also is integral to the mission of DIR, allowing key lab discoveries to be translated rapidly into methods of disease prevention, diagnosis, or treatment. DIR researchers are conducting more than 120 clinical trials at the NIH Clinical Center on the Bethesda, Maryland, campus and at collaborating U.S. and international sites.
Unparalleled Opportunities

DIR is home to a vibrant research community of more than 115 principal investigators who lead research groups composed of staff scientists, physicians, fellows, technical personnel, and students. DIR principal investigators are distinguished in their fields, recognized with numerous awards, and include several members of the U.S. National Academy of Sciences and the Institute of Medicine. Trainees, both pre- and postdoctoral physicians and scientists, constitute the largest staff group in DIR.

The atmosphere within DIR is one of collegiality, open exchange of ideas, and collaboration. Exceptional research facilities provide investigators with access to state-of-the-art instrumentation in imaging, proteomics, genomics, structural biology, and cell analysis, as well as animal genetics. Taken together, it is an ideal training ground for new researchers.

DIR scientists study all aspects of infectious diseases, including causative agents, vectors, and pathogenesis in human and animal hosts. Clinical research also is integral to the mission of DIR, allowing key lab discoveries to be translated rapidly into methods of disease prevention, diagnosis, or treatment.

World-Class Facilities

DIR has 18 laboratories and 2 free-standing sections that conduct peer-reviewed research. It also has several branches that focus on new research technologies and animal care. Most DIR labs are located on the NIH campus in Bethesda, Maryland, and in nearby Rockville, Maryland. Our other Maryland facilities are located in Frederick, nearly 40 miles north of the main NIH campus.

DIR also has a large research campus in Hamilton, Montana, known as the Rocky Mountain Laboratories. The campus features BSL-2, BSL-3, and BSL-4 laboratory space.

Other research amenities available to DIR employees and trainees include the following:

- The NIH Clinical Center, the world’s largest hospital devoted exclusively to clinical investigation
- State-of-the-art technology development facilities for protein chemistry, flow cytometry, confocal microscopy, electron microscopy, genomics, and bioinformatics
- Flow cytometry, cell sorting, and multiphoton confocal microscopy technology in a BSL-3 environment, with trained staff to operate the instrumentation safely
- Small-group and individual training in the use of specialized instrumentation and the development of research applications
• In-house facilities to design, conduct, and analyze results from microarray experiments for all species, including microbial pathogens
• Development and breeding of transgenic and knockout mice
• The Comparative Medicine Branch, which manages all aspects of research involving laboratory animals
• Computer networking and teleconferencing facilities, including satellite linkage to DIR-supported facilities at international sites

International Research

DIR is a leader in global research. Its International Centers for Excellence in Research (ICER) program, launched in 2002, is a model for developing and sustaining research programs in resource-limited countries with a high burden of infectious diseases. Through partnerships with local scientists, NIAID has developed core programs at the ICER sites—currently located in Mali, Uganda, and India—and, over time, has facilitated the expansion of research capacity by training young scientists, improving laboratory and clinical infrastructure, and enhancing information technology capabilities.

The ICER program builds on experience gained from NIAID’s long-standing malaria research collaboration with scientists in Mali. Initially, the collaboration focused on the genetics of malaria mosquitoes, but it has expanded significantly over the years. Today, Malian researchers collaborate with NIAID scientists on multiple projects, including studies on mosquito vectors, malaria drug resistance, and candidate malaria vaccines; research on neglected tropical diseases such as filariasis and leishmaniasis; and, more recently, other vector-borne diseases, including relapsing fever and Lassa fever. In addition to these activities, several NIAID-supported researchers at the Mali ICER are involved in collaborative research and training in malaria, leishmaniasis, and HIV/tuberculosis co-infection.

Researchers at the ICER site in Uganda, which includes a state-of-the-art field laboratory in the Rakai district and facilities at Makerere University in Kampala and the Uganda Virus Research Institute in Entebbe, conduct basic and clinical research on HIV and other sexually transmitted infections, including studies on viral pathogenesis, transmission kinetics, treatment, and prevention. More recently, NIAID scientists and their counterparts at the Uganda ICER initiated collaborative studies on malaria in children and pregnant mothers. Researchers at the ICER site in India, located at the Tuberculosis Research Centre in Chennai, conduct collaborative studies on filariasis and, more recently, on tuberculosis-filarial and HIV-filarial co-infections.

In addition to its ICER sites, DIR has collaborative research programs under way at several international sites, including the following:
• Brazzaville, Republic of the Congo—hemorrhagic fever viruses, including Ebola virus
• Johannesburg and Cape Town, South Africa—tuberculosis
• Masan and Seoul, South Korea—tuberculosis
• Phnom Penh and Pursat, Cambodia—malaria drug resistance
• Zhengzhou, China—tuberculosis
• Yaounde and Buea, Cameroon—filariasis (lymphatic filariasis, onchocerciasis, and loiasis)

The Edge of Scientific Discovery

DIR has long been at the forefront of research on immunologic, allergic, and infectious diseases. DIR scientists discovered the Lyme disease bacterium, the Norwalk virus responsible for epidemic gastrointestinal disease, several chemokine receptors, and the cytokine interleukin 4. DIR scientists have developed vaccines for hepatitis A and E and rotavirus, and they are currently conducting clinical studies of more than a dozen vaccine candidates
for malaria, dengue, and viral respiratory infections.

DIR laboratory and clinical research on rare immune system diseases has led to the discovery of autoimmune lymphoproliferative syndrome and its underlying genetic basis, the discovery of the gene mutation responsible for Job’s syndrome, and the development of gene therapies for severe combined immunodeficiency and chronic granulomatous disease.

For more than 25 years, DIR scientists have made important observations about the pathogenesis of HIV/AIDS, including the recent identification of another cellular receptor for HIV. DIR researchers also have made great strides in keeping abreast of new and re-emerging diseases, such as research to understand and develop treatments for Ebola and Middle East respiratory syndrome (MERS)-coronavirus infections.
NIAID OFFERS research training experiences for scientists in our laboratories in Maryland and in Hamilton, Montana, through the DIR Office of Training and Diversity (OTD). Mentored research opportunities range from postdoctoral and clinical research fellowships to graduate partnership programs, postbaccalaureate traineeships, and summer internships.

As the focal point for NIAID training, OTD designs and conducts programs to enhance the learning environment for trainees at all levels. NIAID research trainees participate in OTD’s numerous career development activities, such as an annual fellows workshop, skill-building workshops, and grant-writing seminars. OTD also emphasizes mentoring and individual career counseling, as well as conflict resolution to ensure a robust and competitive research program.

OTD is committed to increasing the participation at NIAID of populations underrepresented in biomedical research through three primary programs. An annual outreach program, Intramural NIAID Research Opportunities (INRO), seeks talented undergraduate and doctoral students. The OTD Sponsorship Program supports underrepresented scientists through individual mentorship, a special seminar series, and other events to ensure inclusion and diversity at NIAID. A new initiative, the OTD Summer Diversity Program, engages principal investigators and their summer interns in activities to broaden their understanding of diversity in the biomedical research workforce.

Quick Reference

**DIR Office of Training and Diversity**
Wendy J. Fibison, Ph.D., Associate Director
Quarters 15 F1
6 North Court, MSC 2663
Bethesda, MD 20892-1350
wfibison@niaid.nih.gov
www.niaid.nih.gov/about/organization/dir/Pages/otd.aspx

**INRO Program**
www.niaid.nih.gov/labs/training/inro
Applications are open from September 1 to October 15.
Postdoctoral Training

DIR has several options for those interested in postdoctoral laboratory research training. Our programs consist of a minimum of two to three years of research in one of the DIR labs, and Ph.D. and M.D. candidates can apply.

Available appointments differ slightly in their requirements for citizenship and postdoctoral experience, but all have the same starting point: finding the best research fit for you. Start by reading the descriptions of the labs and investigators in this book and determining which lab or investigator is conducting research in your area of interest.

Appointment Mechanisms

If you are selected for an NIAID DIR postdoctoral program, you may be appointed under one of several mechanisms, depending on the availability of funding, type of research, and your qualifications. These appointment mechanisms include the following:

**Postdoctoral Fellowship**, including the NIH Intramural Research Training Award (IRTA), requires that you be a U.S. citizen or permanent resident with a doctoral degree and five or fewer years of postdoctoral experience.

**Research Fellowship** is for highly experienced postdoctoral scientists (generally more than five years of postdoctoral experience) who seek further research training and professional development.

**NIH Visiting Program (VP)** offers scientists who are not U.S. citizens the opportunity to receive further training or to conduct research in their specialties. Appointments include the **Postdoctoral Fellowship (VP)**, which requires that you have a doctoral degree and five or fewer years of relevant postdoctoral experience.

Other Appointments

**Adjunct Investigator** appointment is possible if you have outside funding and want to enhance your research capabilities in a DIR laboratory. U.S. citizenship is not required.

**Special Volunteer** appointment is suitable if you have funding from a foundation or private grant and wish to conduct research in an NIAID lab.

**Guest Researcher** appointment allows you to use NIH facilities, equipment, and resources for your research and training; however, you cannot provide services to NIH.

NIAID Malaria Infection Biology Research and Training Program

The NIAID Malaria Infection Biology Research and Training Program seeks young scientists finishing their Ph.D. in immunology, parasitology, or closely related fields to study the interface of malaria and the host immune response. Graduate students also are encouraged to consider this program for their thesis work.
HOW TO APPLY

Postdoctoral Opportunities

Visit www.training.nih.gov/career_services/postdoc_jobs.nih, search “NIAID,” and complete an online application for the program that interests you.

OR

After reading this book, send the following information to the NIAID lab chief or investigator with whom you are interested in working:

- A cover letter describing your background, research interests, career goals, and the special training or experience you are seeking. Include the date you can begin training, home address, home and office telephone numbers, fax number, and email address.

- A copy of your curriculum vitae and bibliography. Representative publications are welcome.

If you would like your application to be distributed to more than one lab, send this information to the following contact:

Wendy J. Fibison, Ph.D., Associate Director
Office of Training and Diversity
Quarters 15 F1, 6 North Court, MSC 2663
Bethesda, MD 20892-1350
wfibison@niaid.nih.gov

Malaria Infection Biology Research and Training Program

Visit www.niaid.nih.gov/labs/training/mibprogram for a full description of the program. Submit a curriculum vitae; a short description of your thesis research and interest in malaria infection biology; and two letters of recommendation, one from your thesis advisor, to the following contact:

Susan K. Pierce, Ph.D., Director
NIAID Malaria Infection Biology Research and Training Program
spierce@nih.gov
Predoctoral Training for Students

Postbaccalaureate Intramural Research Training Award (IRTA) enables you to postpone your application to graduate or medical school so you can get an introduction to biomedical research. To qualify, you must be a U.S. citizen, have graduated from a fully accredited U.S. college or university, and have held the degree for no more than two years. Also, you must intend to apply to graduate or medical school in biomedical research during your time at NIAID.

Graduate Partnerships Program links NIH to national and international universities in the training of graduate students. It combines the academic environment of a university and the breadth and depth of research at NIH. This includes the NIH Oxford-Cambridge Scholars Program, an accelerated, international doctoral program in partnership with the Universities of Oxford and Cambridge in the United Kingdom. It is open to exceptional students in the field of biomedical research. Students admitted to the program typically design an innovative Ph.D. project, with co-mentorship by at least one NIH and one university principal investigator.

Technical IRTA is for applicants with a bachelor’s or master’s degree in a biomedical research field. It is a two-year program designed to help you develop the advanced skills and techniques necessary to be a highly trained research support professional.

Summer Internships in an NIAID laboratory can enhance your knowledge and understanding of the world of biomedical research and help you plan your academic goals. DIR offers 10- to 12-week summer internships for high school, college, graduate, and medical students. An online application is available in early November. The application deadline is March 1.
Learn more about predoctoral training programs by visiting the following websites:

**Postbaccalaureate IRTA**
www.training.nih.gov/programs/postbac_irta

**Graduate Partnerships Program**
www.training.nih.gov/programs/gpp

**NIH-Oxford-Cambridge Scholarship Program**
oxcam.gpp.nih.gov

**Technical IRTA**
www.training.nih.gov/programs/tech_irta

**Summer Internships**
www.training.nih.gov/programs/sip

Complete an online application for the program in which you are interested.

OR

After reading this book, send the following information to the NIAID lab chief or investigator with whom you are interested in working:

- A cover letter describing your background, research interests, career goals, and the special training or experience you are seeking. Include the date you can begin training, home address, home and office telephone numbers, fax number, and email address.

- A copy of your curriculum vitae and bibliography. Representative publications are welcome.

If you would like your application to be distributed to more than one lab, send this information to the following contact:

Wendy J. Fibison, Ph.D., Associate Director
Office of Training and Diversity
Quarters 15 F1, 6 North Court, MSC 2663
Bethesda, MD 20892-1350
wfibison@niaid.nih.gov
CLINICAL TRAINING OPPORTUNITIES
NIAID OFFERS three-year ACGME-approved fellowship programs in infectious diseases and in allergy and immunology. These programs aim to develop clinical and basic research skills in physicians who are well-grounded in clinical medicine and are pursuing a career in biomedical research.

Before beginning a fellowship, applicants must have completed three years of residency training in an approved internal medicine program (or in pediatrics for the allergy and immunology training program) in the United States or Canada. Qualified individuals may apply for a student loan repayment program that currently repays up to $35,000 per year of eligible student debt.

The three-year NIAID programs comprise one year of clinical training and two years of research. All trainees spend up to six months of the first year caring for patients in the NIAID inpatient ward at the NIH Clinical Center, where all NIAID patients participate in research protocols conducted by DIR investigators.

Patients enter the Clinical Center with various conditions, including the following:

- Autoimmune diseases
- Genetic and acquired immunodeficiencies
- Disorders of neutrophil and monocyte function
- Severe, acute, and chronic viral infections, including herpes simplex, Epstein-Barr virus, and HIV
- Hypereosinophilic syndromes and eosinophilic gastrointestinal disorders
- Allergic diseases, including atopic dermatitis, anaphylaxis, and mast cell disorders
- Parasitic diseases
- Mycoses
- Bacterial infections

During the remainder of clinical training, fellows join traditional consultation services and didactic rotations at NIH and other medical institutions in the surrounding area. Following clinical training, fellows conduct research in any one of the intramural laboratories at NIAID or in other NIH laboratories or programs.
HOW TO APPLY

Applicants to the allergy and immunology and infectious diseases training programs should follow the instructions in ERAS at www.aamc.org/students/medstudents/eras.

In addition to what is included in the application package, DIR requests the following:

- A personal statement describing the program to which you wish to apply, your background, your research interests, your career goals, and the special training or experience you are seeking at NIH
- Copies of your medical school/graduate school transcripts

**Allergy and Immunology Training Program**

Candidates should apply for the program 12 months prior to entry in July. The application deadline in ERAS is September 15. Applicants must be on track to complete an ACGME-approved residency in internal medicine or pediatrics at the time they enter the program. Interviews are held between late August and early November.

Kelly D. Stone, M.D., Ph.D.,
Director
Allergy and Immunology Training Program
10 Center Drive, MSC 1899,
Room 12C103
Bethesda, MD 20892-1899
301-435-0993 | 301-480-5757 (fax)
STONEK@niaid.nih.gov

Kathryn (Kate) Coons, M.S.,
Program Coordinator
Allergy and Immunology Training Program
10 Center Drive
Room 9N224
Bethesda, MD 20892
301-594-1192
kathryn.coons@nih.gov

**Infectious Diseases Training Program**

Applications are accepted only via ERAS. The program participates in the National Resident Matching Program. Interviews are held from September to October prior to the fellowship match.

Ericka Thomas, Program Coordinator
Infectious Diseases Training Program
10 Center Drive, MSC 1899,
Room 12C103
Bethesda, MD 20892
301-496-3461 | 301-480-0050 (fax)
THOMASER@niaid.nih.gov

**Selection Process**

Candidates are selected for interviews on the basis of their clinical and/or research credentials and research interests. Interview visits to the NIH campus are designed to introduce potential trainees to NIH preceptors and to provide the candidates with the opportunity to explore the clinical setting and the research they might conduct.
Allergy and Immunology Training Program

The Allergy and Immunology Training Program is designed to train fellows in the care of children and adults with immunologic diseases, including allergy, immunodeficiency, and autoimmune diseases. Fellows have a well-rounded clinical experience in their first year of training and subsequently develop a research program to advance the care of these patients.

The program accepts applications from residents in internal medicine or pediatrics who have completed training in the United States or Canada and who are not J-1 visa holders. H-1 visa holders may apply. Applications for the program are made through the Electronic Residency Application System (ERAS), and the program participates in the National Resident Matching Program.

Trainees who wish to become board-eligible in allergy and immunology are required to do the following:

- Complete inpatient and outpatient rotations at the NIH Clinical Center, Children’s National Medical Center, George Washington University, Johns Hopkins Hospital, and the Institute for Asthma and Allergy during their first year of training.
- Participate in monthly continuity clinics during their second year of training.
- Provide allergy and immunology consultation to the NIH Clinical Center.
- Attend the core basic and clinical immunology conferences and case conferences of the training program.
- Attend monthly journal clubs.
- Take American Board of Allergy and Immunology certification preparatory courses.
Infectious Diseases Training Program

The Infectious Diseases Training Program accepts applications from residents in internal medicine who have completed training in the United States or Canada and who are not J-1 visa holders. H-1 visa holders may apply.

Three years of residency training are required. Applicants who wish to pursue the ABIM Research Pathway, and who have the approval of the director of their respective internal medicine residency program, may apply for fellowship to begin after two years of residency. Applicants accepted under the ABIM Research Pathway must spend four years in fellowship to be eligible for certification in both internal medicine and infectious diseases.

The first year of the training program is entirely clinical and comprises 11 months of rotations at NIH and five outside sites. Fellows also rotate on the NIAID Inpatient Ward and spend two to three weeks at a private-practice infectious diseases clinic. Fellows receive training in hospital epidemiology and diagnostic microbiology.

Fellows are required to attend a weekly continuity clinic and participate in teaching conferences during the first two years of the training program. Fellows take the IDSA Infectious Diseases In-Training Examination during their first and second years and are eligible to take the Infectious Diseases Board Examination in their third year (fourth year for ABIM Research Pathway fellows).

NIAID Transition Program in Clinical Research

The NIAID Transition Program in Clinical Research provides opportunities for physicians to gain clinical and translational research experience in association with a DIR laboratory. NIAID conducts a national search to identify participants for this program. Participants are appointed as assistant clinical investigators. Applicants must have an M.D. or an M.D./Ph.D., be board-eligible or board-certified in a subspecialty (or equivalent), and qualify for credentialing from the NIH Clinical Center.

Candidates may choose the laboratory in which they will carry out their program, contingent upon approval from the lab chief and the DIR Director. Appointments are for three to five years; accepted participants will be reviewed throughout their appointments by a committee composed of DIR senior investigators with clinical research interests. Participants also will be paired with a senior clinical investigator who will serve as a mentor.

The application package must include a curriculum vitae/bibliography, three letters of reference sent directly from the referee to NIAID, a two-page research proposal, and a letter of support from the accepting NIAID lab chief. Submit application materials to the following address: NIAIDDIRSearch@niaid.nih.gov.

For questions about the program, contact Karyl S. Barron, M.D., at kbarron@niaid.nih.gov.

Competitive candidates will be asked to present their research accomplishments and plans to the search committee. Visit www.niaid.nih.gov/about/organization/dir/pages/clinicalresearchtransition.aspx for more information.
Scientists employed by NIH, as well as fellows accepting an NIH full-time equivalent (FTE) appointment into the infectious diseases or allergy and immunology training program, are eligible to apply for student loan repayment. There are competitive and noncompetitive repayment programs.

**General Research Intramural Loan Repayment Program**

The NIH General Research Intramural Loan Repayment Program (General ILRP) was established to attract highly qualified professionals, particularly physicians, to conduct research at NIH. Unlike previously authorized programs that targeted specific areas or types of research, such as AIDS or clinical research, this program supports research in a variety of scientific disciplines.

The general competitive ILRP may repay up to a maximum of $35,000 per year toward participants’ outstanding eligible education loans. NIH also will make payments to cover the increased federal taxes incurred as a result of receiving program benefits, as loan repayments are considered income for tax purposes. In return, participants must sign a contract agreeing to conduct qualified research activities as NIH FTE employees for a minimum of three consecutive years. Continuation contracts for additional years may be entered.

**Quick Reference**

NIH Loan Repayment Programs  
866-849-4047  
www.lrp.nih.gov  
lrp@nih.gov
AIDS Research Intramural Loan Repayment Program

This loan repayment program was established to enable highly qualified physicians, nurses, and scientists to enter AIDS research. In exchange for loan repayment benefits, researchers with NIH FTE appointments must agree to participate in AIDS research for a minimum of two consecutive years. Continuation contracts for additional years may be entered.

Clinical Research Loan Repayment Program for Individuals From Disadvantaged Backgrounds

The NIH Clinical Research Loan Repayment Program (CR-LRP) is designed to recruit highly qualified health professionals from disadvantaged backgrounds to serve as clinical researchers. Eligibility requirements for the CR-LRP are the same as those for the other LRPs, with two additional criteria: 1) You must be from a disadvantaged background, and 2) You must be awarded clinical privileges by the Clinical Center Medical Board or other credentialing board upon NIH employment.

An individual from a disadvantaged background is defined as one who comes from a family with an income below low-income thresholds. The income level considers family size and Bureau of the Census statistics, with annual adjustments for changes in the Consumer Price Index. HHS adjusts this level for use in all health professions programs and publishes this information periodically in the Federal Register. You must certify your disadvantaged background status by submitting at least one of the following documents:

- A written statement from your former school that you qualified for federal disadvantaged assistance during attendance
- Documentation that you received Health Professions Student Loans (HPSL) and Loans for Disadvantaged Students
- Documentation that you received scholarships from the U.S. Department of Health and Human Services (HHS) under the Scholarship for Individuals With Exceptional Financial Need

ACGME Fellows Loan Repayment Program

NIH offers student loan repayment benefits to qualified candidates who join one of its Accreditation Council for Graduate Medical Education (ACGME)-accredited residency or fellowship training programs through the General Research ILRP. The ACGME Loan Repayment Program (ACGME-LRP) can repay a maximum of $17,000 of eligible student loans for each year of the three-year fellowship program (maximum guarantee of $51,000). The program also covers the federal taxes on the loan amounts. Individuals who have been accepted to an ACGME program at NIH can receive these benefits upon completion of a short electronic application. These benefits are available to ACGME fellows non-competitively.

Fellows in non-ACGME subspecialty and residency training programs with an NIH FTE appointment can apply to the competitive General ILRP or the AIDS or Clinical ILRP.

General Requirements for Loan Repayment Programs

You must be a U.S. citizen, U.S. national, or permanent resident of the United States.

You must have a health professional doctoral degree (Ph.D., M.D., D.O., D.D.S., D.M.D., Pharm.D., or equivalent doctoral level degree) or a P.A., B.S.N., or A.D.N. degree from an accredited institution.

