Report to the National Advisory Environmental Health Sciences Council

Director, NIEHS

20-21 February 2019

Budget and Legislative Report

Appropriations Overview

	FY 2016 Omnibus Appropriation	FY 2017 Omnibus Appropriation	FY 2018 Omnibus Appropriation	FY 2019 Appropriation
NIEHS	$ 693,533,000[a/]	$ 714,261,000	$ 751,143,000	$ 774,707,000
NIH (LHHS)[b/]	$32,084,000,000	$34,084,000,000	$37,084,000,000	$39,084,000,000
Common Fund[c/]	$ 675,639,000	$ 695,456,000	$ 600,716,000[d/]	$ 606,566,000[d/]
Superfund	$ 77,349,000	$ 77,349,000	$ 77,349,000	$???[f/]
NIEHS/DOE Training[e/]	$ 10,000,000	$ 10,000,000	$ 10,000,000	$ 10,000,000

a/ Reduced by $169,000 transfer to the NIH Office of AIDS Research.
b/ Excludes Mandatory Type 1 Diabetes Research and Superfund.
c/ Includes addition of $12.6 million for the Gabriella Miller Kids First Act pediatric research initiative.
d/ Excludes $60 million "All of US" funding which the committee moved to the NIH Office of the Director.
e/ Appropriations Committee report language supporting the transfer of funds from the U.S. Department of Energy's Defense Environmental Cleanup account to NIEHS for the NIEHS/DOE Nuclear Worker Training Program.
f/ House is currently considering the Senate mark of $78.349 million, $1 million above FY 2018

FISCAL YEAR 2019 APPROPRIATIONS UPDATE

Broad Overview

Of the 12 annual appropriations bills considered by Congress every calendar year to fund Federal Government agencies and programs, to date only five (42%) have been enacted into law for Fiscal Year (FY) 2019, which began on October 1, 2018 and ends on September 30, 2019. These five bills were enacted in two batches—that is, in a form colloquially referred to as a "mini omnibus" or "minibus" bill. These two "minibuses" now public law are outlined in the table below with their applicability to NIEHS noted in the right-hand column:

Public Law #	Date of Enactment	Bill No.	Short Title / Components
P.L. 115-244	Sept. 21, 2018	H.R. 5895	(1) Energy and Water; (2) Legislative Branch, and (3) Military Construction and Veterans Affairs Appropriations Act, 2019 [NOTE: Component (1) includes the annual Department of Energy (DOE) Defense Environmental Cleanup account appropriation with committee report language supporting the transfer of $10,000,000 from that DOE account to NIEHS for the NIEHS/DOE Nuclear Worker Training Program (S.Rept. 115-258, May 24, 2018, pg. 108)].
P.L. 115-245	Sept. 28, 2018	H.R. 6157	(4) Department of Defense; and (5) Labor, Health and Human Services, and Education Appropriations Act, 2019 [NOTE: Component (5) includes the annual appropriation for the core part of the NIEHS budget, which for Fiscal Year 2019 is $774,707,000 (H.R. 6157, as enrolled, pg. 95)].

Incomplete FY2019 Appropriations Bills and Continuing Resolutions

The seven FY2019 appropriations bills that remained incomplete at the time the 115th Congress adjourned sine die on January 2, 2019, and that remain outstanding in the current Congress—the 116th Congress which convened on January 3, 2019—are as follows in alphabetical order.

1. Agriculture, Rural Development, Food and Drug Administration, and Related Agencies
2. Commerce, Justice, Science, and Related Agencies
3. Financial Services and General Government
4. Homeland Security
5. **Interior, Environment, and Related Agencies (applies to NIEHS)**
6. State, Foreign Operations, and Related Programs
7. Transportation, Housing and Urban Development, and Related Agencies

Four components of the U.S. Department of Health and Human Services (HHS) fall under either one of two of these seven outstanding appropriations bills. The Indian Health Service (IHS), the Agency for Toxic Substances and Disease Registry (ATSDR), and the NIEHS Superfund Research Program (SRP) and Worker Training Program (WTP) are funded under the Interior, Environment, and Related Agencies appropriations bill. The Food and Drug Administration (FDA) is funded under the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies bill. The remainder of HHS is funded

under the Labor, Health and Human Services, Education, and Related Agencies appropriations bill, which for FY2019 became law on September 28, 2019—three days before the start of the fiscal year.

To date, three Continuing Resolutions (CRs) have kept Federal agencies and programs covered under the seven outstanding appropriations bills—including the NIEHS SRP and WTP—operating for certain number of days at FY2018 levels. The first two of these three CRs were seamless and applied to the first 82 days of FY2019—from October 1, 2018 through December 21, 2018. A lapse in appropriations occurred for 35 days thereafter—from December 22, 2018 until January 25, 2019—resulting in a partial government shutdown before a third CR became law and took effect. The third CR spans 22 calendar days and will expire on February 15, 2019, or for an applicable Federal agency or program upon the enactment of its full-year appropriation, whichever is earlier. Absent enactment into law of a full-year appropriation or another CR by February 15, 2019, the NIEHS SRP and WTP, as well as other similarly-situated Federal agencies and programs, are at risk of again being shut down.