You must have qualifying educational debt in excess of 20 percent of your annual NIH base salary on the expected date of program eligibility.

You must have an NIH FTE appointment prior to submitting your application.
THE PRIMARY PURPOSE OF an NIH fellowship is to provide time-limited research training, clinical training, and/or career development opportunities to postdoctoral scientists. At the end of the training period, the majority of fellows will leave NIH to pursue careers at institutions in the United States or abroad. Longer appointment positions may be available through tenure-track or tenured positions. Opportunities for such appointments arise when research in a specific area is needed to fulfill the NIAID mission.

Tenure at NIAID consists of a permanent position and a long-term commitment of salary, personnel, and the research resources needed to conduct an independent research program within the scope of the NIAID mission. Scientists at NIAID obtain tenure in one of two ways: 1) The scientist is recruited from a national search for a tenured position after compiling an extensive research record at another institution or at NIH, or 2) The scientist successfully competes for and completes a tenure-track appointment at NIAID and is advanced to tenure.

Following nationwide recruitment efforts, candidates for tenured and tenure-track positions are selected by a search committee and a recommending official and approved by the NIH Deputy Director of Intramural Research. While traditional tenured and tenure-track positions are created by the hiring laboratory, DIR’s new Clinical Tenure-Track Program will periodically conduct searches for outstanding clinical researchers. Selected clinical tenure-track candidates are then matched to an NIAID laboratory.

Tenure-track investigators in basic research are given seven years to establish themselves as independent scientists before being evaluated for tenure; clinical tenure-track candidates are given up to nine years. At the midpoint, the NIAID Board of Scientific Counselors (BSC) reviews the
candidate’s and the lab’s performance and qualifications for tenure and decides whether the candidate should continue in tenure track or advance for an accelerated tenure decision. The BSC reviews the candidate’s performance again at the completion of the tenure-track period and decides if the candidate should be recommended for tenure.

If a candidate is recommended for tenure by the BSC and the NIAID Promotion and Tenure Committee or by a search committee, and if the DIR Director concurs, the request is forwarded for approval to the NIH Central Tenure Committee, which is chaired by the NIH Deputy Director for Intramural Research.

The initial fellowship appointment is for a period of two to three years. This may be renewed at the request of the host laboratory, if it is mutually beneficial to do so. It is the usual policy of NIH that postdoctoral trainees should not remain at NIH for more than five years. The overall limitation is eight years, regardless of appointment mechanism, unless the postdoctoral trainee is approved for tenure track or a permanent appointment.
DIR LABORATORIES & BRANCHES
RESEARCH ACTIVITIES

Use of animals in biomedical research is necessary to expand our ability to curtail infectious diseases, characterize new diseases, combat bioterrorism, and discover new ways to augment or harness the body’s immune system. The mission of the Comparative Medicine Branch is to serve as a resource for Division of Intramural Research investigators, support research activities, and provide the animals in its care with a comfortable, stable environment that eliminates research variables.

MAJOR AREAS OF SUPPORT

- Managing containment facilities for infectious disease research performed at animal biosafety levels 1 to 3
- Assisting with the development, annual review, and renewal of animal study proposals
- Purchasing animals
- Importing and exporting animals to and from locations throughout the world
- Overseeing intramural contracts and inter- and intra-agency agreements involving animals
- Diagnosing, characterizing, and treating diseases
- Controlling adventitious infectious agents
- Selecting and properly administering anesthetics and analgesics
- Overseeing the construction and renovation of animal facilities and assisting with planning for future animal-related requirements
- Tracking animal cage information through an interactive website

SECTIONS AND UNITS

**Infectious Disease Pathogenesis Section**
Randy Elkins, D.V.M.; Diplomate, ACLAM
RANDY ELKINS, D.V.M.; DIPLOMATE, ACLAM

Associate Director, Laboratory Animal Resources, Division of Intramural Research
Director, Animal Program, DIR
Chief, Comparative Medicine Branch
Chief, Infectious Disease Pathogenesis Section, CMB

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MAJOR AREAS OF RESEARCH

• Biostability of research models and issues related to animal welfare
• Adventitious infections and inherent disease conditions of laboratory animals
• Nonhuman primate-modeled infectious diseases and vaccine development support

BIOGRAPHY

Dr. Elkins obtained his D.V.M. from the University of Missouri College of Veterinary Medicine in 1974. He then completed a one-year internship in large animal surgery at the University of California, School of Veterinary Medicine, Veterinary Medical Teaching Hospital. Following several years of clinical practice in California, he completed a residency in comparative pathology at the U.S. Army Medical Research Institute of Infectious Diseases in Frederick, Maryland. In 1992, he joined the Immunodeficiency Viruses Section of the NIAID Laboratory of Infectious Diseases (LID) as a senior staff laboratory animal veterinarian. He became specialty board-certified by the American College of Laboratory Animal Medicine in 1996 and was promoted to head of LID’s Experimental Primate Virology Section in 1997. Dr. Elkins was appointed DIR Associate Director for Nonhuman Primate Research in 2000 and DIR Associate Director for Laboratory Animal Resources and Animal Program Director in December 2001.
RESEARCH ACTIVITIES

The Cytokine Biology Section (CBS) conducts basic and translational research on human interferons (IFNs). Our studies examine the structure and function of human IFN alphas using a variety of methods, including protein engineering, gene expression microarrays, proteomics, and bioassays.

CBS is composed of an interactive group of Ph.D., M.D., and interdisciplinary scientists who work in a state-of-the-art building.

MAJOR AREAS OF RESEARCH

- Identifying the structure and function of both naturally occurring and protein-engineered human IFN alphas
- Examining the interaction of IFN-alpha with its receptor
- Studying the signal transduction pathways of IFN-alphas using gene expression microarrays and proteomics
- Studying the biological effects of IFN-alphas in cell culture and animal models
Dr. Zoon obtained her B.S. cum laude and her Ph.D. in biochemistry from Johns Hopkins University. Her research focuses on the structure and function of human IFNs. She is an associate editor of the Journal of Interferon Research and author or co-author of more than 100 publications. She was past president of the International Society for Interferon and Cytokine Research, served on the board of directors for the Foundation for Advanced Education in the Sciences (FAES) and the International Association of Biologicals, and was the first vice president of FAES.

Prior to joining NIAID in June 2004, Dr. Zoon was principal deputy director of the Center for Cancer Research at the National Cancer Institute, director of the FDA Center for Biologics Evaluation and Research, and a member of the NIH Scientific Directors. She has received numerous awards and is a member of the Institute of Medicine.
RESEARCH ACTIVITIES

The Emerging Viral Pathogens Section (EVPS) conducts basic research to elucidate the pathophysiological processes associated with infections with viral hemorrhagic fevers and other Category A pathogens. In addition to developing animal models by using authentic microbial agents, EVPS develops treatment strategies that include vaccines, antimicrobials, immunoprophylaxis, and inhibitors of the coagulation cascade and cytokine storm to reverse the consequences of viral infection. Pathogen discovery also is a component of EVPS activities.

MAJOR AREAS OF RESEARCH

- Countermeasure development and improved medical outcomes
- Generic solutions to broad classes of microbial agents
- Assessment of broad spectrum of diseases, including newly discovered pathogens, for commonalities amenable to generic intervention strategies
**PETER JAHRLING, PH.D.**

Chief Scientist, NIAID Integrated Research Facility  
Chief, Emerging Viral Pathogens Section

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**MAJOR AREAS OF RESEARCH**

- Development of animal models for human diseases involving Category A viral pathogens
- Evaluation of immunization strategies and therapeutic interventions based on antiviral drugs, passive immunization, and targeted reversal of pathophysiological processes
- Isolation and characterization of viral agents associated with previously uncharacterized diseases

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**BIOGRAPHY**

Dr. Jahrling received his Ph.D. in medical microbiology from Cornell Medical College. Upon graduation, he served as an Army officer at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), where he specialized in viral hemorrhagic fevers requiring biosafety level (BSL)-4 containment. After fulfillment of his military obligation, Dr. Jahrling converted to civilian status and was eventually appointed scientific advisor for USAMRIID. In 2005, Dr. Jahrling accepted appointments as chief scientist of the NIAID Integrated Research Facility in Frederick, Maryland, and chief of the Emerging Viral Pathogens Section.
RESEARCH ACTIVITIES

The Laboratory of Allergic Diseases (LAD) conducts basic and clinical research on immunologic diseases with an emphasis on disorders of immediate hypersensitivity, which include the spectrum of classic allergic diseases. LAD is composed of an interactive group of Ph.D.s, M.D.s, research nurses, technicians, and administrative staff, who work in contemporary laboratories adjacent to NIAID’s clinical facilities. Scientific personnel are engaged in basic and translational research aimed at elucidating events in mast cell-dependent, immunoglobulin-mediated allergic inflammatory reactions, including anaphylaxis, eosinophilic gastrointestinal diseases, and systemic mast cell disorders. Studies are focused on the role of cytokines, mast cells, basophils, eosinophils, and T lymphocytes in these disorders.

MAJOR AREAS OF RESEARCH

- Study the growth, differentiation, and activation of mast cells, basophils, and eosinophils
- Elucidate signal transduction pathways in inflammation
- Understand the biological manifestations of effector-cell activation in tissues
- Perform clinical/translational research directed at understanding the pathogenesis of allergic inflammation
- Find novel immunomodulatory and anti-inflammatory approaches to the treatment of allergic and immunologic disorders

SECTIONS AND UNITS

- Mast Cell Biology Section
  Dean D. Metcalfe, M.D.

- Molecular Signal Transduction Section
  Kirk M. Druey, M.D.

- Food Allergy Research Unit
  Pamela Frischmeyer-Guerrerio, M.D., Ph.D.

- Genetics and Pathogenesis of Allergy Section
  Joshua D. Milner, M.D.

- Inflammation Immunobiology Section
  Helene F. Rosenberg, M.D., Ph.D.
DEAN D. METCALFE, M.D.

Chief, Laboratory of Allergic Diseases
Chief, Mast Cell Biology Section, LAD

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MAJOR AREAS OF RESEARCH

- Identification of mutations and polymorphisms in human disease that affect the mast-cell compartment
- Characterization of key signaling pathways in human mast cells that control mast-cell responses
- Application of this information to the diagnosis and treatment of anaphylaxis and other allergic and immunologic diseases

BIOGRAPHY

Dr. Metcalfe received his M.D. at the University of Tennessee and an M.S. in microbiology at the University of Michigan, where he also did a residency in internal medicine. Dr. Metcalfe then trained in allergy and immunology during a fellowship at NIAID, followed by training in rheumatology while a fellow in immunology at the Robert Brigham Hospital in Boston. In 1995, he was appointed as the first chief of the newly created Laboratory of Allergic Diseases at NIAID. He is a past president of the American Academy of Allergy, Asthma, and Immunology (AAAAI) and a past chair of the American Board of Allergy and Immunology. Dr. Metcalfe is a fellow of AAAAI and a member of the Association of American Physicians, Collegium Internationale Allergologicum, and American Clinical and Climatological Association.

KIRK M. DRUEY, M.D.

Chief, Molecular Signal Transduction Section, LAD

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MAJOR AREAS OF RESEARCH

- Basic signaling mechanisms of G protein-coupled receptors (GPCR)
- Leukocyte trafficking in allergic inflammation
- GPCR-induced bronchial contraction/relaxation
- Systemic capillary leak syndrome

BIOGRAPHY

Dr. Druey obtained his M.D. from Rush Medical College in Chicago. In 1992, following a residency in internal medicine at the New York Hospital/Cornell Medical Center, Dr. Druey became a postdoctoral fellow in the NIAID Laboratory of Immunoregulation. He joined the Laboratory of Allergic Diseases in 1997 to become chief of the Molecular Signal Transduction Section.
PAMELA FRISCHMEYER-GUERRERIO, M.D., PH.D.

Chief, Food Allergy Research Unit, LAD

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MAJOR AREAS OF RESEARCH

• Identification of genetic disorders associated with the development of food allergy and related conditions
• Investigation of the cellular and biochemical pathways critical to the development of tolerance to food antigens
• Development of novel therapies for food allergy

BIOGRAPHY

Dr. Guerrerio graduated with a B.S. in biology from the University of Iowa and went on to enter the Medical Scientist Training Program at Johns Hopkins University, where she completed medical school and a Ph.D. in human genetics. She also did her residency in pediatrics and fellowship in allergy and immunology at Johns Hopkins, and she subsequently joined the faculty there. In 2014, Dr. Guerrerio was appointed as chief of the Food Allergy Research Unit in the NIAID Laboratory of Allergic Diseases.

JOSHUA D. MILNER, M.D.

Chief, Genetics and Pathogenesis of Allergy Section, LAD

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MAJOR AREAS OF RESEARCH

• Investigation of defects in T-cell receptor signaling and repertoires
• Clinical and pathophysiologic analysis of patients with known genetic diseases associated with atopy
• Search for novel genetic diseases associated with atopy

BIOGRAPHY

Joshua Milner graduated with an S.B. in biology from the Massachusetts Institute of Technology (MIT) in 1995 and an M.D. with distinction in immunology from the Albert Einstein College of Medicine in 2000. He finished his residency in pediatrics in 2003 at the Children’s National Medical Center in Washington, DC. He was the recipient of the Pediatric Scientist Development Program Fellowship and did his fellowship in allergy and immunology at NIAID. He completed a postdoctoral fellowship with Dr. William Paul, NIAID, examining issues of mouse T-cell receptor repertoires. He was in the NIAID Clinical Research Transition Program immediately prior to being named section chief as a clinical tenure-track investigator in 2009. He received tenure in 2013.
HELENE F. ROSENBERG, M.D., PH.D.

Chief, Inflammation Immunobiology Section, LAD

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MAJOR AREAS OF RESEARCH

- Eosinophils, eosinophil ribonucleases, and their role in innate immune responses
- Inflammatory responses to and novel immunomodulatory therapies for severe respiratory virus infection
- Diversity and biology of eosinophil and other RNase A family ribonucleases

BIOGRAPHY

Dr. Rosenberg received M.D. and Ph.D. degrees from the Rockefeller University and Cornell University Medical College (1984, 1985). Following postdoctoral research at Harvard University, she joined NIH in 1991 and became a section chief in 2002.
RESEARCH ACTIVITIES

The Laboratory of Bacteriology (LB) studies bacteria that cause important human infections, including *Chlamydia*, *Coxiella*, *Francisella*, *Rickettsia*, and *Salmonella*. In addition, LB conducts research with pathogens listed as serious or urgent threats in the National Action Plan for Combating Antibiotic-Resistant Bacteria, such as methicillin-resistant *Staphylococcus aureus* (MRSA) and carbapenem-resistant *Klebsiella pneumoniae*. The ultimate goal of our research is to identify novel or improved strategies to control bacterial diseases, including development of diagnostics, vaccines, and therapeutics. LB maintains a flexible laboratory and theoretical infrastructure to permit analysis of bacterial pathogens of special interest.

MAJOR AREAS OF RESEARCH

- Investigation of molecular and cellular mechanisms of host-pathogen interactions, with special attention to emerging and re-emerging pathogens
- Host innate and adaptive immune responses to bacterial infection
- Neutrophil biology and function
- Bacterial immune evasion and virulence mechanisms
- Bacterial biofilms
- Systems biology-level approaches for virulence factor and vaccine target discovery
- Pathogen-occupied vacuole maturation and trafficking and manipulation of host cell signal transduction pathways

SECTIONS AND UNITS

- **Pathogen-Host Cell Biology Section**
  - Frank R. DeLeo, Ph.D.

- **Salmonella-Host Cell Interactions Section**
  - Olivia Steele-Mortimer, Ph.D.

- **Immunity to Pulmonary Pathogens Section**
  - Catharine (Katy) Bosio, Ph.D.

- **Host-Parasite Interactions Section**
  - David W. (Ted) Hackstadt, Ph.D.

- **Coxiella Pathogenesis Section**
  - Robert A. Heinzen, Ph.D.

- **Pathogen Molecular Genetics Section**
  - Michael Otto, Ph.D.
FRANK R. DELEO, PH.D.

Chief, Laboratory of Bacteriology
Chief, Pathogen-Host Cell Biology Section, LB

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MAJOR AREAS OF RESEARCH

- Neutrophil biology and function
- Neutrophil-bacteria interactions, with special emphasis on the interaction of MRSA and human neutrophils
- *Staphylococcus aureus* virulence mechanisms
- Clinically related research performed in collaboration with DIR laboratories in Bethesda, Maryland

BIOGRAPHY

Dr. DeLeo received his Ph.D. in microbiology from Montana State University in 1996, studying the molecular basis of superoxide generation by human neutrophils. He did his postdoctoral training in the areas of innate immunity and infectious diseases in the department of medicine at the University of Iowa (1996 – 2000). Dr. DeLeo joined the staff at NIAID’s Rocky Mountain Laboratories in 2000 and is currently chief of the Laboratory of Bacteriology (LB). He served as acting chief and then chief of the former Laboratory of Human Bacterial Pathogenesis from 2007 to 2015 and was appointed to the NIH Senior Biomedical Research Service in 2011.

OLIVIA STEELE-MORTIMER, PH.D.

Deputy Chief, Laboratory of Bacteriology
Chief, Salmonella-Host Cell Interactions Section, LB

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MAJOR AREAS OF RESEARCH

- Host-cell proteins involved in invasion
- Biogenesis of the *Salmonella*-containing vacuole

BIOGRAPHY

Dr. Steele-Mortimer received her Ph.D. in cell biology from the European Molecular Biology Laboratory in 1994. From 1995 to 1999, she did postdoctoral research on *Salmonella*-host cell interactions in the laboratory of B. Brett Finlay at the University of British Columbia in Vancouver, followed by one year at Washington University, St. Louis, with Phillip D. Stahl. She came to NIH in 2001 and became a tenured senior investigator in 2007. Dr. Steele-Mortimer is an associate editor of *Microbial Pathogenesis* and is a member of the editorial board of *Traffic*. 
**BIOGRAPHY**

Dr. Bosio graduated from Washington State University *cum laude* with a B.Sc. in 1993. Following completion of her Ph.D. at Colorado State University in 1998, Dr. Bosio completed postdoctoral fellowships at the FDA Center for Biologics Evaluation and Research and at the U.S. Army Medical Research Institute for Infectious Diseases, studying innate immunity to *Mycobacterium tuberculosis*, *F. tularensis*, Marburg virus, and Ebola virus. Prior to joining NIAID in 2007, Dr. Bosio was an assistant professor at Colorado State University in the department of microbiology, immunology, and pathology. Dr. Bosio’s laboratory studies the host response to pulmonary pathogens, with special emphasis on virulent *F. tularensis* and dendritic cells, macrophages, and monocytes.

**MAJOR AREAS OF RESEARCH**

- Innate immunity to *Francisella tularensis*
- Vaccine development for pneumonic tularemia
- Modulation of human cells by *F. tularensis*

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**BIOGRAPHY**

Dr. Hackstadt received his Ph.D. from Washington State University. His postdoctoral work was in the NIAID Laboratory of Microbial Structure and Function. Dr. Hackstadt then assumed an associate professorship in the departments of pathology and microbiology at the University of Texas Medical School in Galveston. In 1990, he returned to NIAID, where he was appointed chief of the Host-Parasite Interactions Section, awarded tenure in 1995, and appointed to the NIH Senior Biomedical Research Service in 2005. He currently serves on the editorial boards of *Traffic*, *Cellular Microbiology*, and *Infection and Immunity*. He is a past president of the American Society for Rickettsiology and was elected a fellow of the American Academy of Microbiology in 2005.

**MAJOR AREAS OF RESEARCH**

- Chlamydia interactions with host cells
- Vesicle trafficking pathways
- Biology of *Rickettsia*
ROBERT A. HEINZEN, PH.D.

Chief, Coxiella Pathogenesis Section, LB

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MAJOR AREAS OF RESEARCH

- Genomics and genetic systems
- Developmental biology
- Host interactions

BIOGRAPHY

Dr. Heinzen received his Ph.D. in microbiology from Washington State University in 1991. After completing an Intramural Research Training Award fellowship in the Laboratory of Intracellular Parasites in 1996, Dr. Heinzen joined the faculty of the molecular biology department at the University of Wyoming, where he was awarded tenure in 2002. Dr. Heinzen was recruited to NIH in 2003 as head of the new Coxiella Pathogenesis Section, where he was awarded tenure in 2010 and promoted to senior investigator. Dr. Heinzen has served on the executive council for the American Society for Rickettsiology. In 2011, Dr. Heinzen was elected fellow of the American Academy of Microbiology in recognition of his studies on Coxiella and Rickettsia pathogenesis.

MICHAEL OTTO, PH.D.

Chief, Pathogen Molecular Genetics Section, LB

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MAJOR AREAS OF RESEARCH

- Physiology of staphylococcal biofilms and biofilm-associated infection
- Molecular basis of immune evasion mechanisms in *Staphylococci*: exopolymers, proteases, toxins, antimicrobial peptide resistance, etc.
- Community- and hospital-associated MRSA: virulence determinants and epidemiology
- Gene regulatory processes during pathogen-host interaction

BIOGRAPHY

Dr. Otto received his M.S. in biochemistry in 1993 from the University of Tuebingen, Germany. In 1998, he earned his Ph.D. in microbiology from the same institution. Dr. Otto joined the former Laboratory of Human Bacterial Pathogenesis in July 2001 as a principal investigator. In 2008, he became a tenured senior investigator and moved his laboratory to the main NIH campus in Bethesda, Maryland. In 2015, his section joined the newly formed Laboratory of Bacteriology.
RESEARCH ACTIVITIES

The Laboratory of Clinical Infectious Diseases (LCID) conducts clinical and basic studies of important human infectious and immunologic diseases. Sections of the laboratory focus on mycobacterial, bacterial, and fungal infections, as well as the acquired and congenital immune disorders associated with infection susceptibility and resistance. The program integrates clinical, cellular, and molecular investigation, including animal models and human natural history and therapeutics clinical trials.

The defining feature of LCID is the focus on patients and their infections to develop a comprehensive understanding of natural history, pathogenesis, pathophysiology, and management of diseases.

Training of physicians and scientists is central to the LCID mission. The NIAID Infectious Diseases Training Program and the NIH Clinical Center Infectious Disease Consultation Service are located in LCID and are involved in all aspects of both clinical and laboratory activities. The integration of these programs into LCID is critical to the reciprocal education of basic scientists and clinical fellows alike.

The major themes of the laboratory center on infections that are recurrent or chronic, as these provide insight into both host and pathogen.

MAJOR AREAS OF RESEARCH

- Immune defects of phagocytes
- Cytokines in the pathogenesis and therapy of infections
- Mechanisms of bacterial pathogenesis
- Tuberculosis drug discovery, mechanisms of action, and resistance
- Mechanisms of fungal pathogenesis (Cryptococcus, Candidiasis, and Aspergillus)
- Diagnosis and treatment of Lyme disease

SECTIONS AND UNITS

- Immunopathogenesis Section
  Steven M. Holland, M.D.

- Antibacterial Host Defense Unit
  Robert S. Munford, M.D.

- Tuberculosis Research Section
  Clifton E. Barry III, Ph.D.

- Chlamydial Pathogenesis Section, LCID
  Harlan D. Caldwell, Ph.D.

- Bacterial Pathogenesis Unit
  Sandip Datta, M.D.

- Molecular Microbiology Section
  Kyung (June) Kwon-Chung, Ph.D.

- Fungal Pathogenesis Unit
  Michail S. Lionakis, M.D., Sc.D.

- Translational Mycology Unit
  Peter Williamson, M.D., Ph.D.
STEVEN M. HOLLAND, M.D.

Chief, Laboratory of Clinical Infectious Diseases
Chief, Immunopathogenesis Section, LCID

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MAJOR AREAS OF RESEARCH

- Immune defects of phagocytes: GATA2 deficiency (MonoMAC), nontuberculous mycobacterial infections, chronic granulomatous disease, hyper IgE (Job’s) syndrome, leukocyte adhesion deficiency
- Cytokines and their receptors in the pathogenesis and therapy of infections
- Susceptibility to disseminated mycobacterial infections
- Mechanisms of airway dysfunction leading to mycobacterial and fungal infections

BIOGRAPHY

Dr. Holland received his M.D. from the Johns Hopkins University School of Medicine in 1983, where he stayed as a resident in internal medicine, assistant chief of service in medicine, and fellow in infectious diseases. He came to NIH in 1989 as a National Research Council fellow in the Laboratory of Molecular Microbiology, working on transcriptional regulation of HIV. In 1991, Dr. Holland joined the Laboratory of Host Defenses, focusing on phagocyte defects and their associated infections. In 2004, he became chief of LCID.

ROBERT S. MUNFORD, M.D.

Senior Clinician and Deputy Chief, Laboratory of Clinical Infectious Diseases
Chief, Antibacterial Host Defense Unit, LCID

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MAJOR AREAS OF RESEARCH

- Basis for prolonged immunosuppression that develops after lipopolysaccharides (LPS) exposure in animals that cannot inactivate LPS
- How human cells regulate production of AOAH, the LPS-inactivating enzyme
- Associations between AOAH deficiency and human diseases
- How LPS and other stimulatory microbial molecules induce macrophages to accumulate and retain triglycerides contributing to pathological outcomes

BIOGRAPHY

Dr. Munford received his B.A. in history from Vanderbilt University and his M.A. in animal physiology from Oxford University before attending Harvard Medical School. After training in internal medicine at Parkland Memorial Hospital, Dallas, he served as an epidemic intelligence officer at the CDC, did postdoctoral research at the Rockefeller University in New York, and completed an infectious diseases fellowship at Massachusetts General Hospital. He worked for many years as a physician-scientist at the University of Texas Southwestern Medical School in Dallas before moving to NIH in 2009.
CLIFTON E. BARRY III, PH.D.

Chief, Tuberculosis Research Section, LCID

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MAJOR AREAS OF RESEARCH

• Tuberculosis (TB) drug discovery
• Mechanism of action of anti-TB agents
• Drug resistance in Mycobacterium tuberculosis
• Chemical biology of the interaction of TB and humans
• Clinical trials of therapies in drug-resistant TB patients
• Advanced diagnostic solutions for TB

BIOGRAPHY

Dr. Barry received his Ph.D. in organic and bio-organic chemistry in 1989 from Cornell University. He joined NIAID following postdoctoral research at Johns Hopkins University. In 1998, he was tenured as chief of the Tuberculosis Research Section. Dr. Barry is a member of several editorial boards, has authored more than 120 research publications in tuberculosis, and is the most cited researcher in the field, according to ScienceWatch.com.

HARLAN D. CALDWELL, PH.D.

Chief, Chlamydial Pathogenesis Section, LCID

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MAJOR AREAS OF RESEARCH

• Immunity to chlamydial infection
• Chlamydia vaccine design

BIOGRAPHY

Dr. Caldwell received his Ph.D. in pathobiology from the University of Washington in 1976. After completing a senior research fellowship in the department of medicine at the University of Washington in 1978, Dr. Caldwell joined the faculty of the University of California, San Francisco, as an assistant professor of microbiology and immunology. In 1980, he was recruited to NIH as a tenure-track investigator in the Laboratory of Microbial Structure and Function. He became a tenured investigator in 1986 and chief of the Laboratory of Intracellular Parasites in 1990. He is a recipient of the NIH Director’s Award, NIH Merit Award, and PHS Superior Service Award. He was appointed to the NIH Senior Biomedical Research Service in 1997. Dr. Caldwell is a member of the editorial board of Infection and Immunity and a fellow of the American Academy of Microbiology. He is an internationally recognized leader in the fields of chlamydial pathogenesis and immunology.
SANDIP K. DATTA, M.D.

Chief, Bacterial Pathogenesis Unit, LCID

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MAJOR AREAS OF RESEARCH

- Host defense against bacteria
- Development of adaptive immunity after bacterial infection
- Interaction of innate and adaptive immune systems after bacterial infection

BIOGRAPHY

Sandip Datta received his M.D. from the University of California, San Francisco, in 1996. He then completed his residency in internal medicine and fellowship in infectious diseases at the University of California, San Diego (UCSD), including postdoctoral training with Dr. Eyal Raz. Dr. Datta was appointed as assistant professor of medicine at UCSD in 2004. In February 2008, he joined LCID as tenure-track chief of the newly formed Bacterial Pathogenesis Unit.

K.J. KWON-CHUNG, PH.D.

Chief, Molecular Microbiology Section, LCID

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MAJOR AREAS OF RESEARCH

- Virulence determinants of Cryptococcus neoformans and Aspergillus fumigatus
- Mechanism by which Cryptococcus neoformans invades the brain
- Mechanism by which cryptococci adapt to the brain environment and produce fulminating disease
- Signaling mechanism involved in the cryptococcal adaptation to the human brain environment
- Mechanism of cryptococcal adaptive resistance to azole drugs and flucytosine
- Identification of pathobiological differences between Cryptococcus neoformans and its sibling species, Cryptococcus gattii
- Identification of host factors that predispose patients to invasive aspergillosis

BIOGRAPHY

Dr. Kwon-Chung received her B.S. and M.S. in biology from Ewha Woman’s University in Seoul, South Korea, prior to receiving a Fulbright Scholarship to pursue her doctoral work in the bacteriology department at the University of Wisconsin, Madison. After receiving her Ph.D., she joined the Medical Mycology Section of the NIAID Laboratory of Microbiology as a visiting fellow. She became a senior investigator in the NIAID Laboratory of Clinical Investigation in 1973 and has been the chief of the LCID Molecular Microbiology Section since 1995.
MAJOR AREAS OF RESEARCH

- Role of chemotactic factors in host defense against invasive candidiasis
- Role of specific resident and recruited innate immune cells in antifungal host defense against mucosal and systemic fungal challenge
- Genetic susceptibility to infection in mice and patients with candidiasis
- Organ-specific immunity in invasive candidiasis
- Immunological mechanisms of susceptibility to chronic mucocutaneous candidiasis in patients with APECED syndrome
- Dysbiosis and acquired local immunopathology in the pathogenesis of antibiotic-induced vaginal candidiasis

BIOGRAPHY

Dr. Lionakis obtained his M.D. and Sc.D. from the University of Crete in Greece. In 2002, he worked as a research fellow at the University of Texas MD Anderson Cancer Center under the mentorship of Dimitrios Kontoyiannis. After clinical training in internal medicine at Baylor College of Medicine and in infectious diseases at NIAID, Dr. Lionakis joined the Laboratory of Molecular Immunology (LMI) in 2008. In 2010, he was recruited as an assistant clinical investigator in the NIAID Transition Program in Clinical Research and established the Clinical Mycology Unit in LMI. In 2012, Dr. Lionakis was recruited as a tenure-track investigator and established the Fungal Pathogenesis Unit within LCID.

MAJOR AREAS OF RESEARCH

- Role of specialized signal motifs in trafficking virulence factors to the fungal cell wall
- How copper is exploited by cryptococcal strains to produce meningitis
- Regulation of autophagy by Cryptococcus in latent and active infections
- TOR-dependent regulation of autophagic-associated phagocytosis in macrophages
- Genetic susceptibility to infection by Cryptococcus in non-HIV-related infections
- Genetic susceptibility to bloodstream infections by Candida albicans
- Cryptococcal disease in AIDS patients and markers of immune reconstitution syndrome (Africa and India)

BIOGRAPHY

Dr. Williamson received his M.D./Ph.D. from Boston University in 1987 and completed a residency in internal medicine at Georgetown University before coming to NIH for a fellowship in infectious diseases. In 1995, after serving a short stint as chief medical officer with Lalima Sudan, Dr. Williamson joined the faculty at the University of Illinois at Chicago as an assistant professor of medicine in the section of infectious diseases. After progressing to the rank of professor of medicine, pathology, microbiology, and immunology, Dr. Williamson returned to NIH to head the LCID Translational Mycology Unit.
RESEARCH ACTIVITIES

The Laboratory of Host Defenses (LHD) studies the immune functions essential for host defense against infection. LHD also studies the genetics and pathophysiology of inherited primary immune deficiencies. These abnormalities may be associated with recurrent infections and/or dysfunctions of immune homeostasis, which the lab investigates in clinical protocols. LHD clinical investigations aim to develop new diagnostic and therapeutic approaches to the management or correction of immune dysfunction in patients.

MAJOR AREAS OF RESEARCH

- Discovery of the gene mutations causing primary immune deficiencies and autoimmune disorders
- Detection and treatment of associated infections
- Determination of the basis for excessive inflammation and associated autoimmune symptoms
- Use of cytokines, monoclonal antibodies, gene transfer technologies, and other therapeutics to modify or correct immune function, prevent infection, and reduce inflammation
- Application of gene therapy and allogeneic or autologous stem cell and immune cell transplantation for correction of disorders of immune function

SECTION AND UNITS

- Genetic Immunotherapy Section
  Harry L. Malech, M.D.
- Clinical Pathophysiology Section
  John I. Gallin, M.D.
- Molecular Defenses Section
  Thomas L. Leto, Ph.D.
- Mucosal Immunity Section
  Warren Strober, M.D.
- Human Immunological Diseases Unit
  Helen C. Su, M.D., Ph.D.
HARRY L. MALECH, M.D.

Chief, Laboratory of Host Defenses
Chief, Genetic Immunotherapy Section, LHD

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hmalech@nih.gov

MAJOR AREAS OF RESEARCH

- Clinical trials and basic research of gene therapy using \textit{ex vivo} transduction of autologous CD34+ hematopoietic stem cells
- Allogeneic transplantation using hematopoietic stem-cell grafts
- Chronic granulomatous disease
- X-linked severe combined immune deficiency
- Leukocyte adhesion deficiency
- WHIM syndrome
- Acute and chronic graft versus host disease
- Biology of engraftment of hematopoietic stem cells and the role of the CXCR4 chemokine receptor
- Excessive inflammation and associated autoimmune symptoms with primary immune deficiencies
- Induced pluripotent stem cells used to model human immune deficiencies and for development of novel treatments

BIOGRAPHY

Dr. Malech received his medical degree from Yale University in 1972. He completed clinical residency training at the University of Pennsylvania, followed by basic research postdoctoral fellowship training at NIH. After completing clinical fellowship training in infectious diseases at Yale University, he remained at Yale as an assistant and then associate professor until 1986. In 1986, he returned to NIH as a senior investigator in NIAID. He is currently chief of the Laboratory of Host Defenses (LHD). Dr. Malech’s research and clinical program within LHD is the Genetic Immunotherapy Section.

JOHN I. GALLIN, M.D., M.A.C.P.

Director, Clinical Center, NIH
Chief, Clinical Pathophysiology Section, LHD

www.niaid.nih.gov/labs/aboutlabs/lhd/clinicalpathophysiologysection
jgallin@cc.nih.gov

MAJOR AREAS OF RESEARCH

- Inflammation
- Phagocyte dysfunction

BIOGRAPHY

Dr. Gallin received his medical training at Cornell University Medical College in New York City, followed by a residency in internal medicine at Bellevue Hospital in New York City. In 1971, he first came to NIH as a clinical associate in Sheldon Wolff’s Laboratory of Clinical Investigation. In 1974, he served as senior chief resident in medicine at Bellevue Hospital before returning to NIH in 1976 as a senior investigator. Dr. Gallin has served as director of the NIAID intramural research program (1985 – 94) and as chief of the Laboratory of Host Defenses (1991 – 2003). Since 1994, Dr. Gallin also has been director of the NIH Clinical Center. Among his honors are membership in the American Society of Clinical Investigation, the Association of American Physicians, and the Institute of Medicine of the National Academy of Sciences. He also is a master of the American College of Physicians.
THOMAS L. LETO, PH.D.
Chief, Molecular Defenses Section, LHD
www.niaid.nih.gov/labs/aboutlabs/lhd/moleculardefensessection
tleo@nih.gov

MAJOR AREAS OF RESEARCH

- Nox family NADPH oxidases
- Reactive oxygen-dependent innate immune mechanisms in phagocytic cells and on mucosal surfaces
- Role of reactive oxygen in health and disease (host defense, inflammation, adaptive immunity, and cellular signaling)

BIOGRAPHY

Dr. Leto received his Ph.D. in biochemistry from the University of Virginia for studies on mechanisms of cell membrane assembly. He followed this work with postdoctoral studies at Yale University on membrane cytoskeleton interactions. Dr. Leto joined NIAID in 1988 and became a senior investigator in the Laboratory of Host Defenses in 1996.

WARREN STROBER, M.D.
Chief, Mucosal Immunity Section, LHD
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wstrober@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Basic studies of mucosal immunity, mucosal inflammation, and inflammatory bowel diseases such as ulcerative colitis and Crohn's disease
- Studies of immunodeficiency such as common variable immunodeficiency and hyper-IgM syndrome
- Studies of the immunobiology of inflammatory cytokines
- Studies of innate immunity in the mucosal immune system

BIOGRAPHY

Dr. Strober obtained his medical degree from the University of Rochester and completed an internship and residency at Strong Memorial Hospital. He has served as NIAID Deputy Scientific Director and as the interim scientific director of the National Institute of Arthritis and Musculoskeletal and Skin Diseases. Dr. Strober is the recipient of numerous awards, including the Distinguished Achievement Award of the American Gastroenterological Association and the PHS Distinguished Achievement Medal. In addition, he has been awarded an honorary doctorate from Humboldt University, Berlin. Dr. Strober has provided leadership to the scientific community as chair of the American Board of Allergy and Immunology and as president of the Society for Mucosal Immunity.
HELEN C. SU, M.D., PH.D.
Chief, Human Immunological Diseases Unit, LHD
www.niaid.nih.gov/labs/aboutlabs/lhd/humanimmunologicaldiseasesunit
hsu@niaid.nih.gov

MAJOR AREAS OF RESEARCH

• Defining the molecular mechanisms of new inherited human immunological diseases
• Understanding DOCK8 function in health and human disease

BIOGRAPHY

Helen Su received her M.D. and Ph.D. from Brown University. She completed training in pediatrics at St. Louis Children's Hospital, Washington University, and subspecialty training in allergy and immunology at NIAID. After postdoctoral training with Dr. Michael Lenardo in the Laboratory of Immunology, she joined the Laboratory of Host Defenses in 2007 as a tenure-track clinical investigator.
RESEARCH ACTIVITIES

Research in the Laboratory of Immunogenetics (LIG) focuses on the cellular and molecular mechanisms that underlie the signaling functions of immune cell receptors. This work encompasses a wide spectrum of experimental approaches, from the structural determination of immune receptors to live-cell image analysis of the behavior of chemotactic receptors.

LIG members are highly interactive, creating a unique environment in which structural biology, molecular biology, and cell biology interface. Interactions within LIG are facilitated by weekly work-in-progress presentations detailing recent advances and future directions of LIG fellows and students.

MAJOR AREAS OF RESEARCH

- Structure and function of the natural killer cell inhibitory and activating receptors
- Molecular mechanisms underlying the functions of the FcγRIIB receptor
- Signal transduction pathway in chemotaxis mediated by G protein-coupled receptors
- Function of the B-cell antigen receptor in initiating signaling cascades and transporting antigen for processing with MHC class II molecules
- Structures of components of important pathogens and the cellular receptors with which they interact

SECTIONS AND UNITS

Lymphocyte Activation Section
Susan K. Pierce, Ph.D.

Autoimmunity and Functional Genomics Section
Silvia Bolland, Ph.D.

Receptor Cell Biology Section
John E. Coligan, Ph.D.

Malaria Infection Biology and Immunity Unit
Peter D. Crompton, M.D., M.P.H.

Chemotaxis Signal Section
Tian Jin, Ph.D.

Molecular Pathology Section
Victor V. Lobanenkov, Ph.D.

Molecular and Cellular Immunology Section
Eric O. Long, Ph.D.

T-Cell Tolerance and Memory Section
Polly Matzinger, Ph.D.

Virology and Cellular Immunology Section
Herbert C. Morse III, M.D.

Structural Immunology Section
Peter D. Sun, Ph.D.
SUSAN K. PIERCE, PH.D.

Chief, Laboratory of Immunogenetics  
Chief, Lymphocyte Activation Section, LIG

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spierce@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Regulation of the antigen-driven initiation of B cell-receptor signaling
- Generation and maintenance of immunological memory in malaria

BIOGRAPHY

Dr. Pierce became chief of the NIAID Laboratory of Immunogenetics in 1999. Prior to joining NIAID, she was a member of the faculty at Northwestern University, where she held the Cook Chair in the Biological Sciences. She earned her Ph.D. in immunology from the University of Pennsylvania in 1976.

SILVIA BOLLAND, PH.D.

Chief, Autoimmunity and Functional Genomics Section, LIG

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sbolland@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Identification of new genetic modifiers of systemic autoimmune disease
- Dose effect of Toll-like receptor genes and its role in autoimmune pathologies
- Inhibitory signaling pathways mediated by the immunoglobulin-G Fc receptor and the phosphoinositol 5-phosphatase

BIOGRAPHY

Dr. Bolland received her Ph.D. in molecular biology from the University of Cantabria, Spain, and received postdoctoral training at Harvard and Rockefeller University. She joined the NIAID Laboratory of Immunogenetics in September 2001. She is the recipient of an S.L.E. Foundation Career Development Award and a Novel Research Grant Award from the Lupus Research Institute.
JOHN E. COLIGAN, PH.D.

Chief, Receptor Cell Biology Section, LIG

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jcoligan@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Regulation of expression and function of the human NKG2D/DAP10 and CD16 receptors expressed by natural killer (NK) and T cells
- Understanding the biological processes that regulate the intracellular transport and release of NK-cell cytolytic and cytokine-bearing granules
- Determination of the ligands and function of orphan lymphoid/myeloid cell inhibitory receptors, in particular mouse CLM receptors (human CD300) and the newly described immunoglobulin M Fc receptor (FCMR) formerly known as Toso

BIOGRAPHY

Dr. Coligan received his Ph.D. from Indiana University and did postdoctoral research at the City of Hope Research Institute. After two years as an assistant professor at Rockefeller University, he became a founding member of the Laboratory of Immunogenetics. He has served as head of the Biological Resources Branch and Laboratory of Molecular Structure. In 1998, he joined the Laboratory of Allergic Diseases and became chief of the Receptor Cell Biology Section. In 2007, this section moved to the Laboratory of Immunogenetics.

PETER D. CROMPTON, M.D., M.P.H.

Chief, Malaria Infection Biology and Immunity Unit, LIG

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pcrompton@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Mechanisms of naturally acquired immunity to malaria
- Antibody responses to Plasmodium falciparum infection
- B- and T-cell biology of P. falciparum infection
- Regulation of P. falciparum-induced inflammation
- Systems immunology of human malaria

BIOGRAPHY

Dr. Crompton received his M.D. and M.P.H. from the Johns Hopkins Schools of Medicine and Public Health in 2000. He then completed a residency in internal medicine at Massachusetts General Hospital/Harvard University in Boston before doing a fellowship in infectious diseases at NIAID in 2004. After a year of clinical training at NIAID, he earned a diploma in tropical medicine and hygiene at the London School of Hygiene & Tropical Medicine. He then joined the Laboratory of Immunogenetics in 2005 to pursue his research interest in the human immune response to malaria. In 2010, he became a tenure-track investigator and chief of the Malaria Infection Biology and Immunity Unit. Dr. Crompton is certified in internal medicine and infectious disease by the American Board of Internal Medicine.
TIAN JIN, PH.D.

Chief, Chemotaxis Signal Section, LIG

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tjin@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Mechanisms underlying GPCR-mediated chemotaxis in *Dictyostelium discoideum*
- Mechanisms involved in chemotaxis of immune and cancer cells

BIOGRAPHY

Dr. Jin received his B.S. in biology from Peking University, China, in 1984 and his Ph.D. from the department of biochemistry at the Robert Wood Johnson Medical School at Rutgers-UMDNJ in 1994. From 1994 to 2000, he was a postdoctoral fellow in the department of biological chemistry at the Johns Hopkins University School of Medicine. Dr. Jin was appointed instructor in the department of cell biology and anatomy at Johns Hopkins in 2001. Later that year, he joined the Laboratory of Immunogenetics as a tenure-track investigator. In 2009, he became senior investigator at NIAID.

VICTOR V. LOBANENKOV, PH.D.

Chief, Molecular Pathology Section, LIG

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vlobanenkov@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Three classes of CTCF/brother of the regulator of imprinted sites (BORIS) binding in epigenetic regulation
- Regulation of BORIS and its targets in cellular and viral genomes
- Translational research of BORIS repressors and of anti-BORIS immune responses directed to cancer diagnostics, therapy, and anti-tumor vaccination

BIOGRAPHY

Dr. Lobanenkov received an M.A. in nuclear physics from the Institute of Physics in 1977 and a Ph.D. in experimental oncology from the Cancer Research Center, Moscow, in 1981. He was molecular carcinogenesis team leader in the All-Union Cancer Center of the former U.S.S.R. and a visiting scholar at the Royal Cancer Hospital, London, until 1990, where he discovered avian CTCF. He was invited to the Fred Hutchinson Cancer Research Center in Seattle as a foreign faculty-in-residence funded by NIH grants. In 1999, he became chief of the Molecular Pathology Section in the NIAID Laboratory of Immunopathology; identified CTCF in *Drosophila*, mice, and humans; and characterized the novel BORIS+CTCF gene family universally involved in epigenetic regulation of mammalian cellular and viral genomes. His section moved to the Laboratory of Immunogenetics in 2012.
ERIC O. LONG, PH.D.