The following table outlines the FY2019 CRs that have been enacted into law to date:

Continuing Resolution	**Enacted into Law**	**Expiration Date**	**Days Covered**
1. Continuing Appropriations Act, 2019 (Division C, P.L. 115-245)	Sept. 28, 2018	Dec. 7, 2018	68 days
2. Amendment to the Continuing Appropriations Act, 2019 (P.L. 115-298)	Dec. 7, 2018	Dec. 21, 2018	14 days
… (LAPSE IN APPROPRIATIONS)	(Dec. 22, 2018)	Jan. 25, 2019)	(34 days)
3. Further Additional Continuing Appropriations Act, 2019	Jan. 25, 2019	Feb. 15, 2019	22 days
TOTAL NUMBER OF DAYS WITHIN FISCAL YEAR			**138 days (38%)**

FY2019 NIH Appropriations

On September 28, 2018, the President signed into law H.R. 6157, the *Department of Defense and Labor, Health and Human Services, and Education Appropriations Act, 2019*, or second "minibus" as Public Law 115-245. The law provides a total of $39.1 billion for NIH, an increase of $2 billion above the FY2018 enacted level. As highlighted by the Congressional Appropriations Committees, the law provides increases for several specific NIH research initiatives, including:

- $2.34 billion, a $425 million increase, for Alzheimer's disease research;
- $550 million, a $37 million increase, for research on Combating Antibiotic-Resistant Bacteria;
- $429 million, a $29 million increase, for the Brain Research through Application of Innovative Neurotechnologies (BRAIN) initiative;
- $400 million, a $100 million increase, for the Cancer Moonshot research initiative;
- $376 million, a $86 million increase, for the "All of Us" research initiative;
- $362 million, a $11 million increase, for Institutional Development Awards (IDeA);
- $140 million, a $40 million increase, for research to develop a universal influenza vaccine; and
- $12.6 million for the Gabriella Miller "Kids First" pediatric cancer research initiative.

The law also expands support for the Down syndrome research initiative established in

FY2018. Apart from these targeted increases for specific research initiatives, every NIH Institute and Center received an increase in funds to the base budget over the prior year. The law specifically provides $774.707 million for NIEHS, an increase of $23.564 million (3.14%).

FY2019 NIEHS Appropriations

The following table outlines the current status of FY2019 appropriations for NIEHS:

DISTRIBUTION OF CONGRESSIONAL APPROPRIATIONS FOR NIEHS FY 2019 BUDGET[1]

Budget Line	FY2018 Enacted Amount[2]	House		Senate		FY2019 FINAL Enacted Amount	Δ v FY2018
		Proposed Amount	Δ v FY2018	Proposed Amount	Δ v FY2018		
NIEHS base budget[3]	$751.143	$760.113	$8.970 (1.19%)	$775.115	$23.972 (3.19%)	$774.707	$23.564 (3.14%)
NIEHS Superfund-related activities[4]	$77.349	$80.000	$2.651 (3.43%)	$78.349	$1.000 (1.29%)	Pending	Pending
DOE Transfer to NIEHS for Nuclear WTP[5]	$10.000	$0	($10.000)	$10.000	$0	$10.000	$0

NIEHS Total	$838.492	$840.113	$1.631 (0.19%)	$863.464	$24.972 (2.89%)	Pending	Pending

[1] Dollars in thousands.

[2] May not reflect the amount actually received at NIEHS due to the application of transfer authority that reduces the amount for all or most ICs.

[3] Funded under the Labor, Health and Human Services, Education, and Related Agencies Appropriations bill.

[4] Funded under the Interior, Environment, and Related Agencies Appropriations bill.

[5] Funded pursuant to Committee Report Language accompanying the Energy and Water Development and Related Agencies Appropriations Act that supports the DOE/NIEHS Nuclear Worker Training Program.

NIEHS Superfund Research Program (SRP) and Worker Training Program (WTP) Appropriations

When the 115th Congress adjourned sine die on January 2, 2019, enactment of a FY2019 full-year appropriation for the NIEHS Superfund Research Program (SRP) and Worker Training Program (WTP) remained outstanding. Prior to that adjournment, the House of Representatives had passed an Interior, Environment and Related Agencies appropriations bill on July 19, 2018, by a vote of 217-199. That House bill proposed $80 million—or a $2.651 million (3.43%) increase over the FY2018 level—for the NIEHS SRP and WTP in FY2019. The Senate amended that House-passed bill by a vote of 92-6 on August 1, 2018. The Senate amendment proposed $78.349 million for the SRP and WTP, which would be a $1 million (1.29%) increase. The amount for the SRP and WTP has remained $77.349 million since FY2014.

Since the 116th Congress convened on January 3, 2019, the House of Representatives has passed three separate Interior, Environment and Related Agencies appropriations bills. The table below outlines what each of these bills—which are pending in the Senate—propose for the SRP and WTP. The first two bills—H.R. 21 and H.R. 266—adopt the Senate-proposed number from this past summer, which is the lower of the two proposed increases considered in the immediate previous Congress. The third bill—which is the most recent to have passed the House—reflects a compromise between the two competing proposals. It proposes $79 million, which would be a $1.651 million or 2.13% increase. Further action on this legislation is pending the outcome of a conference committee that convened on January 30, 2019, between the House and the Senate to resolve differences over homeland security policy and appropriations.