Chief, Molecular and Cellular Immunology Section, LIG

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elong@nih.gov

MAJOR AREAS OF RESEARCH

- Proteomics and imaging as tools to investigate signal transduction
- Regulation through inhibitory receptors
- Integrin signaling
- Natural killer (NK)-cell function in malaria
- Role of NK cells in pregnancy

BIOGRAPHY

Dr. Long graduated in biochemistry from the Swiss Federal Institute of Technology in Zürich, spent a year as a post-baccalaureate at the MRC Department of Molecular Genetics, University of Edinburgh, and obtained a Ph.D. in biology from the University of Geneva, Switzerland. After postdoctoral research at the department of embryology, Carnegie Institution, in Baltimore, and at the NIH National Cancer Institute, he returned to Geneva as a junior faculty member in the medical school’s department of microbiology. There, he began to apply molecular approaches to study MHC class II molecules and processing pathways for antigen presentation to antigen CD4 T cells. In 1983, he was recruited to the NIAID Laboratory of Immunogenetics, where he has remained to this day. In 1988, he became a tenured investigator and chief of the Molecular and Cellular Immunology Section. In 1995, his research interest shifted from antigen presentation to the regulation of NK-cell activation, when his team identified molecular clones for the inhibitory killer cell immunoglobulin-like receptors (KIR) and the signaling basis for inhibition.

POLLY MATZINGER, PH.D.

Chief, T-Cell Tolerance and Memory Section, LIG

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pcm@helix.nih.gov

MAJOR AREAS OF RESEARCH

- Danger model of immunity
- Tissue-based class control
- Immune tolerance and activation

BIOGRAPHY

Polly Matzinger has worked as a bartender, carpenter, jazz musician, playboy bunny, and dog trainer. She is currently chief of the T-Cell Tolerance and Memory Section. She worried for years that the dominant model of immunity does not explain a wealth of accumulated data and suggested an alternative, the Danger model, which suggests that the immune system is far less concerned with things that are foreign than with those that do damage. This model has very few assumptions and yet explains most of what the immune system seems to do right, as well as most of what it appears to do wrong, covering such areas as transplantation, autoimmunity, and the immunobiology of tumors. The model has been the subject of a BBC Horizon film and was featured in three other films about immunity, as well as countless articles in both the scientific and the lay press. In 2013, her section was assigned to the Laboratory of Immunogenetics.
HERBERT C. MORSE III, M.D.

Chief, Virology and Cellular Immunology Section, LIG

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hmorse@niaid.nih.gov

MAJOR AREAS OF RESEARCH

• Hematopoietic development and function in health and disease
• Pathogenesis of autoimmune and inflammatory diseases
• Mechanisms of lymphoma/leukemia development

BIOGRAPHY

Dr. Morse graduated from Harvard Medical School and then completed his internship and residency at Peter Bent Brigham Hospital, Boston. Following postdoctoral studies at NIAID, he joined the Laboratory of Viral Diseases in 1980 and became chief of the Laboratory of Immunopathology (LIP) in 1985. In 2011, LIP merged with the Laboratory of Immunogenetics, and Dr. Morse became chief of the Virology and Cellular Immunology Section.

PETER D. SUN, PH.D.

Chief, Structural Immunology Section, LIG

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psun@niaid.nih.gov

MAJOR AREAS OF RESEARCH

• Structural immunology
• Structure and function of natural killer-cell receptors
• Structural mechanisms of HIV and host interactions

BIOGRAPHY

Dr. Sun obtained his Ph.D. from the Molecular Biology Institute, University of Oregon, for the study of structure and thermostability of phage T4 lysozyme using X-ray crystallography. He then joined the National Institute of Diabetes and Digestive and Kidney Diseases for his postdoctoral training in 1991, focusing on the structure and function of cytokines. In particular, he determined the crystal structure of a human transforming growth factor, TGF-beta 2. He joined NIAID in 1994.
RESEARCH ACTIVITIES

The major research activities of Laboratory of Immunology scientists concern the basic genetics, molecular biology, cell biology, and cellular immunology of the immune system. Other important topics of interest are how dysregulation of the immune system results in autoimmune and lymphoproliferative diseases and what strategies might be valuable for vaccine development.

MAJOR AREAS OF RESEARCH

- miRNA regulation of immune cell function
- T-cell development, differentiation, and plasticity
- Transcriptional regulation of lymphocyte differentiation
- Regulation of primary and secondary immune responses
- Cytokine biology, transcriptional networks, and signaling mechanisms
- Programmed cell death and autophagy
- Biology of regulatory T cells and control of autoimmunity
- Role of T regulatory cells in chronic infection
- Induction of T-cell tolerance and treatment of autoimmunity
- Lymphocyte dynamics
- Structure and function of viral immunoevasins
- Detection and analysis of genetically determined defects in human lymphocyte homeostasis

SECTIONS AND UNITS

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<tr>
<td>Cytokine Biology Unit</td>
<td>William E. Paul, M.D.</td>
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<td>T-Cell Development Section</td>
<td>B.J. Fowlkes, Ph.D.</td>
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<td>Molecular Development of the Immune System Section</td>
<td>Michael J. Lenardo, M.D.</td>
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<td>Molecular Biology Section</td>
<td>David H. Margulies, M.D., Ph.D.</td>
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<td>Integrative Immunobiology Unit</td>
<td>Stefan A. Muljo, Ph.D.</td>
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<td>Ethan M. Shevach, M.D.</td>
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<tr>
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<td>Jinfang (Jeff) Zhu, Ph.D.</td>
</tr>
</tbody>
</table>
WILLIAM E. PAUL, M.D.

Chief, Laboratory of Immunology
Chief, Cytokine Biology Unit, LI
NIH Distinguished Investigator

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wpaul@niaid.nih.gov

**MAJOR AREAS OF RESEARCH**

- Cytokines: characterization, regulation of production, mode of action, and mechanism of receptor function
- Regulation of lymphocyte activation, differentiation, and proliferation
- Lymphocyte dynamics in health and in chronic infection, including HIV
- Immunologic memory and strategies for vaccine development

**BIOGRAPHY**

Chief of the Laboratory of Immunology (LI) since 1970, Dr. Paul served as director of the NIH Office of AIDS Research and as NIH Associate Director for AIDS Research from 1994 to 1997. He was editor of the *Annual Review of Immunology* for volumes 1 through 30 and is a member of the editorial boards of *Immunity* and the *Proceedings of the National Academy of Sciences*. He is a member of the National Academy of Sciences, its Institute of Medicine, and the Association of American Physicians and is a fellow of the American Academy of Arts and Sciences. He is a former president of the American Association of Immunologists and the American Society for Clinical Investigation.

B.J. FOWLKES, PH.D.

Chief, T-Cell Development Section, LI

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bfowlkes@niaid.nih.gov

**MAJOR AREAS OF RESEARCH**

- Notch signaling in T-cell development, activation, and immune responses
- GATA3 in T-cell activation, differentiation, and lineage commitment
- Mechanism of pre-T-cell receptor signaling in thymocyte development

**BIOGRAPHY**

After receiving an M.S. from the Medical College of Virginia, Virginia Commonwealth University, for studies of *Drosophila* genetics, Dr. Fowlkes conducted cancer research at the National Cancer Institute and immunology research at NIAID prior to receiving her Ph.D. for studies of thymocyte differentiation at George Washington University. She joined the Laboratory of Cellular and Molecular Immunology in 1987, was tenured as a senior investigator in 1990, and became chief of the T-Cell Development Section in 1992. In 2013, she joined the Laboratory of Immunology. Dr. Fowlkes organizes several immunology courses at NIH and at local universities. In 1999, she was appointed adjunct professor of genetics and of microbiology/immunology at George Washington University. She has been on the admissions board for the NIH Oxford-Cambridge Scholars Program since 2001 and is currently serving as a class dean. Dr. Fowlkes has been appointed to numerous editorial and scientific advisory boards and served as scientific editor for *Immunity* from 2003 to 2007. She is the recipient of a Roche Basic Science Award, an NIH Merit Award, and an American Association of Immunologists Investigator Award for outstanding contributions to immunology.
MICHAEL J. LENARDO, M.D.
Chief, Molecular Development of the Immune System Section, LI

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lenardo@nih.gov

Major Areas of Research
- Genetic diseases of immune homeostasis and autoimmunity
- Non-apoptotic mechanisms of cell death
- Development of novel immunodiagnostics and immunotherapeutics
- Physiology of Mg2+ as a second messenger in signal transduction

Biology
Dr. Lenardo graduated with a B.A. from Johns Hopkins University and an M.D. from Washington University, St. Louis. He performed clinical work in internal medicine and research at the University of Iowa and received postdoctoral training at the Whitehead Institute for Biomedical Research at the Massachusetts Institute of Technology. He established an independent research unit in the Laboratory of Immunology in 1989 and became a senior investigator and section chief in 1994. Dr. Lenardo serves on several editorial boards and has given numerous lectures around the world on his work on the molecular regulation of immune homeostasis. His work focuses on lymphocyte apoptosis, autoimmunity, and genomics of the immune system. He was one of the founders of the NIH Oxford-Cambridge Scholars Program for doctoral training and the NIH M.D./Ph.D. partnership program.

DAVID H. MARGULIES, M.D., PH.D.
Chief, Molecular Biology Section, LI

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dmargulies@niaid.nih.gov

Major Areas of Research
- MHC class I and class II molecules, whose function is to present antigens to T lymphocytes
- Viral immunoevasins and related molecules, in particular those encoded by cytomegaloviruses, that mimic MHC-I molecules in structure and function to modulate the immune response as decoy receptors or by other mechanisms
- Immune hypersensitivity reactions related to MHC-I molecules
- Natural killer (NK)-cell receptors, cell surface molecules of effector cells of the innate immune system that mediate recognition of tumor- and virus-infected cells via the level and composition of MHC-I molecules on the NK-cell target
- T-cell receptors that by clonal expression confer antigen and MHC specificity for the activation of T cells

Biology
Dr. Margulies received an A.B. from Columbia University in 1971. In 1978, he earned his M.D. and Ph.D. from the Albert Einstein College of Medicine. From 1978 to 1980, he served as a resident in medicine at Columbia/Presbyterian Medical Center. From 1980 to 1983, he worked as a research associate in the Laboratory of Molecular Genetics at the National Institute of Child Health and Human Development. From 1983 to 1987, he was an investigator in the Laboratory of Immunology. In 1987, he became a senior investigator and, since 1989, has been chief of the Molecular Biology Section. Since 2008, he has been a member of the Senior Biomedical Research Service.
MAJOR AREAS OF RESEARCH

- Non-coding RNAs: characterization under physiological and pathological conditions, regulation of production, mechanisms of action, identification of cognate targets
- Gene expression and its regulation in hematopoietic stem cells and during cellular differentiation
- Application of small RNAs for modulating or enhancing immune responses
- MicroRNA expression profiling to identify novel biomarkers

ETHAN M. SHEVACH, M.D.
Chief, Cellular Immunology Section, LI
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eshevach@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Roles of thymic-derived regulatory T cells and peripherally induced regulatory T cells in immune responses
- Role of regulatory T cells (Tregs) in the immune response to infectious agents
- Mechanisms of action of Foxp3+ Treg
- Studies of human Foxp3+ Tregs

BIOGRAPHY

Dr. Shevach received his M.D. from Boston University in 1967. Following clinical training, he joined the Laboratory of Immunology as a senior staff fellow in 1972, was appointed a senior investigator in 1973, and became a section chief in 1987. Dr. Shevach served as editor-in-chief of the Journal of Immunology from 1987 to 1992 and editor-in-chief of Cellular Immunology from 1996 to 2007. He received the 2004 William B. Coley Award for Distinguished Research in Basic and Tumor Immunology.

STEFAN A. MULJO, PH.D.
Chief, Integrative Immunobiology Unit, LI
www.niaid.nih.gov/labs/aboutlabs/li/iiu
stefan.muljo@nih.gov

MAJOR AREAS OF RESEARCH

- Non-coding RNAs: characterization under physiological and pathological conditions, regulation of production, mechanisms of action, identification of cognate targets
- Gene expression and its regulation in hematopoietic stem cells and during cellular differentiation
- Application of small RNAs for modulating or enhancing immune responses
- MicroRNA expression profiling to identify novel biomarkers

BIOGRAPHY

Dr. Muljo joined the Laboratory of Immunology in July 2008 to head the Integrative Immunobiology Unit. He earned his Ph.D. from the graduate program in immunology at the Johns Hopkins University School of Medicine. Part of his dissertation work was performed at the department of molecular and cell biology in the division of immunology and pathogenesis, University of California, Berkeley. This was followed by a postdoctoral fellowship at the Immune Disease Institute (formerly the Center for Blood Research), Harvard Medical School.
JINFANG (JEFF) ZHU, PH.D.

Chief, Molecular and Cellular Immunoregulation Unit, LI

jzhu@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Diversity and plasticity of T-helper subsets
- Development and functions of innate lymphoid cell subsets
- Transcriptional regulation of lineage-specific genes

BIOGRAPHY

Dr. Zhu received his bachelor’s degree summa cum laude from the department of biology, Nankai University, Tianjin, China, and his Ph.D. in biochemistry and molecular biology from the Shanghai Institute of Biochemistry (now known as Shanghai Institute of Biochemistry and Cell Biology), Chinese Academy of Sciences. He joined the Laboratory of Immunology (LI) first as a visiting fellow and then as a staff scientist studying CD4 T-cell differentiation. He became a principal investigator in LI in October 2011.
RESEARCH ACTIVITIES

The major theme of the Laboratory of Immunoregulation (LIR) continues to be the elucidation of cellular and molecular mechanisms regulating the human immune response in health and disease. A major component of these efforts is the study of the immunopathogenic mechanisms of HIV infection and disease progression.

The rational design of strategies aimed at the prevention and treatment of HIV infection depends on delineating how HIV destroys the immune system. Our investigation of host factors involved in the evolution of HIV disease indicates that HIV pathogenesis is a multifactorial and multiphasic process. Particularly important aspects of this process that are under intense investigation include the following:

- Regulation of HIV replication by endogenous cytokines and chemokines
- Regulation of expression of HIV coreceptors
- HIV envelope-mediated intracellular signaling events responsible for immune dysfunction
- Role of a latent, inducible reservoir of HIV-infected cells in the pathogenesis of HIV disease and its implication for antiretroviral therapy
- Contribution of HIV-infected T cells, B cells, dendritic cells, monocyte/macrophages, and multipotent progenitor cells to disease pathogenesis
- Role of immunomodulation in immune reconstitution during antiretroviral therapy for HIV infection
- LIR researchers conduct clinical trials to determine the safety and efficacy of drugs for the treatment of HIV infection and its complications and the development of methods for immunologic reconstitution in HIV-infected individuals. Their studies of the epidemiology and pathogenesis of HIV infection and other sexually transmitted diseases are both domestic and international.

MAJOR AREAS OF RESEARCH

- Cellular and molecular mechanisms of HIV immunopathogenesis
- Regulation of the human immune system, particularly the cellular and molecular mechanisms of activation, proliferation, and differentiation of human T and B cells
- Cellular gene expression during activation of human T and B cells
- Pathogenesis and treatment of immune-mediated diseases, particularly vasculitic syndromes

SECTIONS AND UNITS

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<tr>
<td>Immunopathogenesis Section</td>
<td>Anthony S. Fauci, M.D.</td>
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<tr>
<td>HIV-Specific Immunity Section</td>
<td>Mark Connors, M.D.</td>
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<tr>
<td>Clinical Research Section</td>
<td>Richard Davey, M.D.</td>
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<td>B-Cell Molecular Immunology Section</td>
<td>John H. Kehrl, M.D.</td>
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<td>Clinical and Molecular Retrovirology Section</td>
<td>H. Clifford Lane, M.D.</td>
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<td>Viral Pathogenesis Section</td>
<td>Paolo Lusso, M.D., Ph.D.</td>
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<tr>
<td>International HIV/STD Section</td>
<td>Thomas C. Quinn, M.D., M.Sc. Steven J. Reynolds, M.D., M.P.H.</td>
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<tr>
<td>HIV Pathogenesis Unit</td>
<td>Irini Sereti, M.D.</td>
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ANTHONY S. FAUCI, M.D.

Director, NIAID
Chief, Laboratory of Immunoregulation
Chief, Immunopathogenesis Section, LIR

www.niaid.nih.gov/labs/aboutlabs/lir/immunopathogenesissection
afauci@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Roles of latently infected, resting CD4+ T cells, B cells, and innate immunity in the pathogenesis and treatment of HIV disease
- Role of HIV-envelope signaling in viral replication and immune dysfunction
- Therapeutic strategies for management of hepatitis C/HIV co-infection
- Novel approaches to the inhibition of HIV binding and entry into CD4+ T cells
- Novel approaches to the treatment of recently acquired and chronic HIV infection

BIOGRAPHY

Dr. Fauci received his A.B. from the College of the Holy Cross and his M.D. from Cornell University Medical College. He then completed an internship and residency at the New York Hospital-Cornell Medical Center. In 1968, Dr. Fauci came to NIH as a clinical associate in the NIAID Laboratory of Clinical Investigation. In 1980, he was appointed chief of the Laboratory of Immunoregulation, a position he still holds. Dr. Fauci became director of NIAID in 1984. He serves as one of the key advisors to the White House and U.S. Department of Health and Human Services on global AIDS issues and on initiatives to bolster medical and public health preparedness against emerging infectious disease threats such as pandemic influenza.

MARK CONNORS, M.D.

Chief, HIV-Specific Immunity Section, LIR

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mconnors@nih.gov

MAJOR AREAS OF RESEARCH

- Cellular immune response to HIV
- Mechanisms of immunologic control of HIV in long-term nonprogressors, or elite controllers
- Mechanisms of broad cross-neutralization of HIV

BIOGRAPHY

Dr. Connors received his M.D. from Temple University and was trained in pediatrics at Tufts-New England Medical Center. He joined the NIAID Laboratory of Infectious Diseases in 1989 to study the immune response to respiratory syncytial virus. He was trained in infectious diseases at the NIH Clinical Center and at the Children's Hospital of Philadelphia. He joined the Laboratory of Immunoregulation in 1994 to study the human immune response to HIV. Dr. Connors has published a series of discoveries that have laid the framework for current understanding of immunologic control of HIV in some rare patients and loss of immunologic control in the majority of infected patients.
RICHARD DAVEY, M.D.
Deputy Clinical Director, NIAID
Chief, Clinical Research Section, LIR
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rdavey@niaid.nih.gov

MAJOR AREAS OF RESEARCH
- Treatments for HIV infection and the consequences of those treatments
- Studies of immune function, immunodeficiency, and pathogenesis of HIV disease
- Studies of the natural history, pathogenesis, and treatment of influenza infection and other emerging infectious diseases

BIOGRAPHY
Dr. Davey received his M.D. from Columbia University and trained in internal medicine at Boston University Hospital and in infectious diseases at NIAID. He joined the NIAID intramural AIDS program in 1987.

JOHN H. KEHRL, M.D.
Chief, B-Cell Molecular Immunology Section, LIR
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MAJOR AREAS OF RESEARCH
- G-protein signaling and the role of regulator of G-protein signaling proteins
- Lymphocyte trafficking
- Cell migration
- Autophagy and inflammasomes

BIOGRAPHY
Dr. Kehrl graduated from Wayne State Medical School, completed his medical residency in internal medicine at Yale-New Haven Hospital, and held fellowships in both infectious diseases and allergy-immunology in the Laboratory of Immunoregulation (LIR). Dr. Kehrl is currently a tenured senior investigator and a member of the research officers group in the Commissioned Corps of the U.S. Public Health Service. Dr. Kehrl was appointed chief of the LIR B-Cell Molecular Immunology Section in 1993. Under his supervision, his laboratory has gained international recognition for its studies of human and murine B lymphocytes and the function and regulation of heterotrimeric G-protein signaling in lymphocytes and other cell types.
H. CLIFFORD LANE, M.D.
Clinical Director, NIAID
Chief, Clinical and Molecular Retrovirology Section, LIR
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clane@niaid.nih.gov

MAJOR AREAS OF RESEARCH
- Pathogenesis of HIV infection emphasizing mechanisms of immunodeficiency
- Immunologic approaches to therapy for HIV infection

BIOGRAPHY
Dr. Lane received his M.D. from the University of Michigan in 1976. He then completed an internship and residency at the University of Michigan Hospital, Ann Arbor. In 1979, Dr. Lane came to the National Institutes of Health as a clinical associate in the Laboratory of Immunoregulation (LIR). In 1985, he was appointed deputy clinical director of NIAID; in 1989, he became the chief of the Clinical and Molecular Retrovirology Section of LIR, a position he still holds. In 1991, Dr. Lane became clinical director of NIAID and, in 2006, became NIAID Deputy Director for Clinical Research and Special Projects. He is currently on the editorial boards of the Journal of Acquired Immune Deficiency Syndromes and a.

PAOLO LUSSO, M.D., PH.D.
Chief, Viral Pathogenesis Section, LIR
www.niaid.nih.gov/labs/aboutlabs/lir/viralpathogenesis
plusso@niaid.nih.gov

MAJOR AREAS OF RESEARCH
- Viral receptors and coreceptors
- Structure-function relationships in the HIV-1 envelope
- Molecular basis of HIV-1 immune evasion
- Novel approaches to the development of HIV-1 vaccines
- Role of chemokines and other endogenous factors in HIV-1 disease

BIOGRAPHY
Dr. Lusso received his M.D., magna cum laude, from the University of Turin, Italy, and his Ph.D. from the Ministry of Scientific and Technologic Research, Rome. He is a board-certified specialist in internal medicine and in infectious diseases. He came to NIH for the first time in 1986 to work in the Laboratory of Tumor Cell Biology under Dr. Robert C. Gallo at the National Cancer Institute. He returned to Italy in 1994, where he created the Laboratory of Human Virology at the San Raffaele Scientific Institute in Milan and became associate professor of infectious diseases at the University of Cagliari. In 2006, he again joined NIH, where he became chief of the Viral Pathogenesis Section in the Laboratory of Immunoregulation. He is an executive editor of Current HIV Research and a member of the editorial board of several other journals. He is an elected member of the European Molecular Biology Organization.
THOMAS C. QUINN, M.D., M.SC.

Chief, International HIV/STD Section, LIR

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tquinn@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Definition of epidemiologic features of HIV-1 and HIV-2 infections in developing countries and the United States
- Assessment of biomedical interventions to control HIV, including circumcision, prevention of mother-to-child transmission, pre-exposure prophylaxis, and vaccine development
- Assessment of the frequency of Chlamydia trachomatis infections in selected populations using noninvasive, sensitive nucleic-acid amplification assays for diagnosis
- Evaluations of interventions to control blinding trachoma due to Chlamydia trachomatis in sub-Saharan Africa

BIOGRAPHY

Dr. Quinn obtained his M.D. from Northwestern University. He was a research associate in infectious diseases in the NIAID Laboratory of Parasitic Diseases and completed a fellowship in infectious diseases at the University of Washington. Since 1981, he has been assigned to the division of infectious diseases at Johns Hopkins University, where he became a professor of medicine in 1991. Dr. Quinn is a member of the Institute of Medicine and the National Academy of Sciences and is a fellow of the American Association for the Advancement of Science.

STEVEN J. REYNOLDS, M.D., M.P.H.

Senior Clinician, International HIV/STD Section, LIR

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sjreynolds@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Understanding the impact of antiretroviral therapy on both rural and urban populations in Uganda
- Developing optimal laboratory monitoring strategies to improve treatment outcomes of patients receiving antiretroviral treatment
- Conducting clinical trials to delay HIV disease progression among individuals co-infected with HIV and herpes simplex virus type 2
- Investigating the etiology of accelerated liver fibrosis among HIV-infected individuals in Uganda

BIOGRAPHY

Dr. Reynolds received his M.D. from McGill University in 1994 and was certified by the Royal College of Physicians and Surgeons of Canada in medical microbiology and infectious diseases in 2000. He completed his M.P.H. at Johns Hopkins University in 2002 and joined NIAID in 2003, when he was posted full time to the U.S. embassy in Kampala, Uganda. He has lived in Uganda since 2003, where he oversees clinical and laboratory research activities for the NIAID International Centers for Excellence in Research Program. In addition to his research activities, he provides HIV care and treatment at both the Rakai Health Sciences Program and the Infectious Diseases Institute in Kampala.
IRINI SERETI, M.D.
Chief, HIV Pathogenesis Unit, LIR

www.niaid.nih.gov/labs/aboutlabs/lir/HIVpathogenesis
isereti@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Pathogenesis of HIV infection emphasizing mechanisms of immune reconstitution inflammatory syndrome in advanced HIV infection and of serious non-AIDS events in treated HIV-infected patients
- Pathogenesis of idiopathic CD4 lymphocytopenia (ICL)
- Immune-based therapeutic strategies of HIV infection and ICL

BIOGRAPHY

Dr. Sereti received her M.D. from the University of Athens, Greece, in 1991. She did research for one year in Dr. Greg Spear’s laboratory at Rush Presbyterian Hospital in Chicago and then completed an internship, residency, and chief residency in medicine at Northwestern University. In 1997, Dr. Sereti came to NIH as a clinical associate in the Laboratory of Immunoregulation. She became a staff clinician in 2003. She was appointed to a clinical tenure-track position in 2009.
RESEARCH ACTIVITIES

Established in 1942, the Laboratory of Infectious Diseases (LID) has a long history of vaccine development and identification of new agents of viral diseases. LID is noted for undertaking high-risk, high-reward programs that require extraordinary time and resource commitments, such as programs to develop vaccines for viral hepatitis, severe childhood respiratory diseases, and viral gastroenteritis.

Clinical studies complement LID’s major areas of research, including the testing of candidate vaccines in clinical trials, a human challenge study with influenza to study pathogenesis and immune correlates for protection against the virus, and studies of severe virus infections in people without known immune deficiency.

MAJOR AREAS OF RESEARCH

• Vaccines for respiratory viruses, gastrointestinal viruses, hepatitis C, flaviviruses, and herpesviruses
• Pathogenesis of and host immune response to viral infections
• Microarray analysis of liver biopsies and central nervous system tissue to study host responses to viral hepatitis and neurotropic flaviviruses, respectively
• New antiviral agents
• Monoclonal antibodies to emerging and select agents
• Structure and function of viral glycoproteins
• Pandemic, seasonal, and animal influenza
• Evolution of norovirus, rotavirus, and influenza
• Immunodeficiencies associated with severe herpesvirus infections
• Paramyxovirus vectors
• Virus discovery

SECTIONS AND UNITS

Medical Virology Section
Jeffrey I. Cohen, M.D.

RNA Viruses Section
Peter L. Collins, Ph.D.

Hepatic Pathogenesis Section
Patrizia Farci, M.D.

Caliciviruses Section
Kim Y. Green, Ph.D.

Structural Informatics Unit
Audray K. Harris, Ph.D.

Neurotropic Flaviviruses Section
Alexander G. Pletnev, Ph.D., D.Sci.

Emerging Respiratory Viruses Section
Kanta Subbarao, M.B.B.S., M.P.H.

Viral Pathogenesis and Evolution Section
Jeffery K. Taubenberger, M.D., Ph.D.
JEFFREY I. COHEN, M.D.
Chief, Laboratory of Infectious Diseases
Chief, Medical Virology Section, LID

MAJOR AREAS OF RESEARCH
- Pathogenesis of human virus infections \textit{in vitro} and \textit{in vivo}
- Identification of cellular proteins that interact with herpesviruses
- Development of vaccines against human herpesviruses
- Identification of cellular mutations in patients with severe herpesvirus infections

BIOGRAPHY
Dr. Cohen received his M.D. from Johns Hopkins University and was a resident in medicine at Duke University. Following a medical staff fellowship at NIH, he was a clinical fellow in infectious diseases at the Brigham and Women’s Hospital in Boston and an instructor in medicine at Harvard University. He then returned to NIH, where he was the chief of the Medical Virology Section in the Laboratory of Clinical Infectious Diseases until 2010. In June 2010, Dr. Cohen became chief of the Laboratory of Infectious Diseases.

PETER L. COLLINS, PH.D.
Chief, RNA Viruses Section, LID

MAJOR AREAS OF RESEARCH
- Studies in molecular biology, immunobiology, and pathogenesis of the human respiratory pathogens respiratory syncytial virus (RSV); human parainfluenza virus (HPIV) serotypes 1, 2, and 3; and human metapneumovirus (HMPV)
- Development of novel attenuating mutations that are introduced by reverse genetics into RSV; HPIV 1, 2, and 3; and HMPV to produce live, attenuated vaccine candidates
- Evaluation of candidate live vaccines in clinical studies with clinical collaborators, as well as wild type viruses in adult volunteers
- Studies with mutants of pneumonia virus of mice, a relative of RSV, to characterize viral infection and host responses
- Development of vaccine vectors based on HPIV and avian paramyxoviruses, such as Newcastle disease virus, for use against highly pathogenic emerging viruses such as severe acute respiratory syndrome (SARS) coronavirus, avian influenza, and Ebola viruses

BIOGRAPHY
Dr. Collins received a Ph.D. in 1981 from the University of Connecticut. He conducted postdoctoral research at the University of North Carolina from 1981 to 1984. At that time, he joined the Laboratory of Infectious Diseases, where he received tenure in 1990. He serves on the editorial boards of the \textit{Journal of Virology}, \textit{Virology}, and \textit{Virus Research}. 
PATRIZIA FARCI, M.D.
Chief, Hepatic Pathogenesis Section, LID
www.niaid.nih.gov/labs/aboutlabs/lid/hepaticpathogenesis
pfarci@niaid.nih.gov

MAJOR AREAS OF RESEARCH
• Pathogenesis of acute and chronic viral hepatitis
• Molecular mechanisms of liver fibrosis progression and regression
• Role of liver cirrhosis in the pathogenesis of hepatocellular carcinoma
• Role of neutralizing antibodies in the prevention and control of hepatitis C virus (HCV) infection
• HCV evolution and clinical outcome
• Search for new hepatitis agents

BIOGRAPHY
Dr. Farci earned her M.D. at the University of Cagliari Medical School, Italy, and then became a board-certified specialist in infectious diseases and gastroenterology at the same university. She was trained at the department of gastroenterology of the Molinette Hospital in Torino under Dr. Mario Rizzetto and at the department of medicine of the Royal Free Hospital School of Medicine in London under Professor Sheila Sherlock. In 1989, she joined the laboratory of Dr. Robert H. Purcell in the Laboratory of Infectious Diseases (LID) as a visiting scientist. In 1992, she became associate professor of medicine and, in 2000, full professor of medicine and director of the liver unit and of the postgraduate school of gastroenterology at the University of Cagliari. In 2007, she returned to LID, where in 2010 she became chief of the Hepatic Pathogenesis Section.

KIM Y. GREEN, PH.D.
Chief, Caliciviruses Section, LID
www.niaid.nih.gov/labs/aboutlabs/lid/caliciviruses
kgreen@niaid.nih.gov

MAJOR AREAS OF RESEARCH
• Molecular epidemiology
• Animal models of norovirus disease
• Vaccines and antiviral inhibitors
• Basic replication mechanisms of noroviruses and other caliciviruses

BIOGRAPHY
Dr. Green earned her Ph.D. from the University of Tennessee Center for Health Sciences in the department of microbiology and immunology. She joined the Laboratory of Infectious Diseases in 1986 and has focused on the study of viruses associated with gastroenteritis. In recent years, her research program has addressed the role of noroviruses in human disease, with an emphasis on the development of prevention and control strategies.
AUDRAY K. HARRIS, PH.D.

Chief, Structural Informatics Unit, LID
www.niaid.nih.gov/labs/aboutlabs/lid/structuralinformatics
harrisau@niaid.nih.gov

MAJOR AREAS OF RESEARCH
• Structure-function of viral glycoproteins
• Epitope mapping and structure-supported design of immunogens
• Molecular architecture and assembly of viruses
• Predictive structural correlations to virus pathogenesis and immune escape
• Coherent integration of structural, computational, and biological information

BIOGRAPHY
Dr. Harris received his Ph.D. in 2002 from the University of Alabama at Birmingham. Following postdoctoral training at the National Institute of Arthritis and Musculoskeletal and Skin Diseases, he joined the National Cancer Institute as a research fellow. In 2012, Dr. Harris was selected as an Earl Stadtman Investigator and in 2013 joined the Laboratory of Infectious Diseases.

ALEXANDER G. PLETNEV, PH.D., D.SCI.

Chief, Neurotropic Flaviviruses Section, LID
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apletnev@niaid.nih.gov

MAJOR AREAS OF RESEARCH
• Study of the pathogenesis of flavivirus infection in the central nervous system
• Development of novel approaches to restrict flavivirus neurotropism
• Generation of attenuated vaccine candidates against diseases caused by highly virulent neurotropic flaviviruses and evaluation of their safety, immunogenicity, and protective efficacy
• Evaluation of the safety and immunogenicity of live, attenuated vaccine candidates in human clinical trials

BIOGRAPHY
Dr. Pletnev earned his Ph.D. in 1983 in chemistry from the Russian Academy of Sciences, studying RNA polymerases. Following postdoctoral research at the Novosibirsk Institute of Bioorganic Chemistry, he served as chief of the laboratory of radiochemistry and the laboratory of molecular virology from 1984 to 1993 and became a professor of molecular biology in 1993. In 1990, he received his doctorate of sciences degree in biochemistry and molecular biology from the Russian Academy of Sciences. He joined the Laboratory of Infectious Diseases in 1993 as a visiting scientist and became a senior investigator in 2005.
KANTA SUBBARAO, M.B.B.S., M.P.H.
Chief, Emerging Respiratory Viruses Section, LID
www.niaid.nih.gov/labs/aboutlabs/lid/ervs
ksubbarao@niaid.nih.gov

MAJOR AREAS OF RESEARCH
• Studying viral pathogenesis and immune responses in animal models
• Identifying and prioritizing potential pandemic strains of influenza to target for vaccine development
• Generating attenuated vaccine viruses by reassortment or plasmid-based reverse genetics
• Evaluating antigenic relatedness and cross-protection between influenza viruses
• Evaluating candidate vaccine viruses in preclinical studies in animal models
• Conducting clinical evaluation to establish safety, immunogenicity, and infectivity of live, attenuated vaccines

BIOGRAPHY
Dr. Subbarao received her M.B.B.S. in 1982 from the Christian Medical College, Vellore, University of Madras, India, and completed a residency in pediatrics at Cardinal Glennon Memorial Hospital for Children at St. Louis University. She completed a fellowship in pediatric infectious diseases and earned her M.P.H. in epidemiology from the University of Oklahoma Health Sciences Center. After postdoctoral training in the Laboratory of Infectious Diseases (LID), she served on the faculty of McGill University, Montreal, and subsequently served as chief of the molecular genetics section of the influenza branch at the CDC. Dr. Subbarao joined LID as a senior investigator in 2002.

JEFFERY K. TAUBENBERGER, M.D., PH.D.
Chief, Viral Pathogenesis and Evolution Section, LID
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taubenbergerj@niaid.nih.gov

MAJOR AREAS OF RESEARCH
• Influenza pathogenesis
• Animal models of influenza infection
• Influenza virus genomics and evolution
• Viral surveillance
• Archeavirology
• Influenza diagnostics
• Clinical influenza research

BIOGRAPHY
Dr. Taubenberger received a B.S. in biology from George Mason University in 1982. He earned his medical degree in 1986 and his Ph.D. in 1987, both from the Medical College of Virginia. He completed a residency in pathology at the National Cancer Institute and holds dual board certifications in anatomic pathology and in molecular genetic pathology from the American Board of Pathology and the American Board of Medical Genetics. Prior to coming to NIAID in 2006, he served as chair of the department of molecular pathology at the Armed Forces Institute of Pathology in Washington, DC, a position he had held since 1994. Dr. Taubenberger’s research interests include influenza virus biology, evolution, pathophysiology, and surveillance. He also has clinical interests in the development and implementation of molecular diagnostic assays for neoplasia and infectious diseases.
LABORATORY OF
MALARIA AND VECTOR RESEARCH

Thomas E. Wellems, M.D., Ph.D., Chief
www.niaid.nih.gov/labs/aboutlabs/lmvr
301-402-1274

RESEARCH ACTIVITIES

The Laboratory of Malaria and Vector Research (LMVR) is dedicated to studies of malaria and insect vectors of infectious diseases. Research groups in the laboratory maintain an array of on-campus and overseas activities investigating disease-transmitting insects and broad areas of malaria biology and pathogenesis. Basic discoveries from these investigations support searches for new drug treatments, diagnostic tools, and vaccines. The LMVR environment is highly collaborative and is organized to foster research teamwork by experts in various disciplines of the biological, physical, and medical sciences.

MAJOR AREAS OF RESEARCH

- Malaria biology and pathogenesis
- Insect vectors of infectious diseases
- New drug treatments, diagnostic tools, and vaccines

SECTION AND UNITS

Malaria Genetics Section
Thomas E. Wellems, M.D., Ph.D.

Mosquito Immunity and Vector Competence Section
Carolina V. Barillas-Mury, M.D., Ph.D.

Apicomplexan Molecular Physiology Section
Sanjay Desai, M.D., Ph.D.

Malaria Pathogenesis and Human Immunity Unit
Rick M. Fairhurst, M.D., Ph.D.

Malaria Immunology Section
Carole A. Long, Ph.D.

Malaria Cell Biology Section
Louis H. Miller, M.D.

Vector Biology Section
José Ribeiro, M.D., Ph.D.

Malaria Functional Genomics Section
Xin-zhuang Su, Ph.D.

Vector Molecular Biology Section
Jesus G. Valenzuela, Ph.D.
THOMAS E. WELLEMS, M.D., PH.D.

Chief, Laboratory of Malaria and Vector Research
Chief, Malaria Genetics Section, LMVR

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twellem@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Antimalarial drug responses and factors that affect clinical outcome after treatment
- Malaria protection conferred by human hemoglobinopathies and red cell polymorphisms
- Antigenic variation by *Plasmodium falciparum* parasites
- Molecular mechanisms of malaria parasite infectivity and pathogenesis

BIOGRAPHY

Dr. Wellems received his M.D. and Ph.D. from the University of Chicago. He completed his internal medicine residency at the Hospital of the University of Pennsylvania, and in 1984 he joined the Division of Intramural Research. He has directed the Malaria Genetics Section since 1991 and has served as chief of the Laboratory of Malaria and Vector Research since 2002. Dr. Wellems is a member of the U.S. National Academy of Sciences and the Institute of Medicine, is a past president of the American Society of Tropical Medicine and Hygiene, and serves on a number of advisory committees for foundations and public-private partnerships, including the Medicines for Malaria Venture.

CAROLINA V. BARILLAS-MURY, M.D., PH.D.

Chief, Mosquito Immunity and Vector Competence Section, LMVR

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cbarillas@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Interactions between *Plasmodium* parasites, the gut microbiota, and mosquito midgut epithelial cells
- Immune pathways that mediate antiplasmodial responses
- Hemocyte differentiation and immune memory in mosquitoes
- *Plasmodium* evasion of the mosquito immune system

BIOGRAPHY

Dr. Barillas received her B.S. in biology from the Universidad del Valle de Guatemala in 1981, her M.D. from Universidad Francisco Marroquín de Guatemala in 1985, and her Ph.D. in biochemistry from the University of Arizona in 1992. From 1992 to 1993, she did postdoctoral training at the University of Arizona. She then went to Harvard University in 1994 and the European Molecular Lab until 1998. She was an assistant professor in the department of microbiology, immunology, and pathology at Colorado State University from 1998 to 2003. She joined the Laboratory of Malaria and Vector Research in 2003 and became a senior investigator in 2010.
SANJAY A. DESAI, M.D., PH.D.
Chief, Apicomplexan Molecular Physiology Section, LMVR
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MAJOR AREAS OF RESEARCH
- Cellular and molecular biology of the malaria parasite
- Unusual parasite ion channels, e.g., the plasmodial surface anion channel (PSAC), required for parasite survival within human erythrocytes
- Identification of PSAC’s gene(s) with molecular, genetic, and biochemical approaches
- Characterization of PSAC’s unusual functional properties with the goal of understanding both structure and physiological role
- Identification of novel, high-affinity PSAC antagonists that may be starting points for the development of new antimalarial drugs

BIOGRAPHY
Dr. Desai received his M.D. and Ph.D. from Washington University in St. Louis. Following an internal medicine residency and infectious diseases fellowship at Duke University Medical Center, he joined the Division of Intramural Research. His work focuses on the molecular and cellular biology of malaria parasites.

RICK M. FAIRHURST, M.D., PH.D.
Chief, Malaria Pathogenesis and Human Immunity Unit, LMVR
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MAJOR AREAS OF RESEARCH
- Mechanisms of malaria protection conferred by red blood cell polymorphisms and naturally acquired immune responses
- Mechanisms of malaria pathogenesis associated with the sequestration of parasitized red blood cells in microvessels
- Mechanisms of malaria parasite resistance to artemisinin and other antimalarial drugs

BIOGRAPHY
Dr. Fairhurst received his M.D. and Ph.D. (molecular biology) from the University of California, Los Angeles (UCLA). Following an internal medicine residency and an infectious diseases fellowship at UCLA Medical Center, he joined the Division of Intramural Research in 2001. As a clinical tenure-track investigator, Dr. Fairhurst focuses his laboratory’s work on elucidating the mechanisms of malaria pathogenesis, human genetic resistance to malaria, acquired immunity to malaria, and parasite resistance to the artemisinin class of antimalarial drugs. He travels frequently to malaria-endemic areas of Mali and Cambodia, where his trainees and colleagues enroll patients into clinical research protocols and use biospecimens in laboratory investigations. Dr. Fairhurst is past president of the American Committee on Molecular, Cellular, and Immunoparasitology, a subcommittee of the American Society of Tropical Medicine and Hygiene (ASTMH), and director of the NIH M.D.-Ph.D. Partnership Training Program. He has received the NIAID Outstanding Mentor of the Year Award (2011) and the ASTMH Bailey K. Ashford Medal for distinguished work in tropical medicine (2013).
CAROLE A. LONG, PH.D.

Chief, Malaria Immunology Section, LMVR
Director, PATH Malaria Vaccine Initiative Growth Inhibition Assay-Reference Center

www.niaid.nih.gov/labs/aboutlabs/lmvr/malariaimmunologysection
clong@niaid.nih.gov

**MAJOR AREAS OF RESEARCH**

- Studying the acquisition of immunity to malaria in people living in malaria-endemic areas
- Investigating the process of transmission of malaria in the field
- Identifying and evaluating possible new malaria vaccine candidates, focusing on the erythrocytic and sexual stages of malaria infection
- Standardization and application of an *in vitro* parasite growth inhibition assay and a mosquito membrane feeding assay for testing antibodies to *Plasmodium falciparum* erythrocytic and sexual stages, respectively

**BIOGRAPHY**

Dr. Long received her Ph.D. in microbiology and immunology from the University of Pennsylvania and also did postdoctoral training there. Before joining NIAID in 1999, Dr. Long was a professor of microbiology and immunology at Hahnemann University School of Medicine (now Drexel University) in Philadelphia. She has served as president of the American Society for Tropical Medicine and Hygiene and chair of the Tropical Medicine and Parasitology Study Section. Her lab’s work focuses on immune responses to malaria parasites, particularly in those living in malaria-endemic areas, and on identification and evaluation of possible candidate antigens for malaria vaccines.

LOUIS H. MILLER, M.D.

Chief, Malaria Cell Biology Section, LMVR

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lmiller@niaid.nih.gov

**MAJOR AREAS OF RESEARCH**

- Mechanism by which malaria parasites invade erythrocytes (including the study of parasite ligands and erythrocyte receptors)
- Mechanism of antigenic variation
- Study of binding of parasitized erythrocytes in placenta

**BIOGRAPHY**

Dr. Miller received his B.S. from Haverford College in Pennsylvania; his M.S. from Columbia University; and his M.D. from Washington University in St. Louis. He then served as a medical resident at Montefiore Hospital, New York, and as an intern and resident at Mount Sinai Hospital. He is a member of the Association of American Physicians, American Society of Clinical Investigation, American Society of Tropical Medicine and Hygiene, Royal Society of Tropical Medicine and Hygiene, National Academy of Sciences, and the Institute of Medicine. In 2011, he received the Walter Reed Medal for distinguished accomplishment in the field of tropical medicine from the American Society of Tropical Medicine and Hygiene.
MAJOR AREAS OF RESEARCH

- Role of vector saliva in blood-feeding by arthropods
- Discovery and determination of mode of action of novel anti-clotting, anti-platelet, immunomodulatory, and vasodilatory agents
- Expression of novel proteins and peptides with known and unknown function
- Development of tools for transcriptome annotation

BIOGRAPHY

Dr. Ribeiro received his M.D. from the State University of Rio de Janeiro and a Ph.D. from the Biophysics Institute of the Federal University of Rio de Janeiro. He was an assistant and associate professor at the Harvard School of Public Health and professor at the department of entomology in the University of Arizona before joining NIAID in 1996. His work focuses on the role of vector saliva in blood-feeding by arthropods, where a great diversity of pharmacologically active compounds and new targets for vaccination against vector-borne diseases have been uncovered. Dr. Ribeiro has served for many years in the Tropical Diseases Research Program of the World Health Organization and as editor and reviewer for several journals.

XIN-ZHUAN SU, PH.D.

Chief, Malaria Functional Genomics Section, LMVR

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MAJOR AREAS OF RESEARCH

- Plasmodium genetics and genomics
- Mechanisms of antimalarial drug resistance and virulence
- Host-parasite interaction and pathogenesis

BIOGRAPHY

Dr. Su received his Ph.D. in parasitology from the University of Georgia in 1990. He joined NIAID’s Laboratory of Parasitic Diseases in 1992 and became an investigator in the Laboratory of Malaria and Vector Research in 2001 and a senior investigator in 2006.
MAJOR AREAS OF RESEARCH

- Functional transcriptomic approaches to characterizing vector salivary proteins
- Development of natural models of vector-transmitted cutaneous and visceral leishmaniasis to study the impact of immune responses to sand fly salivary proteins in parasite transmission, early events of pathogenesis post-bite, and adaptive immunity to naturally acquired disease
- Studies of human cellular immune responses to sand fly salivary proteins in people living in leishmaniasis-endemic areas
- Development of biomarkers for vector exposure using immunogenic salivary proteins

BIOGRAPHY

Dr. Valenzuela received his Ph.D. in biochemistry from the University of Arizona in 1995. He joined the Laboratory of Parasitic Diseases in 1996, became a research fellow in 1999, and became a tenure-track investigator in the Laboratory of Malaria and Vector Research in 2002. Dr. Valenzuela became a senior investigator in 2009.
The Laboratory of Malaria Immunology and Vaccinology (LMIV) was commissioned in 2009 to conduct basic and applied research relevant to malaria immunology and vaccine development, to pursue novel vaccine concepts, to produce prototype malaria vaccines, and to conduct early-phase clinical trials of promising vaccine candidates. Our overarching goal is to develop malaria vaccines that will reduce severe disease and death among African children and pregnant women and will eliminate malaria from low-transmission areas of the world.