Appropriations Bill	SRP & WTP Amount	Vote Outcome	Vote Taken
H.R. 21, (1st) *Consolidated Appropriations Act*	$78.349 million (+$1 million (1.29%))	241-190	Jan. 3, 2019
H.R. 266, *Department of the Interior, Environment, and Related Agencies Appropriations Act, 2019*	$78.349 million (+$1 million (1.29%))	240-179	Jan. 11, 2019
H.R. 648, (2nd) *Consolidated Appropriations Act, 2019*	$79.000 million (+$1.651 million (2.13%))	234-180	Jan. 23, 2019

Supplemental Disaster Appropriations for the NIEHS Worker Training Program

On January 16, 2019, the House of Representatives passed by a vote of 237-187, H.R. 268, the *Supplemental Appropriations Act, 2019*, which is pending in the Senate. On January 24, 2019, the Senate voted to invoke "cloture" or end debate on an amendment to the House-passed bill. That motion failed to receive the number of votes required—60 votes—for debate to end. The vote on the motion was 52-44. The pending bill would provide $12.1 billion in FY2019 to several Federal departments and agencies for expenses related to the consequences of recent wildfires, hurricanes, volcanos, earthquakes, typhoons, and other natural disasters in several states and territories. The bill includes $1 million, to remain available until expended, for the NIEHS Worker Training Program to address debris management and mold remediation that resulted from hurricane and flooding events in 2018 and provide personal protective equipment and informational materials to affected residents and communities. The funding that would be provided by this bill is designated as emergency spending, which is exempt from discretionary spending limits and other budget enforcement rules. It is unlikely further action on this legislation will occur until agreement is reached on the outstanding regular FY2019 appropriations bills, including the homeland security appropriations bill.

FY2020 Appropriations Cycle

Owing to the incompleteness of the FY2019 appropriations process, transmittal of the President's FY2020 budget request—to include the NIH Congressional Budget Justifications (CJs)—to Congress may be delayed beyond February. As of this writing, no hearings of the House and Senate Appropriations Subcommittees to consider the FY2020 budget requests have been scheduled. Each year the NIH Director—accompanied by select Institute and Center Directors—is traditionally invited to testify on the NIH budget request before both the House and Senate Labor, Health and Human Services, Education, and Related Agencies Subcommittees. In recent years, Statements for the Record from the NIEHS Director and all other Institute and Center Directors have been submitted to supplement the hearing testimony and CJs.

NON-APPROPRIATIONS CONGRESSIONAL HEARINGS AND BRIEFINGS

Senate Hearing About Per- and Polyfluoroalkyl Substances (PFAS) (Sept. 26, 2018)

On September 28, 2018, Dr. Birnbaum testified at a hearing held by the Subcommittee on Federal Spending Oversight and Emergency Management of the Senate Committee on Homeland Security and Governmental Affairs. The hearing was entitled, "*The Federal Role in the Toxic PFAS Chemical Crisis*." Dr. Birnbaum joined representatives from the Environmental Protection Agency (EPA), the Department of Defense (DOD), and the U.S. Government Accountability Office (GAO) on the first of two witness panels. The second panel included three representatives from communities concerned about PFAS exposures—Pease, New Hampshire; Oscoda-Wurtsmith AFB, Michigan; and the International Association of Fire Fighters. During the hearing Dr. Birnbaum fielded approximately eight questions about research investigating health effects that may be associated with PFAS exposures and answered another six questions on this subject for the record following the hearing. Eight Senators attended this hearing; they were:

- Sen. Rand Paul of Kentucky, Subcommittee Chairman;
- Sen. Gary Peters of Michigan, Subcommittee Ranking Minority Member;
- Sen. Clare McCaskill of Missouri, full Committee Ranking Minority Member;
- Sen. Thomas Carper of Delaware;
- Sen. Kamala Harris of California;
- Sen. Doug Jones of Alabama;
- Sen. Margaret Woods Hassan of New Hampshire; and
- Sen. Jeanne Shaheen of New Hampshire.

Dr. Birnbaum's written testimony from this hearing is available on the Committee's website at this link.

Friends of NIEHS Briefing on Children's Health (Oct. 10, 2018)

On October 10, 2018, the Friends of NIEHS held an informational briefing for Congressional staff about NIEHS research relating to child health. The briefing was entitled, "*A Healthy Start for Every Child: How the Environment Influences Health and Development*." Dr. Margaret Karagas of Dartmouth College and Dr. Rebecca Fry from the University of North Carolina, Chapel Hill joined Dr. Birnbaum as the speakers at this briefing. Dr. Birnbaum provided an overview of the NIEHS mission and the NIEHS children's environmental health research programs. Dr. Karagas presented information about the Dartmouth

Children's Environmental Health and Disease Prevention Research Center, and the breadth of different contaminants and exposures of national relevance to children in the United States. Dr. Fry discussed the issue of toxic metals in private drinking water wells, and health effects associated with a range of metals including arsenic and cadmium. Following the presentations, the speakers fielded several questions from attendees. Roughly 70 people representing at least 30 different organizations and Congressional offices attended this briefing.

116TH CONGRESS (2019-2020)

The 116th Congress convened on January 3, 2019, and consists of 102 newly-elected Representatives and 10 new Senators, five of which previously served in the House of Representatives and two which served as Governors. The Democrats are in the Majority in the House of Representatives, and the Republicans are in the Majority in the Senate.

Committee Leadership

The following table outlines the chairmen and ranking members of the House and Senate committees and subcommittees in the 116th Congress with jurisdiction over NIEHS authorities and programs:

House Appropriations Committee	**Senate Appropriations Committee**
Chairwoman: Nita Lowey (NY) *Ranking Member:* Kay Granger (TX)	*Chairman:* Richard C. Shelby (AL) *Vice Chairman:* Patrick J. Leahy (VT)
House Labor, HHS, Education and Related Agencies Appropriations Subcommittee	**Senate Labor, HHS, Education and Related Agencies Appropriations Subcommittee**
Chairwoman: Rosa L. DeLauro (CT) *Ranking Member:* Tom Cole (OK)	*Chairman:* Roy Blunt (WA) *Ranking Member:* Patty Murray (WA)
House Interior, Environment and Related Agencies Appropriations Subcommittee	**Senate Interior, Environment and Related Agencies Appropriations Subcommittee**
Chairwoman: Betty McCollum (MN) *Ranking Member:* David Joyce (OH)	*Chairman:* Lisa Murkowski (AK) *Ranking Member:* Tom Udall (NM)
House Energy and Commerce (E&C) Committee	**Senate Health, Education, Labor and Pensions (HELP) Committee**
Chairman: Frank Pallone, Jr. (NJ) *Ranking Member:* Greg Walden (OR)	*Chairman:* Lamar Alexander (TN) *Ranking Member:* Patty Murray (WA)
House E&C Subcommittee on Health	**Senate Environment and Public Works (EPW) Committee**
Chairwoman: Anna G. Eshoo (CA) *Ranking Member:* Michael C. Burgess (TX)	*Chairman:* John Barrasso (WY) *Ranking Member:* Thomas R. Carper (DE)

House E&C Subcommittee on Environment and Climate Change	Senate EPW Superfund, Waste Management, and Regulatory Oversight Subcommittee
Chairman: Paul D. Tonko (NY) *Ranking Member:* John Shimkus (IL)	*Chairman:* TBA. *Ranking Member:* TBA.

Physicians and Scientists in Congress

There are 35 physicians and scientists serving in the 116th Congress. The breakdown of this group is as follows:

Occupation/Training	Chamber
18 physicians	2 Senate, 16 House
5 dentists	House
3 nurses	House
3 veterinarians	House
2 psychologists	House
2 physical scientists	House
1 optometrist	Senate
1 pharmacist	House

NIEHS-relevant legislation: The Federal Accountability in Chemical Testing Act (FACT Act)

To date, only one non-appropriations bill in the 116th Congress that directly pertains to NIEHS has been introduced. It is H.R. 249, the "*Federal Accountability in Chemical Testing Act*" or the "*FACT Act*." It was reintroduced by Rep. Ken Calvert of California, Rep. Dina Titus of Nevada, and Rep. Vern Buchanan of Florida on January 4, 2019. The bill would require the biennial reports of the Congressionally-mandated Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM)—a permanent committee of NIEHS managed by the Division of the National Toxicology Program—to include a description of the progress on the development, validation, acceptance, and utilization of alternative test methods (including animal use data by species, number, and test type) for toxicological testing conducted, supported, or required by each of the 16 ICCVAM-participating Federal agencies during the reporting period. This bill was H.R. 816 in the 115th Congress and had 70 bipartisan cosponsors—50 Democrats and 20 Republicans. The bill has been referred to the House Committee on Energy and Commerce.

Science Advances

One NIEHS (NIEHS authors' groups in parens)

- ***Leucine-Rich Repeats and Calponin Homology containing 4 regulates the innate immune response.*** *Aloor JJ [DIR], KM Azzam [DIR], JJ Guardiola [DIR], KM Gowdy [DIR], JH Madenspacher [DIR], KA Gabor [DIR], GA Mueller [DIR], WC Lin [DIR], JM Lowe [DIR], A Gruzdev [DIR], MW Henderson [DIR], DW Draper [DIR], BA Merrick [NTP] and MB Fessler [DIR]. J. Biol. Chem. (2018).* https://doi.org/10.1074/jbc.RA118.004300
  SP Theme 1: Goal 1

- ***Associations between longitudinal serum perfluoroalkyl substance (PFAS) levels and measures of thyroid hormone, kidney function, and body mass index in the Fernald Community Cohort.*** *Blake BE [NTP], Pinney SM, Hines EP, Fenton SE [NTP], Ferguson KK [DIR]. Environ Pollut. (2018).* https://www.ncbi.nlm.nih.gov/pubmed/30373035
  SP Theme 1: Goal 1, 2

- ***Screening for Developmental Neurotoxicity at the National Toxicology Program: The Future is Here.*** Behl M, K Ryan [NTP], JH Hsieh, F Parham [NTP], AJ Shapiro [NTP], BJ Collins [NTP], NS Sipes [NTP], LS Birnbaum [OD], JR Bucher [NTP], PMD Foster [NTP], NJ Walker [NTP], RS Paules [NTP] and RR Tice. *Toxicological Sciences (2018).* https://doi.org/10.1093/toxsci/kfy278
  SP Theme 1: Goal 6, 7

DNTP

- ***Toxicology and carcinogenesis studies in Hsd:Sprague Dawley SD rats exposed to whole-body radio frequency radiation at a frequency (900 MHz) and modulations (GSM and CDMA) used by cell phones.*** *National Toxicology Program. TR 595. 2018.* https://ntp.niehs.nih.gov/ntp/htdocs/lt_rpts/tr595_508.pdf
  SP Theme 1: Goal 1; Theme 2: Goal 5