LMIV has an organizational structure that encompasses both basic discovery and product development within a small, integrated team. Discovery sections within LMIV conduct basic research on malaria pathogenesis and immunology, with an emphasis on studies in humans who are naturally or experimentally infected with malaria parasites. In parallel, the Vaccine Development Unit operates more like a small biotech firm than a typical research laboratory. Specialists in each step of the development process, from antigen selection to clinical trials, contribute their expertise as the candidate moves along the development pathway. This allows multiple vaccine candidates to move from concept to clinical trials efficiently and rapidly. LMIV forms a research and testing enterprise that can rapidly translate ideas into proof-of-concept trials and then capture basic information about human immunity and responses to infection during clinical trials.

- Enhance our basic understanding of malaria pathogenesis and immunity in humans
- Develop strategies for anti-infection, anti-disease, and transmission-blocking vaccines
- Produce and formulate antigens suitable for human testing
- Develop assays and perform animal trials that define the potential for protection
- Conduct clinical trials to test vaccines in the United States and in malaria-endemic areas
- Establish scientific collaborations and obtain outside funding to accelerate the program

Vaccine Development Unit
Pathogenesis and Immunity Section
Patrick Duffy, M.D.

Molecular Pathogenesis and Biomarkers Section
Michal Fried, Ph.D.
Patrick E. Duffy, M.D.
Chief, Laboratory of Malaria Immunology and Vaccinology
Chief, Vaccine Development Unit, LMIV
Chief, Pathogenesis and Immunity Section, LMIV

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BAIOWGRAPHY
Patrick E. Duffy is chief of the Laboratory of Malaria Immunology and Vaccinology. Before taking this position in November 2009, he served as director of the malaria program at Seattle Biomedical Research Institute (SBRI) and as affiliate professor of global health at the University of Washington. His research is focused on understanding the pathogenesis and immunology of malaria in humans. He has led the Pregnancy Malaria Initiative to develop a malaria vaccine for pregnant women, a Grand Challenges in Global Health consortium project to understand immunity to severe malaria in African children, and a vaccine discovery consortium that is identifying novel vaccine targets against liver-stage malaria parasites. He recently established the Malaria Clinical Trials Center for experimental malaria infections of humans in Seattle and for several years led the SBRI-Tanzania Malaria Research Training Program for young African scientists. He received his medical degree from Duke University, his internal medicine training at Walter Reed, and his postdoctoral training in molecular vaccine development at NIH.

Michal Fried, Ph.D.
Chief, Molecular Pathogenesis and Biomarkers Section, LMIV

friedm@mail.nih.gov

MAJOR AREAS OF RESEARCH
- Correlates of immunity: parasite adhesion phenotypes, parasite antigens, and antigen-specific antibodies
- Disease biomarkers: pathways analysis of host response and disease comparison
- Identifying targets of pre-erythrocytic immunity

BIOGRAPHY
Dr. Fried earned her Ph.D. in molecular parasitology at Hebrew University (Israel) and M.Sc. in biochemistry at Ben-Gurion University. She did groundbreaking work on the molecular basis of placental malaria and described the model of protective immunity that is the basis of the current effort to develop a pregnancy malaria vaccine. The model of pregnancy malaria has been expanded to studies of severe malaria in children carried out in longitudinal studies in Africa.
RESEARCH ACTIVITIES

The Laboratory of Molecular Immunology (LMI) conducts basic, translational, and clinical studies related to innate and adaptive immune system function in health and disease. LMI scientists have made major contributions to our understanding of immunoregulation by chemokines and their G protein-coupled receptors, HIV pathogenesis, the NFκB family of transcription factors, mucosal immunology in the gut, reovirus and rotavirus infection in the gut, and mouse models of inflammatory bowel disease. LMI researchers explore the basic properties of neutrophils, macrophages, naïve and memory T cells, and dendritic cells, as well as genetic risk factors for complex immune-mediated diseases.

Current studies focus on the molecular pathogenesis of infectious and immunologic/inflammatory diseases, including West Nile virus infection, Listeria infection, Trypanosoma cruzi, Toxoplasma gondii, fungal infection, sepsis, atherosclerosis, psoriasis, inflammatory bowel disease, primary immunodeficiency disease, and cancer, working toward the goal of identifying novel therapeutic targets and strategies.

MAJOR AREAS OF RESEARCH

- Structure and function of the mucosal immune system in the gastrointestinal tract
- Basic properties of neutrophils, naïve and memory T cells, macrophages, and dendritic cells
- Genetic and epigenetic regulation of chemokine receptor expression
- Chemokines as mediators in antimicrobial host defense, inflammation, and cancer
- Primary immunodeficiency disease

SECTIONS AND UNITS

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<td>Brian L. Kelsall, M.D.</td>
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<tr>
<td>Immune Activation Section</td>
<td>Ulrich Siebenlist, Ph.D.</td>
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PHILIP M. MURPHY, M.D.

Chief, Laboratory of Molecular Immunology
Chief, Molecular Signaling Section, LMI

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pmurphy@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Host defense and inflammation
- G protein-coupled chemoattractant receptors
- Genetic risk factors in infectious and immune-mediated diseases
- Primary immunodeficiency disease

BIOGRAPHY

Dr. Murphy obtained an A.B. from Princeton University in 1975 and an M.D. from Cornell University Medical College in 1981. He trained in internal medicine at New York University from 1981 to 1985, serving as chief resident from 1984 to 1985, and in infectious diseases at NIAID from 1985 to 1988. He began his research career as a medical staff fellow in the Bacterial Diseases Section of the NIAID Laboratory of Clinical Investigation in 1986 and was promoted to senior investigator with tenure in the Laboratory of Host Defenses (LHD) in 1992. In 1998, he was promoted to the Senior Biomedical Research Service and named chief of the LHD Molecular Signaling Section. In 2003, Dr. Murphy’s research group was reorganized as part of the new Laboratory of Molecular Immunology, where he served first as acting chief from 2003 to 2006 and then as chief from 2006 to the present.

JOSHUA M. FARBER, M.D.

Chief, Inflammation Biology Section, LMI

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jfarber@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Chemokines and their receptors in health and disease

BIOGRAPHY

Dr. Farber obtained his M.D. from Johns Hopkins University, where he did additional clinical training in internal medicine and infectious diseases. Dr. Farber did postdoctoral training in bench research at NIH and Johns Hopkins. Dr. Farber joined the NIAID Laboratory of Clinical Investigation in 1993, became a senior investigator in 2000, and moved to the Laboratory of Molecular Immunology at its inception in 2004.
BRIAN L. KELSALL, M.D.
Chief, Mucosal Immunobiology Section, LMI
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MAJOR AREAS OF RESEARCH
- Antigen presentation by mucosal dendritic cells and the regulation of mucosal immune responses
- Regulation of interleukin-12 production
- Innate and adaptive immunity to intestinal viral infection
- Genetic susceptibility to intestinal inflammation in mouse models of inflammatory bowel disease

BIOGRAPHY
Dr. Kelsall received his B.A. in human biology from Stanford University in 1982. In 1986, he earned his M.D. from Case Western Reserve University School of Medicine. He did postdoctoral training in internal medicine at the New York Hospital-Cornell Medical Center from 1986 to 1989 and in infectious diseases at the University of Virginia Medical Center from 1989 to 1992. In 1992, Dr. Kelsall came to NIH, completed fellowship training in mucosal immunology in 1996, and became a senior investigator in 2003.

ULRICH SIEBENLIST, PH.D.
Chief, Immune Activation Section, LMI
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usiebenlist@nih.gov

MAJOR AREAS OF RESEARCH
- Elucidation of the normal functions of NFκB transcription factors and their regulators in the context of host defense against pathogens and in immune tolerance
- Dysregulated functions of NFκB transcription factors in diseases, such as inflammation-induced cancers and the break in immune tolerance leading to autoimmunity
- Identification of factors/regulators that may serve as potential targets for therapeutic intervention in specific diseases
- Functions of the various members of the interleukin (IL)-17 cytokine family in host defenses, including Th17- and Th2-mediated responses
- Functions and mechanisms of action of IL-17 cytokines in specific inflammatory and autoimmune diseases, including asthma, allergy, rheumatoid arthritis, and lupus
- Molecular dissection of the signaling pathways engaged by IL-17 cytokines and development of potential therapeutic reagents to block specific signaling paths in disease

BIOGRAPHY
Dr. Siebenlist received his Ph.D. at Harvard University, studying protein-DNA interactions with Nobel Laureate Dr. Walter Gilbert. As a postdoctoral fellow in Dr. Philip Leder’s laboratory at both NIH and Harvard Medical School, Dr. Siebenlist studied immunoglobulin gene structures and the regulation of the myc oncogene. He then joined the NIAID Laboratory of Immunoregulation. He is now chief of the Immune Activation Section in the Laboratory of Molecular Immunology. Dr. Siebenlist has made many significant contributions to the present understanding of the regulation and function of NFκB transcription factors, which serve as master regulators of numerous immune responses.
RESEARCH ACTIVITIES

When it was established in 1981, the Laboratory of Molecular Microbiology (LMM) investigated the structure, function, and regulation of a diverse group of microorganisms including RNA and DNA viruses, aerobic and anaerobic bacteria, and mycoplasmas. Currently, the main focus of LMM scientists is murine (e.g., murine leukemia virus) and primate (e.g., HIV, simian immunodeficiency virus, and human T-lymphotropic virus) retroviruses, with the principal area of research activity involving HIV-1. Fundamental investigations of viral gene regulation, protein structure and function, and particle assembly are integrated with studies of the determinants of immunologic protection against HIV and viral pathogenesis.

MAJOR AREAS OF RESEARCH

- Studies of the synthesis, processing, and assembly of retroviral-encoded proteins into progeny virions
- Exploration of the structure and function relationship of retroviral accessory proteins synthesized during productive and chronic viral infections
- Understanding the regulation of retroviral gene activity and how viral-encoded proteins dysregulate normal cellular processes
- Development of animal models for investigations of viral pathogenesis, the identification of potentially useful antiviral agents, and the development of protective vaccines
MAJOR AREAS OF RESEARCH

• Studies of primate and murine retroviral biology and genetics in cell culture systems and animal models
• Assessment of SIV and SIV/HIV chimeric virus (SHIV) acute infections in macaques
• Development of R5-tropic SHIVs as challenge viruses in vaccine experiments
• Use of R5-tropic SHIVs to investigate the development of cross-reacting anti-HIV-1 neutralizing antibodies in virus-infected and vaccinated nonhuman primate models of HIV/AIDS

BIOGRAPHY

Dr. Martin received an M.D. from Yale University School of Medicine in 1962 and, following two years of clinical training in internal medicine at the University of Rochester, joined NIH as a research associate. He initially investigated the replication and gene regulation of SV40 and polyomaviruses and studied endogenous murine and human retroviral sequences. Since 1984, his research program has focused on HIV. Dr. Martin was appointed chief of the Laboratory of Molecular Microbiology when it was established in 1981. He is a member of the National Academy of Sciences and the recipient of numerous scientific awards.

JASON M. BRENCHLEY, PH.D.

Chief, Immunopathogenesis Section, LMM

jbrenchl@niaid.nih.gov

MAJOR AREAS OF RESEARCH

• Immunopathogenesis in nonhuman primate models of HIV
• Microbial translocation and immune activation
• Mucosal immunology and mechanisms of microbial translocation

BIOGRAPHY

Dr. Brenchley received a master’s degree from Idaho State University in 1999 and received a Ph.D. from the University of Texas Southwestern Medical Center at Dallas in 2003. He joined NIH as a research fellow, studying immunopathogenesis and mucosal immunology in HIV-infected people. Since 2008, he has been an investigator in the Laboratory of Molecular Microbiology.
MAJOR AREAS OF RESEARCH

- AIDS pathogenesis
- Evolution and origins of primate lentiviruses
- HIV vaccine development

BIOGRAPHY

Dr. Hirsch received her D.V.M. from the University of Saskatchewan in 1977. She also did a residency in pathology there, becoming board-certified by the American College of Veterinary Pathologists in 1984. She earned her D.Sc. from Harvard School of Public Health in 1988. She was a research assistant professor at Georgetown University until 1992, when she joined the NIAID Laboratory of Infectious Diseases, transferring to the Laboratory of Molecular Microbiology in 1999 and receiving tenure in 2002.

CHRISTINE A. KOZAK, PH.D.

Chief, Viral Biology Section, LMM

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ckozak@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Genetics of resistance to mouse retroviruses
- Naturally occurring mouse retroviruses

BIOGRAPHY

Dr. Kozak received her Ph.D. in biology from Yale University in 1977. After a postdoctoral fellowship at NIAID under Dr. Wallace Rowe, she joined the Laboratory of Molecular Microbiology (LMM) in 1984. In 1992, Dr. Kozak became chief of the Viral Biology Section in LMM. She is an associate editor for several journals, has served on the Committee on Standardized Nomenclature for Mice, was chair of the Mouse Chromosome 5 Committee for 10 years, and has authored more than 400 research publications dealing with mouse retroviruses and mouse genetics.
KLAUS STREBEL, PH.D.

Chief, Viral Biochemistry Section, LMM

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MAJOR AREAS OF RESEARCH

- Biological and biochemical functions of HIV and SIV accessory proteins Vif, Vpu, Vpr, and Vpx
- Characterization of cellular factors controlled by Vif, Vpu, Vpr, and Vpx
- Characterization of innate immune defense mechanisms

BIOGRAPHY

Dr. Strebel received his Ph.D. in microbiology in 1985 from the University of Heidelberg. After postdoctoral research in Germany on foot-and-mouth disease protein processing and maturation, he joined the Laboratory of Molecular Microbiology (LMM) in 1986 as a postdoctoral fellow to work on molecular mechanisms of HIV-1 replication. He was awarded tenure in 1998 and, since 2000, has been chief of the Viral Biochemistry Section within LMM.
RESEARCH ACTIVITIES

The Laboratory of Parasitic Diseases (LPD) conducts basic and applied research on the prevention, control, and treatment of a variety of parasitic and bacterial diseases of global importance. The work of the group is largely directed toward the identification of immunological and molecular targets for disease intervention. The pathogens studied include parasitic protozoa (Leishmania, Toxoplasma, Giardia, Plasmodium, Trypanosoma, Cryptosporidium, and Entamoeba) and helminths (Filariidae, Schistosoma, Strongyloides, and Taenia), as well as non-parasitic agents (e.g., mycobacteria).

LPD includes a clinical group that conducts patient-centered research at the NIH Clinical Center, as well as international field studies in India, Latin America, and Africa. Four new programs focus on genetic determinants of virulence in apicomplexan protozoa, the function of the eosinophil in human infectious and inflammatory disease processes, the role of commensal microbiota in immune regulation and homeostasis, and T-cell regulation in mycobacterial and fungal opportunistic infections.

MAJOR AREAS OF RESEARCH

• Uncovering basic aspects of the host-pathogen interaction in humans and experimental animal models, as well as in invertebrate vectors that transmit medically important parasites
• Regulatory environment induced in chronic parasitic and bacterial infection
• Identification of determinants of host resistance and pathology, with a focus on barrier sites

SECTIONS AND UNITS

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<td>Thomas A. Wynn, Ph.D.</td>
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ALAN SHER, PH.D.
Chief, Laboratory of Parasitic Diseases
Chief, Immunobiology Section, LPD
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MAJOR AREAS OF RESEARCH
• Mechanisms of host resistance and immune regulation in parasitic and mycobacterial infection
• Role of innate pathogen recognition in the initiation of adaptive immunity and in CD4+ T-cell subset effector choice
• Regulatory pathways limiting pathogen-induced Th1 immunopathology
• Immunotherapeutic approaches to the treatment of infectious diseases

BIOGRAPHY
Dr. Sher received his Ph.D. from the University of California, San Diego, and did his postdoctoral training in the division of parasitology at the National Institute for Medical Research in Mill Hill, London. In 1980, after several years as a research associate and then assistant professor in the department of pathology at Harvard Medical School, he joined NIAID as a section chief in the Laboratory of Parasitic Diseases. Sher became chief of LPD in 2003 and was promoted to NIH Distinguished Investigator in 2011.

THOMAS B. NUTMAN, M.D.
Deputy Chief, Laboratory of Parasitic Diseases
Chief, Clinical Parasitology Section, LPD
Chief, Helminth Immunology Section, LPD
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MAJOR AREAS OF RESEARCH
• Regulation of the host immune response to parasitic helminth infection (primarily filariasis, loiasis, and onchocerciasis)
• Influence of helminth infection on expression of non-parasitic infections, atopy, and asthma
• Molecular characterization of tissue-invasive helminth parasites
• Mechanisms of eosinophil activation and eosinophilia
• Control of immediate hypersensitivity reactions
• Clinical definition and pathogenesis underlying parasitic diseases
• New therapeutic interventions and methods of diagnosis in parasitic infections

BIOGRAPHY
Dr. Nutman received his A.B. from Brown University and his M.D. from the University of Cincinnati College of Medicine. He did an internal medicine residency at New York University (Bellevue) and postdoctoral training in the Laboratory of Parasitic Diseases (LPD). He is board-certified in internal medicine and allergy and immunology. He also holds a diploma/certificate in tropical medicine and travelers’ health. He has been at LPD since 1982, where he is currently deputy chief, as well as chief of both the Helminth Immunology Section and the Clinical Parasitology Section. In addition, he is the director of the NIAID International Center for Excellence in Research (ICER) located in Chennai, India, as well as director of the filariasis unit at the NIAID ICER in Mali. He is on numerous advisory committees and editorial boards and holds patents related to parasite diagnosis and vaccine development. He is the author or co-author of more than 400 papers and book chapters and has received multiple awards for his work in tropical medicine and immunology.
THEODORE E. NASH, M.D.
Principal Investigator, Clinical Parasitology Section, LPD
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tnash@niaid.nih.gov

MAJOR AREAS OF RESEARCH
• Treatment of neurocysticercosis
• Natural history, disease association, morbidity, prevention, and treatment of perilesional edema episodes associated with calcific cysticercosis
• Development of model cestodes infection to determine best treatments for neurocysticercosis
• Immune response associated with treatment and measures to ameliorate acute inflammatory responses
• Antigenic variation in Giardia, cellular biology, and differences among Giardia groups/isolates

BIOGRAPHY
Dr. Nash received his M.D. from the University of Miami in 1968 and completed his internship and residency at Duke University. In 1970, he was appointed as a fellow in the NIAID Laboratory of Clinical Investigation and, in 1973, became a staff fellow in the Laboratory of Parasitic Diseases (LPD). After an infectious disease fellowship at the Beth Israel-Children’s Hospital in Boston and a fellowship in biological chemistry at Harvard University, he returned to LPD as a senior scientist in 1976. He is currently a principal investigator in the Clinical Parasitology Section.

DANIEL L. BARBER, PH.D.
Chief, T-Lymphocyte Biology Unit, LPD
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MAJOR AREAS OF RESEARCH
• Immunoregulation during infection with Mycobacterium tuberculosis and opportunistic fungal pathogens
• Mechanisms of mycobacteria-associated immune reconstitution inflammatory syndrome (IRIS)
• Role of the PD-1 pathway in the regulation of T-cell responses

BIOGRAPHY
Dr. Barber obtained his B.S. from Rider University and his Ph.D. from Emory University in the department of microbiology and immunology. In 2006, he joined the Laboratory of Parasitic Diseases (LPD) as a postdoctoral fellow in the Immunobiology Section. In 2012, Dr. Barber was awarded a position as an Earl Stadtman Tenure-Track Investigator in LPD.
YASMINE BELKAID, PH.D.

Chief, Mucosal Immunology Section, LPD

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MAJOR AREAS OF RESEARCH

- Role of the microbiota in immunity to infection
- Role of dietary metabolites in promoting immune regulation and immune responses to pathogens
- Tissue-specific regulatory responses to infection
- Leishmania major, Toxoplasma gondii, Cryptosporidium, and Microsporidium spp.

BIOGRAPHY

Dr. Yasmine Belkaid obtained her Ph.D. in 1996 from the Pasteur Institute in France on innate responses to Leishmania infection. Following a postdoctoral fellowship at NIAID on immune regulation during Leishmania infection, she joined the Children’s Hospital Research Foundation in Cincinnati as an assistant professor in 2002. In 2005, she joined the Laboratory of Parasitic Diseases as a tenure-track investigator. Since 2008, she has worked as an adjunct professor at the University of Pennsylvania.

MICHAEL E. GRIGG, PH.D.

Chief, Molecular Parasitology Section, LPD

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griggm@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Virulence shifts in protozoan parasites: biology and genetics
- Forward/reverse genetics and functional genomic screens that identify protozoan virulence factors
- Immunoparasitology and mechanisms of host resistance against protozoan parasites
- Parasite gene families that modulate host immunity, infectivity, and parasite pathogenesis

BIOGRAPHY

Dr. Grigg earned his B.Sc. in 1989 from the University of British Columbia. He obtained his Ph.D. and D.I.C. in 1994 from the Imperial College of Science, Technology, and Medicine, University of London. From 1994 to 1997, Dr. Grigg was a Howard Hughes Medical Institute senior fellow at the University of Washington. From 1997 to 2001, he trained as a postdoctoral scholar in molecular parasitology at Stanford University. In 2002, he was appointed as an assistant professor in medicine, microbiology, and immunology at the University of British Columbia. In 2006, he joined the Laboratory of Parasitic Disease as a tenure-track investigator. In 2013, he was appointed senior investigator at NIH. He also is an adjunct professor at the University of British Columbia and Oklahoma State University.
AMY D. KLION, M.D.

Chief, Eosinophil Pathology Unit, LPD

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aklion@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Identification and characterization of new subtypes of hypereosinophilic syndromes
- Elucidation of the role of the eosinophil in pathogenesis of eosinophilic disorders
- Assessment of the safety and efficacy of chemotherapeutic agents targeting eosinophils (or their precursors)
- Prevention of post-treatment reactions in loiasis, a filarial infection associated with dramatic eosinophilia following anthelminthic therapy

BIOGRAPHY

Dr. Klion earned her B.A. from Princeton University and her M.D. from the New York University School of Medicine. After completing a residency in internal medicine at Johns Hopkins University, she was a postdoctoral fellow in the Laboratory of Parasitic Diseases (LPD) from 1989 to 1991. She completed her fellowship in infectious diseases at the University of Iowa Hospitals and Clinics, where she was appointed an assistant professor in the division of infectious diseases prior to returning to LPD in 1997 as a staff clinician. She became a tenure-track clinical investigator in LPD in 2009.

STEPHEN H. LEPPLA, PH.D.

Chief, Microbial Pathogenesis Section, LPD

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MAJOR AREAS OF RESEARCH

- Structure-function relationships in bacterial protein toxins and the roles of toxins and other virulence factors in contributing to bacterial pathogenesis
- Bacterial gene regulation, interactions of bacteria and toxins with animal cells and tissues, the effects of toxins on host physiology, and the molecular mechanisms of toxin action
- Use of basic-research results in the design of vaccines and therapeutics

BIOGRAPHY

Dr. Leppla earned a B.S. in biology from the California Institute of Technology and a Ph.D. in biochemistry from the University of Wisconsin. After postdoctoral study at the University of California, Berkeley, and Brown University, he became a research scientist at the U.S. Army Medical Research Institute of Infectious Diseases in Frederick, Maryland. He moved to NIH in 1989 and to NIAID in 2003.
MAJOR AREAS OF RESEARCH

[Dr. Sacks]

- Study of parasite and sand fly molecules controlling the development of transmissible infections
- Development of vaccines against leishmaniasis and their evaluation using infected sand fly challenge
- Mechanisms of acquired resistance and those controlling persistent infection
- Mechanisms underlying pathogenesis and immunosuppression in human visceral leishmaniasis and development of immune-based therapies

BIOGRAPHY

Dr. Sacks obtained his Ph.D. from Harvard University for studies on immune responses to chlamydial infections. Following a postdoctoral fellowship at the National Institute for Medical Research in Mill Hill, London, studying immune suppression in African trypanosomiasis, he joined the Laboratory of Parasitic Diseases in 1980. He became a senior investigator in 1986.

[Dr. Wynn]

- Type-2 immunity and wound repair
- Asthma and idiopathic pulmonary fibrosis
- Liver fibrosis
- Intestinal fibrosis in inflammatory bowel disease
- Stem cells and tissue regeneration

BIOGRAPHY

Dr. Wynn obtained his Ph.D. from the University of Wisconsin Medical School in the department of microbiology and immunology. He has published more than 175 papers, reviews, and book chapters in many prestigious journals, including Nature, Nature Immunology, Journal of Experimental Medicine, Gastroenterology, Nature Reviews Immunology, Nature Medicine, and Annual Review of Immunology. He serves as the scientific director of the NIH Oxford-Cambridge Scholars Program, which annually supports more than 52 doctoral candidates at NIH, Oxford University, and Cambridge University. Dr. Wynn was recently elected to fellowship in the American Academy of Microbiology and has received several prestigious awards, including the Bailey K. Ashford Medal from the American Society of Tropical Medicine and Hygiene, the Oswaldo Cruz Medal from the Oswaldo Cruz Foundation, and two Merit Awards from NIH. Dr. Wynn has organized several national and international scientific meetings, including three Keystone Symposia, and collaborates extensively with the pharmaceutical industry.
RESEARCH ACTIVITIES

The Laboratory of Persistent Viral Diseases (LPVD) studies persistent active or latent viral infections and prion diseases. Investigators place particular emphasis on persistent infections of the nervous system and of the hematopoietic and lymphoid systems. The laboratory also is studying the roles of persistent infection in the development of retrovirus-induced immunosuppression. Models being examined include prion diseases of various species and murine and human retroviruses.

The major research goals of the laboratory are to understand basic pathogenic mechanisms induced by these infections, to study immune or other defense mechanisms used by infected people against infections, and to develop drug therapies capable of reducing or eliminating such infections.

MAJOR AREAS OF RESEARCH

- Study of the nature of the transmissible agent responsible for prion diseases
- Study of the pathogenesis of prion diseases using biochemical, cell culture, and animal model methods
- Development of drug therapies for prion diseases
- Characterization of mechanisms of pathogenesis, immunosuppression, and immunity of retroviral infection in animals and humans, with particular emphasis on infections involving hematopoietic cells and brain cells
- Study of genetic control of host defense mechanisms against retroviral diseases, including central nervous system disease and leukemia
- Study of diseases associated with expression of endogenous or recombinant retroviruses

SECTIONS AND UNITS

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<tr>
<th>Section / Unit</th>
<th>Chief Investigator</th>
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<tr>
<td>TSE/Prion and Retroviral Pathogenesis Section</td>
<td>Bruce W. Chesebro, M.D.</td>
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<td>TSE/Prion Biochemistry Section</td>
<td>Byron Caughey, Ph.D.</td>
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<td>Retroviral Molecular Biology Section</td>
<td>Leonard H. Evans, Ph.D.</td>
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<tr>
<td>Retroviral Immunology Section</td>
<td>Kim J. Hasenkrug, Ph.D.</td>
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<td>Neuroimmunology Unit</td>
<td>Karin Peterson, Ph.D.</td>
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<tr>
<td>TSE/Prion Molecular Biology Section</td>
<td>Suzette A. Priola, Ph.D.</td>
</tr>
</tbody>
</table>
**BRUCE W. CHESEBRO, M.D.**

Chief, Laboratory of Persistent Viral Diseases  
Chief, TSE/Prion and Retroviral Pathogenesis Section, LPVD

www.niaid.nih.gov/labs/aboutlabs/lpvd/TSEprionretroviralpathogenesissection  
bchesebro@niaid.nih.gov

**MAJOR AREAS OF RESEARCH**

- Transmissible spongiform encephalopathies, or prion diseases  
- Retroviral brain diseases

**BIOGRAPHY**

Dr. Chesebro received his M.D. from Harvard Medical School in 1968. He completed postdoctoral studies at the Karolinska Institute, Sweden, in 1967; at Stanford University from 1968 to 1970; and at the National Institute of Arthritis and Metabolic Diseases from 1970 to 1972. He came to NIAID in 1972 and became chief of the Laboratory of Persistent Viral Diseases in 1979. He was elected as a fellow in the American Academy of Microbiology in 2011.

**BYRON CAUGHEY, PH.D.**

Chief, TSE/Prion Biochemistry Section, LPVD

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bcaughey@nih.gov

**MAJOR AREAS OF RESEARCH**

- Transmissible spongiform encephalopathies, or prion diseases  
- Prion structure, amplification and detection, and disease prevention and therapeutics  
- Prion protein functions and cell biology  
- Protein-folding diseases

**BIOGRAPHY**

Dr. Caughey received his Ph.D. in biochemistry from the University of Wisconsin, Madison, in 1985 and completed postdoctoral studies in pharmacology at Duke University Medical Center from 1985 to 1986. He has conducted TSE/prion research in the Laboratory of Persistent Viral Diseases since 1986. He became a tenured senior investigator in 1994. Dr. Caughey also is an editor for the Journal of Virology.
LEONARD H. EVANS, PH.D.
Chief, Retroviral Molecular Biology Section, LPVD
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MAJOR AREAS OF RESEARCH
- Mixed retrovirus infections
- Interactions of exogenous retroviruses with their endogenous counterparts
- Genetic alterations of retroviruses and their role in disease
- Retroviral vectors for gene delivery

BIOGRAPHY
Dr. Evans received his Ph.D. in biochemistry in 1977 at the Oregon Health Sciences University in Portland. He did postdoctoral studies on the genetic structure of retroviruses in the department of molecular and cellular biology at the University of California at Berkeley from 1977 until 1980. In 1980, he joined NIAID’s Rocky Mountain Laboratories, where he is currently a senior investigator in the Laboratory of Persistent Viral Diseases.

KIM J. HASENKRUG, PH.D.
Chief, Retroviral Immunology Section, LPVD
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khasenkrug@niaid.nih.gov

MAJOR AREAS OF RESEARCH
- Mechanisms of vaccine protection against retroviral infection
- Chronic retroviral infections: immunological control, regulatory T cells, immunomodulation, and therapeutics
- Mechanisms of genetic resistance to retroviral disease

BIOGRAPHY
Dr. Hasenkrug received his Ph.D. in cell biology from the Albert Einstein College of Medicine in 1991 and conducted his postdoctoral research in the laboratory of Dr. Bruce Chesebro at NIAID’s Rocky Mountain Laboratories. In 1998, he established an independent laboratory to study retroviral immunology and mechanisms of vaccine protection. A special focus of his work has been the study of establishment and maintenance of chronic infections and virus escape. Dr. Hasenkrug serves as an affiliated associate professor at Montana State University and the University of Montana and as a scientific advisor for the International AIDS Vaccine Initiative.
MAJOR AREAS OF RESEARCH

- How the innate immune response influences function of intrinsic brain cells during viral infections
- Influence of the innate immune response on retrovirus infection and pathogenesis in the central nervous system (CNS)
- Influence of the innate immune response on bunyavirus infection and pathogenesis in the CNS
- Autonomous and non-autonomous mechanisms of innate immune-induced neuronal damage/protection during viral infections of the CNS

BIOGRAPHY

Karin Peterson received her Ph.D. in microbiology and immunology in 1998 from the University of Missouri Medical School, where she studied autoimmunity and the activation of self-reactive T cells. She then went to NIAID’s Rocky Mountain Laboratories (RML) in 1998 as a postdoctoral fellow in the Laboratory of Persistent Viral Diseases and applied her skills in immunology toward understanding the mechanisms that control the immune response to retrovirus infection. During this time, she became interested in the immune responses to virus infections in the CNS. In 2004, Dr. Peterson accepted a position as an assistant professor at Louisiana State University School of Veterinary Medicine, where she furthered her studies on viral pathogenesis in the CNS and also taught classes in immunology and virology. In 2008, she returned to RML as a tenure-track investigator to study innate immune responses in the CNS and their role in viral pathogenesis.

SUZETTE A. PRIOLA, PH.D.

Chief, TSE/Prion Molecular Biology Section, LPVD

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spriola@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Transmissible spongiform encephalopathies, or prion diseases
- Molecular mechanisms of neurodegenerative diseases

BIOGRAPHY

Dr. Priola received her Ph.D. in microbiology and immunology in 1990 from the University of California, Los Angeles. In 1991, she joined NIAID’s Rocky Mountain Laboratories, where she is now a senior investigator. She is a former chair of the FDA TSE Advisory Committee and is currently chief of the TSE/Prion Molecular Biology Section. She serves on the editorial board of the journal Virology.
RESEARCH ACTIVITIES

Modern technology now allows for the analysis of immune responses and host-pathogen interactions at a global level, across scales ranging from intracellular signaling networks to individual cell behavior to the functioning of a tissue, organ, and whole organism. The challenge is to not only collect the large amounts of data such methods permit, but also to organize the information in a manner that enhances our understanding of how the immune system operates or how pathogens affect their hosts.

To do this, it is necessary to develop detailed quantitative models that can be used to predict the behavior of a complex biological system, whose properties help explain the mechanistic basis for physiological and pathological responses to infection or vaccination and can be used to design new therapies or vaccines. Achieving this goal requires an interdisciplinary effort, and the Laboratory of Systems Biology (LSB) is designed to address this challenge.

LSB is an integrated group of scientists and support staff, rather than a collection of independent laboratories. Although it has been established within NIAID, it is expected to play a major role in fostering the growth of systems biology efforts across NIH, through its development of new software tools for complex systems modeling and high-throughput screening. LSB members are expected to become involved in an extensive web of formal and informal interactions with other intramural NIH scientists and with extramural groups in the United States and abroad that have a common interest in a systems approach to biology.

MAJOR AREAS OF RESEARCH

- Computational biology, bioinformatics, proteomics, cell biology, immunology, and infectious diseases
- Latest technology for gene expression profiling, high-content screening of RNAi libraries for the discovery of pathway components, high-throughput proteomic and genomic analysis, imaging tools, and an extensive computer infrastructure
- Access to biosafety level-3 facilities for working with infectious agents of high priority for human health

SECTIONS AND UNITS

- **Lymphocyte Biology Section**
  Ronald N. Germain, M.D., Ph.D.

- **Signaling Systems Unit**
  Iain D.C. Fraser, Ph.D.

- **Computational Biology Unit**
  Martin Meier-Schellersheim, Ph.D.

- **Cellular Networks Proteomics Unit**
  Aleksandra Nita-Lazar, Ph.D.

- **Systems Genomics and Bioinformatics Unit**
  John Tsang, Ph.D.
MAJOR AREAS OF RESEARCH

- Intravital imaging, analysis, and modeling of immune cell dynamics and in vivo activity
- Control of cell migration and cell-cell interactions by structural and chemical cues
- Multiplex imaging of cell phenotype, signaling, and function in complex tissues
- Systems-level analysis of immune-cell signaling and responses to infection
- Human immune analysis using systems biology methods

BIOGRAPHY

Dr. Germain received his Sc.B. and Sc.M. from Brown University in 1970 and his M.D. and Ph.D. from Harvard Medical School and Harvard University in 1976. From 1976 to 1982, he served as an instructor, assistant professor, and associate professor of pathology at Harvard Medical School. From 1982 to 1987, he worked as a senior investigator in the NIAID Laboratory of Immunology (LI). In 1987, he was appointed chief of LI’s Lymphocyte Biology Section. In 1994, Dr. Germain was named deputy chief of LI. In 2006, he became director of the NIAID Program in Systems Immunology and Infectious Disease Modeling, which became the Laboratory of Systems Biology in 2011.

MAJOR AREAS OF RESEARCH

- Analysis of the signaling pathway interactions in immune cells that define context-specific responses to pathogens
- Profiling and modeling of the cellular response to complex stimuli
- Application of RNAi screening technology to the identification of signaling network components in immune cells
- Design and implementation of high-throughput and high-content assays to facilitate computational modeling of immune cell behavior and function

BIOGRAPHY

Dr. Fraser received his B.S. in biochemistry from Heriot-Watt University, Edinburgh, Scotland, in 1990 and his Ph.D. in biochemistry from Imperial College, University of London, in 1995. He was a Wellcome Trust International postdoctoral fellow at the Vollum Institute in Portland, Oregon, from 1996 to 1999. He joined the Alliance for Cellular Signaling (AfCS) research consortium in 2000 as lead scientist of the molecular biology group at the California Institute of Technology and became co-director of the AfCS molecular biology laboratory in 2005. He joined NIAID in 2008 as leader of the Molecular and Cell Biology Team in the former Program for Systems Immunology and Infectious Disease Modeling, which became the Laboratory of Systems Biology Signaling Systems Unit in 2011.
MAJOR AREAS OF RESEARCH

- Computational modeling and simulation of intra- and intercellular signaling processes
- Exploration of how intracellular reaction-diffusion processes determine cellular communication and behavior by using a combination of agent-based techniques and discretized partial differential equations
- Investigation of T-cell proliferation, differentiation, and death to identify mechanisms of T-cell homeostasis and the reasons for its failure after HIV/SIV infection by using sets of coupled, ordinary differential equations and agent-based approaches
- Development of interfaces between proteomic databases and computational modeling tools

BIOGRAPHY

Dr. Meier-Schellersheim obtained a master’s degree in physics in 1997 and a Ph.D. in 2001 from the University of Hamburg, Germany. His research focuses on building a bridge between experimental and computational cell biology through the development and application of modeling tools that combine accessible graphical interfaces with the capability to perform spatially and temporally highly resolved simulations, even for models of complex cellular signaling processes.

AlekSandra nita-laZar, Ph.D.

Chief, Cellular Networks Proteomics Unit, LSB

nitalazarau@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Protein modifications involved in cell signaling
- Absolute quantification of molecular representation and interaction

BIOGRAPHY

Dr. Nita-Lazar received her Ph.D. in biochemistry in 2003 from the University of Basel, Switzerland, for studies performed at the Friedrich Miescher Institute for Biomedical Research, where she analyzed protein glycosylation using mass spectrometry methods. After postdoctoral training at Stony Brook University and Massachusetts Institute of Technology, where she continued to investigate post-translational protein modifications and their influence on cell signaling, she joined the NIAID Program in Systems Immunology and Infectious Disease Modeling, now the Laboratory of Systems Biology, in April 2009.
JOHN TSANG, PH.D.

Chief, Systems Genomics and Bioinformatics Unit, LSB
Head of Computational Systems Biology, Trans-NIH Center for Human Immunology

tsangjs@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Systems immunology
- Integrative genomics: computational approaches to integrating diverse data types to obtain novel biological insights; biological circuit reconstruction
- Single-cell genomics: the function and consequence of phenotypic heterogeneity and stochastic gene expression in immune cells
- Systems biology of host-microbiome interactions

BIOGRAPHY

Dr. Tsang received his Ph.D. in biophysics from Harvard University and his B.A.Sc. and M.Math. in computer engineering and computer science, respectively, from the University of Waterloo in Canada. After graduating in 2000, he helped pioneer high-throughput computational and experimental methods to annotate the human genome using custom DNA microarrays at Rosetta Inpharmatics and then led a bioinformatics group at Caprion Proteomics. His doctoral research was conducted in Alexander van Oudenaarden’s laboratory at Massachusetts Institute of Technology, where he led research on the systems biology of microRNA-mediated regulation and stochastic gene expression in yeast. After earning his Ph.D. in 2008, he returned to Rosetta/Merck Research Laboratories to work with Dr. Eric Schadt on integrative genomics and genetics of gene expression in humans and mice. He started his own lab at NIH in August 2010, where he has been leading a research program to develop and apply computational and experimental approaches to the study of the immune system. He also was appointed as director of computational systems biology at the Trans-NIH Center for Human Immunology.
RESEARCH ACTIVITIES

The Laboratory of Viral Diseases carries out investigations on the molecular biology of viruses, the interactions of viruses with host cells, the pathogenesis of viral diseases, and host defense mechanisms. These studies are designed to increase fundamental knowledge as well as to facilitate the development of new approaches to the prevention and treatment of disease. The laboratory is well-equipped with an electron microscope, confocal microscopes, FACS machines, DNA sequencers, PCR machines, ultracentrifuges, and other standard items. The members of the laboratory are interactive and hold weekly seminars in which current research is presented and discussed.

MAJOR AREAS OF RESEARCH

- Viral entry into cells
- Regulation of gene expression
- Mechanisms of DNA replication
- Assembly and transport of viral proteins and particles
- Actions of viral growth factors and immune defense molecules
- Determinants of viral virulence
- Viral targets of humoral and cellular immunity
- Development of recombinant expression vectors, candidate vaccines, and antiviral agents
- DNA and RNA viruses, including HIV, poxviruses, herpesviruses, papillomaviruses, influenza viruses, and flaviviruses

SECTIONS AND UNITS

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<td>Viral Immunology Section</td>
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<td>Molecular Structure Section</td>
<td>Edward A. Berger, Ph.D.</td>
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<td>Molecular Genetics Section</td>
<td>Thomas M. Kristie, Ph.D.</td>
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<td>DNA Tumor Virus Section</td>
<td>Alison McBride, Ph.D.</td>
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<td>Viral Pathogenesis Section</td>
<td>Ted C. Pierson, Ph.D.</td>
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<tr>
<td>Cellular Biology Section</td>
<td>Jonathan W. Yewdell, M.D., Ph.D.</td>
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</table>
BERNARD MOSS, M.D., PH.D.

Chief, Laboratory of Viral Diseases
Chief, Genetic Engineering Section, LVD

www.niaid.nih.gov/labs/aboutlabs/lvd/geneticengineeringsection
bmos@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Replication of poxviruses
- Viral immune defense proteins
- Recombinant vaccines

BIOGRAPHY

Dr. Moss received his M.D. from the New York University School of Medicine, interned at the Children’s Hospital Medical Center (Boston), and then earned a Ph.D. in biochemistry from the Massachusetts Institute of Technology. He became interested in viruses after joining NIH and is well known for studies on the cap structure of mRNAs, regulation of gene expression, replication cycle of poxviruses, virus defense molecules, and development and application of virus vectors.

Dr. Moss has received numerous awards and prizes. He was elected to the National Academy of Sciences and American Academy of Microbiology. He is a fellow of the American Association for the Advancement of Science and a former president of the American Society for Virology. He is an editor of Virology and a member of the editorial boards of the Journal of Virology, AIDS Research and Human Retroviruses, Current Opinion in Biotechnology, Advances in Virus Research, and the NIH Catalyst. He is an adjunct professor at George Washington University and the University of Maryland.

JACK R. BENNINK, PH.D.

Chief, Viral Immunology Section, LVD

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jbennink@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Generation of MHC class I peptide ligands from DRiPs and other endogenous antigens
- Cell biology of compartmentalized translation and influenza A virus glycoprotein biogenesis
- Defining mechanisms that contribute to the evolution of influenza A virus and antigenic drift in influenza A virus glycoproteins
- Understanding antibody responses to influenza A virus
- Real-time imaging of virus-host interactions using multiphoton microscopy

BIOGRAPHY

Dr. Bennink obtained his Ph.D. from the University of Pennsylvania for the study of the specificity of virus immune effector T cells. He spent two years as a member of the Basel Institute for Immunology, followed by five years as assistant and associate professor at the Wistar Institute of Anatomy and Biology, before coming to the Laboratory of Viral Diseases in 1987. His research focuses on influenza virus and antigen processing and presentation to class I restricted antiviral T cells.
EDWARD A. BERGER, PH.D.

Chief, Molecular Structure Section, LVD

MAJOR AREAS OF RESEARCH

- Mechanisms of viral Env glycoprotein-receptor interactions and antibody neutralization mechanisms (HIV, herpesviruses, flaviviruses)
- Novel treatment and prevention strategies based on viral Env glycoprotein-receptor interactions

BIOGRAPHY

Dr. Berger earned his B.S. in chemistry from City College of the City University of New York in 1968. He received his Ph.D. in biochemistry and molecular biology in 1973 from Cornell University. He went on to do a postdoctoral fellowship in the department of genetics, biochemistry, and neurobiology at Stanford University School of Medicine from 1973 to 1976 and another fellowship in the department of cellular and developmental immunology at Scripps Clinical and Research Foundation from 1976 to 1977. He was a staff scientist with the cell biology group at the Worcester Foundation for Experimental Biology, Shrewsbury, Massachusetts, from 1977 to 1987. He joined the Laboratory of Viral Diseases in 1987 and became chief of the Molecular Structure Section in 1995.

THOMAS M. KRISTIE, PH.D.

Chief, Molecular Genetics Section, LVD

MAJOR AREAS OF RESEARCH

- Herpes simplex virus gene expression
- Transcriptional coactivators in herpesvirus lytic and latency reaction
- Chromatin control of herpesvirus lytic- and latency-reaction cycles
- Mechanisms involved in RNAP II-mediated gene transcription

BIOGRAPHY

Dr. Kristie received his Ph.D. from the Committee on Virology at the University of Chicago for his work with Dr. Bernard Roizman on the regulation of herpes simplex virus gene expression. As a postdoctoral fellow with Dr. Philip Sharp at the Center for Cancer Research, Massachusetts Institute of Technology, Dr. Kristie focused on the interaction of components involved in the formation of transcriptional enhancer complexes. Dr. Kristie joined the NIAID Laboratory of Viral Diseases in 1993, became a senior investigator in 2000, and became chief of the Molecular Genetics Section in 2001.
ALISON MCBRIDE, PH.D.