- ***Toxicology and carcinogenesis studies in B6C3F1/N mice exposed to whole-body radio frequency radiation at a frequency (1,900 MHz) and modulations (GSM and CDMA) used by cell phones.*** *National Toxicology Program. TR 596. 2018.* https://ntp.niehs.nih.gov/ntp/htdocs/lt_rpts/tr596_508.pdf
  SP Theme 1: Goal 1; Theme 2: Goal 5

- ***The CLARITY-BPA Core Study: A perinatal and chronic extended-dose-range study of bisphenol A in rats.*** *National Toxicology Program. RR 9. 2018.* https://ntp.niehs.nih.gov/ntp/results/pubs/rr/reports/rr09_508.pdf
  SP Theme 1: Goal 1; Theme 2: Goal 5

DIR

- ***Breast Cancer Risk After Recent Childbirth: A Pooled Analysis of 15 Prospective Studies.*** *Nichols HB, MJ Schoemaker, J Cai, J Xu, LB Wright, MN Brook, ME Jones, HO Adami, L Baglietto, KA Bertrand, WJ Blot, MC Boutron-Ruault, M Dorronsoro, L Dossus, AH Eliassen, GG Giles, IT Gram, SE Hankinson, J Hoffman-Bolton, R Kaaks, TJ Key, CM Kitahara, SC Larsson, M Linet, MA Merritt, RL Milne, V Pala, JR Palmer, PH Peeters, E Riboli, M Sund, RM Tamimi, A Tjonneland, A Trichopoulou, G Ursin, L Vatten, K Visvanathan, E Weiderpass, A Wolk, W Zheng, CR Weinberg (DIR), AJ Swerdlow and DP Sandler (DIR). Annals of Internal Medicine (2018).* https://doi.org/10.7326/m18-1323
  SP Theme 1: Goal 1, 2; Theme 2: Goal 1; Theme 3: Goal 3

- ***Epigenome-wide Meta-analysis of DNA Methylation and Childhood Asthma.*** *Reese SE (DIR), CJ Xu, HT den Dekker, MK Lee (DIR), S Sikdar (DIR), C Ruiz-Arenas, SK Merid, FI Rezwan, CM Page, V Ullemar, PE Melton, SS Oh, IV Yang, K Burrows, C Soderhall, DD Jima, L Gao, R Arathimos, LK Kupers, M Wielscher, P Rzehak, J Lahti, C Laprise, AM Madore, J Ward (DIR), BD Bennett (DIR), T Wang (DIR), DA Bell (DIR), JM Vonk, SE Haberg, S Zhao (DIR), R Karlsson, E Hollams, D Hu, AJ Richards, A Bergstrom, GC Sharp, JF Felix, M Bustamante, O Gruzieva, RL Maguire, F Gilliland, N Baiz, EA Nohr, E Corpeleijn, S Sebert, W Karmaus, V Grote, E Kajantie, MC Magnus, AK Ortqvist, C Eng, AH Liu, I Kull, VWV Jaddoe, J Sunyer, J Kere, C Hoyo, I Annesi-Maesano, SH Arshad, B Koletzko, B Brunekreef, EB Binder, K Raikkonen, E Reischl, JW Holloway, MR Jarvelin, H Snieder, N Kazmi, CV Breton, SK Murphy, G Pershagen, JM Anto, CL Relton, DA Schwartz, EG Burchard, RC Huang, W Nystad, C Almqvist, AJ Henderson, E Melen, L Duijts, GH Koppelman and SJ London (DIR). The Journal of allergy and clinical immunology (2018).*
  http://dx.doi.org/10.1016/j.jaci.2018.11.043
  SP Theme 1: Goal 2; Theme 2: Goal 1; Theme 3: Goal 3

- ***Cholestenoic Acid is a Prognostic Biomarker in Acute Respiratory Distress Syndrome.*** *Madenspacher JH (DIR), RD Stapleton, BT Suratt, AE Dixon, FB Lih (DIR), JM Lowe (DIR), KJ Mould, WJ Janssen, ED Morrell, MM Wurfel, S Garantziotis (DIR), KB Tomer (DIR) and MB Fessler (DIR). J Allergy Clin Immunol (2018).*
  http://dx.doi.org/10.1016/j.jaci.2018.09.017
  SP Theme 1: Goal 2; Theme 2: Goal 3