Chief, DNA Tumor Virus Section, LVD

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amcbride@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Characterization of the mechanisms of viral genome establishment in keratinocytes
- Characterization of the mechanisms by which papillomavirus genomes are maintained and partitioned in dividing cells
- Determination of the role of the host’s DNA damage response and repair pathways in viral DNA replication
- Development of therapeutics to intervene in viral genome tethering
- Development of efficient methods to immortalize primary keratinocytes conditionally

BIOGRAPHY

Dr. McBride received a B.Sc. (with honors) in molecular biology from the University of Glasgow, Scotland, and a Ph.D. in biochemistry from the Imperial Cancer Research Fund and Imperial College, London, studying Epstein-Barr virus. She began working on human and other papillomaviruses as a postdoctoral fellow in the National Cancer Institute and joined NIAID in 1994. She became a senior investigator in the Laboratory of Viral Diseases in 2000.

TED C. PIERSON, PH.D.

Chief, Viral Pathogenesis Section, LVD

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piersontc@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Multiple roles of the envelope glycoproteins during the flavivirus lifecycle
- Mechanisms of antibody-mediated neutralization of viruses
- Humoral immunity to flavivirus infection

BIOGRAPHY

Dr. Pierson received his Ph.D. from the Johns Hopkins University School of Medicine in 2001. While training in the laboratory of Dr. Robert F. Siliciano, Dr. Pierson investigated the molecular biology of the pre-integration state of HIV-1 latency and the contribution of this relatively labile reservoir toward the persistence of HIV-1 in the face of aggressive antiretroviral therapy. After completing these studies, Dr. Pierson took a postdoctoral fellowship in the laboratory of Dr. Robert W. Doms in the department of microbiology at the University of Pennsylvania. While training there, Dr. Pierson initiated a new research program to study the cell biology of the envelope proteins of flaviviruses, with a focus on West Nile virus and dengue viruses. In 2005, Dr. Pierson was recruited to initiate the Viral Pathogenesis Section of the Laboratory of Viral Diseases and to continue his work on flaviviruses.
JONATHAN W. YEWDELL, M.D., PH.D.

Chief, Cellular Biology Section, LVD

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jyewdell@nih.gov

MAJOR AREAS OF RESEARCH

- Generation of MHC class I peptide ligands from DRiPs and other endogenous antigens
- Defining mechanisms that contribute to the evolution of influenza A virus and antigenic drift in influenza A virus glycoproteins
- Real-time imaging of virus-host interactions using multiphoton microscopy
- Cell biology of compartmentalized translation and influenza A virus glycoprotein biogenesis
- Understanding antibody responses to influenza A virus

BIOGRAPHY

Dr. Yewdell received an A.B. in biochemistry magna cum laude from Princeton University in 1975, working with Dr. Arnold Levine for his undergraduate thesis on immune recognition of virus-transformed cells. He received an M.D. and Ph.D. in immunology from the University of Pennsylvania in 1981, working with Dr. Walter Gerhard on the mapping of influenza hemagglutinin epitopes using monoclonal antibodies. As a postdoctoral fellow, he worked with Dr. David Lane at the Imperial College in London, studying the newly discovered p53 protein. From 1983 to 1987, he was an assistant professor at the Wistar Institute in Philadelphia. In 1987, Dr. Yewdell joined the Laboratory of Viral Diseases and in 1993 was appointed to lead its Cellular Biology Section.
RESEARCH ACTIVITIES

The Laboratory of Virology (LV) conducts innovative scientific research on viral agents requiring high or maximum containment (biosafety level-2 to biosafety level-4). These agents include filoviruses, bunyaviruses, arenaviruses, and flaviviruses. Research studies focus on vector/reservoir transmission, viral ecology, pathogenesis, pathophysiology, and host immune response of these viral pathogens. A significant goal is to develop diagnostics, vaccines, and therapeutics against these agents.

LV scientists broadly study pathogens that cause viral hemorrhagic fevers, viral encephalitis, and certain respiratory diseases. This work uses investigations in cell culture; animal models, including nonhuman primates; reservoir species; and arthropod hosts to elucidate viral pathogenesis, immune responses, molecular evolution, cellular and molecular biology, and vector-host interactions.

MAJOR AREAS OF RESEARCH

- Studying pathogenesis and pathophysiology of high-containment viral pathogens using molecular technologies, including reverse genetics
- Exploring immune responses to infection and vaccination of high-containment viral pathogens and developing new vaccine candidates
- Investigating vector/reservoir transmission of high-containment viral pathogens using appropriate animal models
- Using *in vitro* and *in vivo* systems to study the interactions between viral pathogens or viral components and host cells and developing new antiviral strategies
- Studying the epidemiology and ecology of high-containment pathogens using newly developed rapid, sensitive, and specific diagnostic-test systems, including those that can be applied under field conditions

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<td>Sonja M. Best, Ph.D.</td>
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<td><strong>Biology of Vector-Borne Viruses Section</strong></td>
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<td>Marshall E. Bloom, M.D.</td>
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<td>Hideki Ebihara, Ph.D.</td>
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<td>Vincent Munster, Ph.D.</td>
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</tbody>
</table>
HEINZ FELDMANN, M.D., PH.D.

Chief, Laboratory of Virology
Chief, Disease Modeling and Transmission Section, LV

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feldmannh@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Disease modeling using rodent and nonhuman primate models
- Emergency vaccines using different replication-competent and replication-deficient viral vector platforms
- Antivirals and therapeutics
- Virus transmission in reservoir and host species

BIOGRAPHY

Dr. Feldmann graduated from medical school in 1987 and received his Ph.D. in 1988, both from the University of Marburg, Germany. His postdoctoral research was conducted in the field of virology (filoviruses and hantaviruses) at the Institute of Virology, University of Marburg, and the special pathogens branch at the CDC in Atlanta, where he held a fellowship from the National Research Council. Following his postdoctoral training, he returned to the Institute of Virology as an assistant and associate professor. During this time, he trained as an infectious disease specialist with a focus on laboratory diagnostics. From 1999 to 2008, Dr. Feldmann was chief of the special pathogens program at the National Microbiology Laboratory, Public Health Agency of Canada. Since 2008, he has been chief of the Laboratory of Virology and the chief scientist at NIAID’s Rocky Mountain Laboratories biosafety level-4 facility. In addition, he is an associate professor with the department of medical microbiology at the University of Manitoba. Dr. Feldmann serves as a consultant on viral hemorrhagic fevers and related pathogens for the World Health Organization and has field experience and expertise in outbreak management.

SONJA M. BEST, PH.D.

Chief, Innate Immunity and Pathogenesis Unit, LV

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sbest@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Mechanisms used by pathogenic viruses to modulate host innate immunity
- Role of novel interferon-stimulated genes in host resistance to virus infection
- Importance of dendritic cell function to antiviral innate and adaptive immune responses

BIOGRAPHY

Dr. Best received her Ph.D. in biochemistry and molecular biology from Australian National University, where she studied the pathogenesis of myxoma virus, a poxvirus. She conducted her postdoctoral research at NIAID’s Rocky Mountain Laboratories (RML) on the complex role of apoptosis in the replication of paroviruses. She stayed at RML as a research fellow and then a staff scientist to investigate virus-host interactions involved in flavivirus pathogenesis. It was during this time that she developed her interests in innate immunity and the molecular mechanisms used by flaviviruses to evade these critical host responses. In 2009, Dr. Best established an independent laboratory as a tenure-track investigator to expand her studies on interactions between pathogenic viruses and the host immune response. In 2011, Dr. Best was awarded a Presidential Early Career Award for Scientists and Engineers for her work on flavivirus suppression of innate immune responses.
MAJOR AREAS OF RESEARCH

- Structural biology of tickborne flaviviruses in vertebrate and arthropod systems
- Biology and molecular pathogenesis of acute and persistent tickborne flavivirus infections
- Viral and host determinants of effective vertical (through the tick life stages) and horizontal (from tick to mammalian host) transmission

BIOGRAPHY

Dr. Bloom received his M.D. in 1971 from Washington University School of Medicine in St. Louis and then joined NIAID’s Rocky Mountain Laboratories (RML) in 1972 as a research associate. From 1975 to 1977, he was a postdoctoral fellow in the NIAID Laboratory of the Biology of Viruses in Bethesda, Maryland. He returned to RML as a tenured investigator in 1977 and was a charter member of the Laboratory of Persistent Viral Diseases. He is a world expert in the molecular biology and pathogenesis of paroviruses and is considered an authority on biocapability. In 2004, Dr. Bloom’s research group changed its focus to the pathogenesis of tickborne flaviviruses. In 2002, Dr. Bloom was appointed associate director for RML in NIAID’s Division of Intramural Research, a position in which he helped guide the permitting, construction, and staffing of NIAID’s first biosafety level-4 facility. In 2008, Dr. Bloom was named associate director for science management at RML. He also served as acting chief of the Laboratory of Virology and the Laboratory of Human Bacterial Pathogenesis.

HIDEKI EBIHARA, PH.D.

Chief, Molecular Virology and Host-Pathogen Interaction Unit, LV

MAJOR AREAS OF RESEARCH

- Molecular determinants of filovirus virulence in animals
- Role of Ebola virus proteins in viral pathogenesis and life cycle
- Identification of host cellular factors essential for Ebola virus replication
- Molecular characterization of pathogenic bunyaviruses that cause disease in humans and animals
- Identification of bunyavirus host range and virulence determinants
- Mechanisms of bunyavirus evolution

BIOGRAPHY

Hideki Ebihara received his Ph.D. in virology and molecular biology in 2001 from Hokkaido University, Japan, where he studied the pathogenesis and genetic determinants of virulence of hantaviruses, which cause hemorrhagic fever with renal syndrome in humans. From 2001 to 2003, he completed postdoctoral research studying the molecular basis of Ebola virus pathogenesis at the School of Veterinary Medicine, University of Wisconsin, Madison. He continued his training first as a postdoctoral fellow (2003 – 7) and then as a research associate (2007 – 9) with the Institute of Medical Science, University of Tokyo, performing research on the molecular biology and pathogenesis of Ebola, Marburg, and hantaviruses as part of the special pathogens program at the National Microbiology Laboratory, Public Health Agency of Canada. Dr. Ebihara was recruited to NIH in 2009 as a staff scientist in the Laboratory of Virology. In 2010, he established his own laboratory as a tenure-track investigator, studying the molecular mechanisms that underlie the pathogenesis of highly pathogenic human and animal RNA viruses.
VINCENT MUNSTER, PH.D.

Chief, Virus Ecology Unit, LV

www.niaid.nih.gov/labs/aboutlabs/lv/virusecology
munstervj@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Natural reservoirs of emerging viruses and elucidation of the underlying biotic and abiotic drivers of zoonotic and cross-species transmission events
- Evolutionary dynamics of emerging viruses in the context of virus-host ecology
- Modeling zoonotic and cross-species transmission of emerging viruses and the efficacy of outbreak intervention strategies

BIOGRAPHY

Dr. Vincent Munster received his Ph.D. in virology from Erasmus Medical Center, Rotterdam, The Netherlands, in 2006. During his Ph.D. studies, Dr. Munster studied the ecology, evolution, and pathogenesis of avian influenza viruses. He continued his training in the department of virology at the Erasmus Medical Center from 2006 to 2009, where he worked within the Center for Research on Influenza Pathogenesis and Surveillance, focusing on pathogenicity and human-to-human transmission of influenza A viruses. Dr. Munster joined the Laboratory of Virology as a visiting fellow in 2009 to expand his research interest in the ecology of emerging viruses to include filoviruses and henipaviruses. He was awarded the European Scientific Working Group on Influenza Best Body of Work Award for Young Scientists in 2011. In 2013, Dr. Munster established the Virus Ecology Unit as an independent tenure-track investigator. The Virus Ecology Unit conducts research at the state-of-the-art high-containment facilities of NIAID’s Rocky Mountain Laboratories, as well as at field study sites in Africa (the Republic of the Congo and Mali) and the Caribbean (Trinidad and Tobago).
RESEARCH ACTIVITIES

Scientists in the Laboratory of Zoonotic Pathogens (LZP) study diseases that are communicable from animals to humans. They conduct research to delineate the molecular basis of interaction between pathogens and their arthropod vectors, primarily ticks and fleas; define and identify pathogen and vector molecules that contribute to successful completion of pathogen transmission; and conduct research to examine differential gene regulation of pathogens during their transmission cycle in vertebrate hosts. The basic research programs in LZP develop and use molecular genetic tools in conjunction with experimental animal models to study the vector-borne pathogens that cause Lyme disease, relapsing fever and plague, and the environmental pathogen that causes leptospirosis.

MAJOR AREAS OF RESEARCH

- Fleas, ticks, and other arthropod vectors
- Interaction between pathogens and vectors
- Pathogen and vector molecules involved in pathogen transmission
- Development of genetic tools

SECTIONS AND UNITS

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<td>Gene Regulation Section</td>
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</tr>
<tr>
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PATRICIA ROSA, PH.D.

*Chief, Laboratory of Zoonotic Pathogens*
*Chief, Molecular Genetics Section, LZP*

www.niaid.nih.gov/labs/aboutlabs/lzp/moleculargeneticssection
prosa@niaid.nih.gov

**MAJOR AREAS OF RESEARCH**

- Development of a genetic system for *Borrelia burgdorferi*, the spiral-shaped bacterium that causes Lyme disease
- Analysis of the structure and function of the plasmid component of the highly segmented *B. burgdorferi* genome
- Determination of the roles of specific plasmids, genes, and proteins during the natural infectious cycle of *B. burgdorferi*
- Cultivation and genetic manipulation of free-living and pathogenic *Leptospira*

**BIOGRAPHY**

Dr. Rosa received her doctorate in 1980 from the Institute of Molecular Biology at the University of Oregon. In 1988, following research fellowships at Washington University School of Medicine in St. Louis and at the Research Institute of Scripps Clinic, Dr. Rosa joined NIAID’s Rocky Mountain Laboratories. She became a tenured investigator in 2000 and joined the newly formed Laboratory of Zoonotic Pathogens in 2005. Dr. Rosa is a fellow of the American Academy of Microbiology and an internationally recognized leader in the field of bacterial molecular genetics.

FRANK GHERARDINI, PH.D.

*Chief, Gene Regulation Section, LZP*

www.niaid.nih.gov/labs/aboutlabs/lzp/generegulationsection
fgherardini@niaid.nih.gov

**MAJOR AREAS OF RESEARCH**

- Physiology, biochemistry, gene regulation, and pathogenesis of *Borrelia burgdorferi*
- *Treponema pallidum*
- *Burkholderia mallei*
- Identification of genes required for intracellular survival of *Burkholderia pseudomallei*

**BIOGRAPHY**

Dr. Gherardini received his doctorate in 1987 from the University of Illinois, studying enzymes involved in the utilization of galactomannans by *Bacteroides ovatus*. From 1991 to 2001, he was a tenured professor in the department of microbiology at the University of Georgia. In 2001, Dr. Gherardini joined NIAID’s Rocky Mountain Laboratories, where he is chief of the Gene Regulation Section and a senior investigator in the Laboratory of Zoonotic Pathogens.
B. JOSEPH HINNEBUSCH, PH.D.

Chief, Plague Section, LZP

www.niaid.nih.gov/labs/aboutlabs/lzp/plaguesection
jhinnebusch@niaid.nih.gov

MAJOR AREAS OF RESEARCH

- Interactions between the bacterium Yersinia pestis and its rat-flea vector Xenopsylla cheopis that lead to transmission
- Mechanisms of Y. pestis pathogenicity and immune evasion
- Aspects of the flea-bacteria-host transmission interface that influence nascent infection and immunity
- Characterization of a protective immune response to plague; new plague vaccines and diagnostics

BIOGRAPHY

Dr. Hinnebusch received his Ph.D. in microbiology in 1991 from the University of Texas Health Science Center at San Antonio, studying the molecular structure and replication of linear plasmids of Borrelia burgdorferi, the bacterial agent of Lyme disease. He joined NIAID’s Rocky Mountain Laboratories as a postdoctoral fellow in 1992, where he developed model systems to study the transmission of Yersinia pestis, the bacterial agent of bubonic and pneumonic plague. He advanced to a tenure-track position in 2001 and is now a senior investigator and chief of the Plague Section in the Laboratory of Zoonotic Pathogens. From 2002 to 2006, he was the recipient of a New Scholar Award in Global Infectious Diseases from the Ellison Medical Foundation.
RESEARCH SUPPORT ACTIVITIES

The Research Technologies Branch (RTB) enables investigators in the NIAID Division of Intramural Research to access state-of-the-art research technologies. Over the past 30 years, the advent of the biotechnology industry and the development of new scientific disciplines have resulted in an explosion of new technologies. In addition, advances in optics, lasers, and computer technology have revolutionized well-established disciplines such as microscopy (both light and electron), flow cytometry, and genomics. These technologies require very expensive instrumentation and highly trained and specialized scientists to adapt these new technologies to the research needs of NIAID. The branch develops cutting-edge research technologies and project-specific applications through a network of facilities located in Bethesda and Rockville, Maryland, as well as in Hamilton, Montana. Scientists in RTB also provide expert training and consultation in experimental design, laboratory protocols, and analysis of results.

MAJOR AREAS OF EXPERTISE

- Light microscopy (confocal, multiphoton, colocalization, TIRF, FRET, high-resolution 3D imaging, laser microcapture, correlative techniques, and post-collection imaging processing)
- Electron microscopy (high-resolution scanning and transmission, cryoimmobilization/viewing, and immunolocalization of selected antigens)
- Flow cytometry (up to 13-color sorting, up to 14-color analysis, biosafety level-3 sorting and analysis, multispectral imaging cytometry, and multiplex bead array assays)
- Custom antibodies (hybridoma expansion, purification, and labeling)
- Protein chemistry (peptide synthesis, protein sequencing, mass spectrometry, protein identification, protein separation, and assay development)
- Genomics (Agilent SurePrint, Illumina BeadChip, and Affymetrix microarrays; microarray design; Illumina and Roche next-generation DNA sequencing; and Q-PCR)
- Bioinformatics and biostatistics (experiment design, data management, statistical analysis, exploratory analysis, data mining, and database integration)

SECTIONS AND UNITS

Protein Chemistry Section
Robert J. Hohman, Ph.D.
ROBERT J. HOHMAN, PH.D.

Associate Director for Research Technologies, Division of Intramural Research
Chief, Research Technologies Branch
Chief, Protein Chemistry Section, RTB

www.niaid.nih.gov/labs/aboutlabs/rtb/protchemsec
rhohman@niaid.nih.gov

MAJOR AREAS OF EXPERTISE

- Edman (N-terminal) protein sequencing
- Peptide synthesis
- Analytical mass spectrometry
- Protein identification
- Protein separation
- Assay development
- Proteomics
- Bioinformatics

BIOGRAPHY

Dr. Hohman received his Ph.D. in microbiology from NIH and the University of Maryland in 1982. After a three-year postdoctoral position in the laboratory of biochemistry at the Pasteur Institute in Paris, he returned to NIH for a second postdoctoral appointment. In 1992, he joined Oncor Inc., a biotechnology company that specialized in DNA diagnostics, and became the vice president of research and development. In 1998, Dr. Hohman became the vice president for research and development and general manager of the newly formed Intergen Discovery Products. In 2000, he was recruited back to NIH to become the DIR Associate Director for Research Technologies and chief of the Research Technologies Branch.
RESEARCH SUPPORT ACTIVITIES

The major research and support activities of the Rocky Mountain Veterinary Branch include basic immunology, molecular biology, and pathogenesis of bacterial, viral, and prion diseases in laboratory animal models, developing new animal models of emerging infectious diseases, vaccine development, increasing the efficiency and safety of animal biosafety level (ABSL)-4 research, and evaluating new caging systems for high-containment research.

MAJOR AREAS OF EXPERTISE

- Biosafety level-4 pathogen animal models and molecular reagents
- Testing novel vaccine candidates for ABSL-4 select agents
- Clinical care and animal model development
- Developing standard operating procedures for high-containment animal research environments
- Full pathological services for infectious disease animal models
- Novel histopathology techniques for laboratory animal models
- Training programs for laboratory animal procedures and biosafety in animal facilities
- Imaging techniques in the high-containment animal research environment
DONALD J. GARDNER, D.V.M.
Interim Chief, Rocky Mountain Veterinary Branch
Interim Chief, Veterinary Pathology Section, RMVB
dgardner@niaid.nih.gov

MAJOR AREAS OF RESEARCH
- Imaging
- Surgical modeling

BIOGRAPHY
Dr. Gardner earned his D.V.M. from Colorado State University in 1984. He served in a private clinical practice for four years and then served in the U.S. Army Veterinary Corps from 1988 to 1991. He was a clinical veterinarian at the FDA Center for Biologics Evaluation and Research from 1991 to 1999 and staff veterinary pathologist at the NIH Division of Veterinary Resources from 1999 to 2002. In 2002, he came to NIAID’s Rocky Mountain Laboratories and has been interim chief of the Rocky Mountain Veterinary Branch since 2013.
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<td>CBS: Cytokine Biology Section</td>
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<td>CDC: Centers for Disease Control and Prevention</td>
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<td>CHI: Trans-NIH Center for Human Immunology</td>
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<td>CMB: Comparative Medicine Branch</td>
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<td>CR-LRP: Clinical Research Loan Repayment Program</td>
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<td>DIR: NIAID Division of Intramural Research</td>
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<td>ERAS: Electronic Residency Application System</td>
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<td>EVPS: Emerging Viral Pathogens Section</td>
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<td>INRO: Intramural NIAID Research Opportunities Program</td>
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<td>LAD: Laboratory of Allergic Diseases</td>
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<td>LB: Laboratory of Bacteriology</td>
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<td>LCID: Laboratory of Clinical Infectious Diseases</td>
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<td>LHD: Laboratory of Host Defenses</td>
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<td>LI: Laboratory of Immunology</td>
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<td>LID: Laboratory of Infectious Diseases</td>
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<td>LIG: Laboratory of Immunogenetics</td>
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<td>LIR: Laboratory of Immunoregulation</td>
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<td>LMI: Laboratory of Molecular Immunology</td>
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<td>LMIV: Laboratory of Malaria and Immunology Vaccinology</td>
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<td>LMM: Laboratory of Molecular Microbiology</td>
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<td>LMVR: Laboratory of Malaria and Vector Research</td>
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<td>LPD: Laboratory of Parasitic Diseases</td>
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<td>LPVD: Laboratory of Persistent Viral Diseases</td>
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<td>LRP: General Loan Repayment Program</td>
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<td>LSB: Laboratory of Systems Biology</td>
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<td>LV: Laboratory of Virology</td>
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<td>LVD: Laboratory of Viral Diseases</td>
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<tr>
<td>LZP: Laboratory of Zoonotic Pathogens</td>
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<tr>
<td>NIAID: National Institute of Allergy and Infectious Diseases</td>
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<tr>
<td>NIH: National Institutes of Health</td>
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<tr>
<td>OTD: Office of Training and Diversity</td>
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<tr>
<td>RML: Rocky Mountain Laboratories</td>
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<tr>
<td>RMVB: Rocky Mountain Veterinary Branch</td>
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