- ***Multiethnic meta-analysis identifies ancestry-specific and cross-ancestry loci for pulmonary function.*** *Wyss AB (DIR), T Sofer, MK Lee (DIR), N Terzikhan, JN Nguyen, L Lahousse, JC Latourelle, AV Smith, TM Bartz, MF Feitosa, W Gao, TS Ahluwalia, W Tang, C Oldmeadow, Q Duan, K de Jong, MK Wojczynski, XQ Wang, R Noordam, FP Hartwig, VE Jackson, T Wang (DIR), M Obeidat, BD Hobbs, T Huan, H Gui, MM Parker, D Hu, LS Mogil, G Kichaev, J Jin, M Graff, TB Harris, R Kalhan, SR Heckbert, L Paternoster, KM Burkart, Y Liu, EG Holliday, JG Wilson, JM Vonk, JL Sanders, RG Barr, R de Mutsert, AMB Menezes, HHH Adams, M van den Berge, R Joehanes, AM Levin, J Liberto, LJ Launer, AC Morrison, CM Sitlani, JC Celedon, SB Kritchevsky, RJ Scott, K Christensen, JI Rotter, TN Bonten, FC Wehrmeister, Y Bosse, S Xiao, S Oh, N Franceschini, JA Brody, RC Kaplan, K Lohman, M McEvoy, MA Province, FR Rosendaal, KD Taylor, DC Nickle, LK Williams, EG Burchard, HE Wheeler, DD Sin, V Gudnason, KE North, M Fornage, BM Psaty, RH Myers, G O'Connor, T Hansen, CC Laurie, PA Cassano, J Sung, WJ Kim, JR Attia, L Lange, HM Boezen, B Thyagarajan, SS Rich, DO Mook-Kanamori, BL Horta, AG Uitterlinden, HK Im, MH Cho, GG Brusselle, SA Gharib, J Dupuis, A Manichaikul and SJ London (DIR). Nat Commun (2018) v. 9 (1).*
  http://dx.doi.org/10.1038/s41467-018-05369-0
  SP Theme 1: Goal 2, 7; Theme 2: Goal 1; Theme 3: Goal 3

- ***SOX17 regulates uterine epithelial-stromal cross-talk acting via a distal enhancer upstream of Ihh.*** *Wang X (DIR), X Li, T Wang (DIR), SP Wu (DIR), JW Jeong, TH Kim, SL Young, BA Lessey, RB Lanz, JP Lydon and FJ DeMayo (DIR). Nature Comm (2018) v. 9 (1).* http://dx.doi.org/10.1038/s41467-018-06652-w
  SP Theme 1: Goal 1

- ***Pol mu dGTP mismatch insertion opposite T coupled with ligation reveals promutagenic DNA repair intermediate.*** *Caglayan M (DIR) and SH Wilson (DIR). Nat Commun (2018) v. 9 (1).* http://dx.doi.org/10.1038/s41467-018-06700-5
  SP Theme 1: Goal 1

- ***Genetic identification of a population of noradrenergic neurons implicated in attenuation of stress-related responses.*** *Chen YW (DIR), M Das, EA Oyarzabal, Q Cheng (DIR), NW Plummer (DIR), KG Smith (DIR), GK Jones (DIR), D Malawsky (DIR), JL Yakel (DIR), YI Shih and P Jensen (DIR). Mol Psychiatry (2018).* http://dx.doi.org/10.1038/s41380-018-0245-8
  SP Theme 1: Goal 1

- ***Revealing a human p53 universe.*** *Nguyen TT (DIR), SA Grimm (DIR), PR Bushel (DIR), J Li (DIR), Y Li (DIR), BD Bennett (DIR), CA Lavender (DIR), JM Ward (DIR), DC Fargo (DIR), CW Anderson (DIR), L Li (DIR), MA Resnick (DIR) and D Menendez (DIR). Nucleic Acids Res (2018).* http://dx.doi.org/10.1093/nar/gky720
  SP Theme 1: Goal 1; Theme 2: Goal 1

- ***Single-molecule DREEM imaging reveals DNA wrapping around human mitochondrial single-stranded DNA binding protein.*** *Kaur P, MJ Longley (DIR), H Pan, H Wang and WC Copeland (DIR). Nucleic Acids Res (2018).* http://dx.doi.org/10.1093/nar/gky875
  SP Theme 1: Goal 1

- ***TRPM7 and CaV3.2 channels mediate Ca(2+) influx required for egg activation at fertilization.*** *Bernhardt ML (DIR), P Stein (DIR), I Carvacho, C Krapp, G Ardestani, A Mehregan, DM Umbach (DIR), MS Bartolomei, RA Fissore and CJ Williams (DIR). Proc Natl Acad Sci (2018).* https://doi.org/10.1073/pnas.1810422115
  SP Theme 1: Goal 1

DERT

- ***Impact of in vitro heavy metal exposure on pancreatic beta cell function.*** *Dover EN, Patel NY, Styblo M. Toxicol Lett 299:137−144.* https://www.ncbi.nlm.nih.gov/pubmed/30300733
  SP Theme 1: Goal 1, 5

- ***Association of phthalates, parabens and phenols found in personal care products with pubertal timing in girls and boys.*** *Harley KG, Berger KP, Kogut K, Parra K, Lustig RH, Greenspan LC, Calafat AM, Ye X, Eskenazi B. Hum Reprod 34(1):109–117.*
  https://www.ncbi.nlm.nih.gov/pubmed/30517665
  SP Theme 1: Goal 2; Theme 2: Goal 4

- ***Signaling events downstream of AHR activation that contribute to toxic responses: the functional role of an AHR-dependent long noncoding RNA (slincR) using the zebrafish model.*** *Garcia GR, Shankar P, Dunham CL, Garcia A, La Du JK, Truong L, Tilton SC, Tanguay RL. Environ Health Perspect 126(11):117002.*
  https://www.ncbi.nlm.nih.gov/pubmed/30398377
  SP Theme 1: Goal 1

- ***Dentine biomarkers of prenatal and early childhood exposure to manganese, zinc and lead and childhood behavior.*** *Horton MK, Hsu L, Claus Henn B, Margolis A, Austin C, Svensson K, Schnaas L, Gennings C, Hu H, Wright R, Rojo MMT, Arora M. Environ Int 121(Pt 1):148—158.*
  https://www.ncbi.nlm.nih.gov/pubmed/30205321
  SP Theme 1: Goal 2, 5

- ***The impact of heat and impaired kidney function on productivity of Guatemalan sugarcane workers.*** *Dally M, Butler-Dawson J, Krisher L, Monaghan A, Weitzenkamp D, Sorensen C, Johnson RJ, Carlton EJ, Asensio C, Tenney L, Newman LS. PLoS One 13(10):e0205181.*
  https://www.ncbi.nlm.nih.gov/pubmed/30289894
  SP Theme 1: Goal 5

- ***Prenatal fluoride exposure and attention deficit hyperactivity disorder (ADHD) symptoms in children at 6-12 years of age in Mexico City.*** *Bashash M, Marchand M, Hu H, Till C, Martinez-Mier EA, Sanchez BN, Basu N, Peterson KE, Green R, Schnaas L, Mercado-Garcia A, Hernandez-Avila M, Tellez-Rojo MM. Environ Int 121(Pt 1):658–666.*
  https://www.ncbi.nlm.nih.gov/pubmed/30316181
  SP Theme 1: Goal 2, 5

- ***Metformin targets mitochondrial electron transport to reduce air pollution-induced thrombosis.*** *Soberanes S, Misharin AV, Jairaman A, Morales-Nebreda L, McQuattie-Pimentel AC, Cho T, Hamanaka RB, Meliton AY, Walter JM, Chen CI, Chi M, Chiu S, Gonzalez-Gonzalez FJ, Antalek M, Adbala-Valencia H, Chiarella SE, Sun KA, Woods PS, Ghio AJ, Jain M, Perlman H, Ridge KM, Morimoto RI, Sznajder JI, Balch WE, Bhorade SM, Bharat A, Prakriya M, Chandel NS, Mutlu GM, Budinger GRS. Cell Metab 29:1–13.*
  https://www.ncbi.nlm.nih.gov/pubmed/30318339
  SP Theme 1: Goal 1

- ***Intrauterine multi-metal exposure is associated with reduced fetal growth through modulation of the placental gene network.*** *Deyssenroth MA, Gennings C, Liu SH, Peng S, Hao K, Lambertini L, Jackson BP, Karagas MR, Marsit CJ, Chen J. Environ Int 120:373–381.* https://www.ncbi.nlm.nih.gov/pubmed/30125854
  SP Theme 1: Goal 2, 5

NIEHS News and Highlights

Staff Updates

- ***Michael Fessler, M.D.*** was appointed as Chief of the Immunity, Inflammation and Disease Laboratory in December
- ***Alison Motsinger-Reif, Ph.D.,*** was appointed as Chief of the Biostatistics and Computational Biology Branch in December
- ***Alexandra White, Ph.D.,*** has started as a Tenure Track Investigator in the Epidemiology Branch.

Spotlight on NIEHS: Cohort Studies

NIEHS -Supported Cohort Studies

Cohort studies are one of the fundamental designs for epidemiological research. Cohorts are large, observational population studies in which a group of people with a particular set of characteristics is followed over time, and their exposures compared to a similar non-exposed group. Cohort studies take large amounts of resources to develop, implement, and maintain. Significant funds are invested in training personnel and developing infrastructure to recruit, track, collect, and analyze data. Epidemiological studies also inherently take a long time, sometimes as much as 9-10 years, to see results from the initial investment. It is the factor of time that makes cohort studies so powerful for the study of environmental exposures whose effects may not be immediate. Cohort studies allow us to follow populations over time, which enables us to discover how early life exposures may impact health later in life. Different cohorts of people with similar characteristics also may be pooled for more robust results. The extended follow-up time, combined with the number of study subjects included in most cohort studies, allows for robust data analysis. The results of these studies are interpreted as associations that may inform healthier lifestyle choices and new or updated regulations of environmental agents and exposures. The nature of cohort studies also allows researchers to observe how risk factors might be associated with health outcomes without purposely exposing research participants to potentially harmful substances.

Extramural Cohorts

The NIEHS Division of Extramural Research and Training (DERT) has supported the development, study, and/or maintenance of 72 environmental epidemiology studies. These include cohort studies, cross-sectional studies, and case-control studies. In FY17 and FY18, NIEHS supported 48 environmental

epidemiology studies through 125 grants or projects. The studies ranged in size from 84 to 35,000 subjects. The study populations include pregnant women and their offspring, children, adults, and men and women of reproductive age. A variety of environmental factors, such as air pollutants, metals, endocrine disrupting chemicals, pesticides, nutrition/diet, stress, and fluorinated chemicals have been studied as they relate to health outcomes such as cancer; metabolic syndrome; immune, respiratory, and neurological disease; reproductive issues; and developmental effects.

The Epidemiology Resources website provides a list of NIEHS-funded epidemiology resources. This online tool organizes and shares information to help the public learn about the environmental epidemiology studies that NIEHS funds, as well as to maximize the substantial investment NIEHS has made in these studies by facilitating new collaborations and ancillary studies within the environmental health research community.

Some of the extramural NIEHS-funded cohort studies that are providing insight on how early life exposure contribute to disease later in life include:

The Environment and Reproductive Health (EARTH) Study is designed to determine the developmental and reproductive toxicity of phthalates and phenols in couples from a fertility clinic. Men and women were recruited at preconception and followed through treatment cycles for infertility and through pregnancy until delivery. Associations between environmental exposures and markers of male fertility and female fertility and pregnancy outcomes were investigated. Dr. Russ Hauser at Harvard University is leading the study. As of June 2017, 799 women and 487 men had enrolled in the study. Men and women are eligible to enroll separately or as a couple. Exposures include bisphenol A (BPA), polybrominated diphenyl ethers (PBDEs), phthalates, and other endocrine disrupting chemicals (EDCs). To date, over 100 manuscripts using data from the EARTH study have been published on the impact of environmental exposures on female and male fertility, pregnancy outcomes, and perinatal outcomes. In addition, the data has been used by a number of masters, predoctoral and postdoctoral students, and clinical fellows for original manuscripts and dissertations.

The Early Life Exposures in Mexico to Environmental Toxicants (ELEMENT) Study is a group of three sequentially-enrolled, on-going, epidemiologic birth cohort studies in Mexico City with an original aim to investigate the impact of lead on child development. The research aims have since expanded to include a wide range health outcomes and environmental, nutritional, behavioral, genetic, and epigenetic risk factors. Children enrolled in the study were born beginning in 1994 through 2011 and were evaluated every 3-6 months during the first 3 years of life. Study enrollment took place in Mexico City, Mexico and included mother-infant pairs. The exposures studied include heavy metals, fluorinated compounds, air pollution, tobacco smoke, psychosocial stress, and nutrition. As of January 2018, data from the ELEMENT Study has been used in more than 90 published manuscripts; 9 book chapters; over 100 presentation, posters, and abstracts; and over 15 dissertations and theses.

The New Hampshire Birth Cohort is a prospective pregnancy cohort study of mothers who use private, unregulated wells for household water in New Hampshire. The study was designed to evaluate maternal and child health impacts of arsenic and other contaminants. The study has recruited over 1,500 mother-infant pairs (over 3,000 individuals) since 2009. Pregnant women receiving prenatal care at study clinics

in New Hampshire are eligible to enroll in the study if there are between the ages of 18 and 45 and pregnant with singleton infants are eligible to participate. To date, the New Hampshire Birth Cohort has found an association between low levels of arsenic exposure and increases in blood pressure, as well as higher risk of gestational diabetes. Maternal arsenic exposure was also linked to reduced head circumference in and low birthweight in fetuses and newborns.

Intramural Cohort Studies

In addition to the epidemiological studies conducted by extramural researchers, large cohort studies are providing scientists at NIEHS with new investigations and insights. Currently, five cohort studies are being conducted by the Division of Intramural Research (DIR), as well as a number of clinical studies. Past and ongoing cohorts are described at this website. Highlights of some of the currently active studies include:

The Sister Study is a prospective cohort study of 50,000 sisters of women who had breast cancer. The study aims to explore environmental and genetic risk factors for breast cancer and other diseases and to identify potentially preventable risk factors. The study, led by Dr. Dale Sandler and Dr. Clarice Weinberg, enrolled women from all over the United States and Puerto Rico from 2003 to 2009. Studying sisters allows researchers to assess the interplay of genes and environment. Exposures include family history; reproductive characteristics such as parity, hormonal birth control use, and age at first period; and lifestyle factors such as body mass index, tobacco use, and alcohol use. The prospective design allows the assessment of exposures prior to the onset of disease and avoid biases common to retrospective studies. The study—designed to last 10 or more years—also provides a resource to examine a wide range of health outcomes relevant to women and creates a framework from which to test new hypotheses as they emerge.

The Gulf Long-term Follow-up Study (GuLF STUDY) is largest study ever conducted on the potential health effects associated with an oil spill, with nearly 33,000 participants. It is focused on both physical and mental health effects related to the 2010 Deepwater Horizon oil spill. The data that is collected can be used by individuals, communities, and governments to better understand the consequences of oil spills and plan for future disasters. The GuLF STUDY was initiated in June 2010 in response to the April 2010 explosion of the Deepwater Horizon drilling rig and resulting oil spill in the Gulf of Mexico. The oil spill in the Gulf of Mexico differed from previous spill in that the leak was at the ocean floor rather than on the surface. However, the area covered, the proximity to populated communities, the number of potentially exposed workers and community members, and the duration of the spill were far greater than any previously studied oil spills.

Recent Advances

Flame retardants and reproductive health. Evidence from animal studies suggests that exposure to organophosphate flame retardants can disrupt endocrine function and impair embryo development. To test this hypothesis in humans, investigators from the EARTH Study evaluated the association between urinary concentrations of flame retardants and outcomes of *in vitro* fertilization. The investigators recently reported a negative association between the concentration of certain organophosphate flame

retardants and successful fertilization, implantation, pregnancy, and live birth in couples undergoing *in vitro* fertilization. [LINK]

Prenatal fluoride exposure and ADHD. Investigators from the ELEMENT birth cohort study examined the association between prenatal fluoride exposure and symptoms associated with attention-deficit/hyperactivity disorder (ADHD). Two hundred-thirteen mother-child pairs enrolled in the cohort study had available urine samples during pregnancy and child assessments of ADHD-like behaviors at ages 6-12. The investigators found that higher levels of fluoride exposure during pregnancy were associated with more symptoms of inattention, but not hyperactivity, in the offspring. [LINK]

Arsenic in rice. Data suggest that the diet is an important source of arsenic exposure for most of the U.S. population. Arsenic in drinking water is currently regulated by the U.S. Environmental Protection Agency (EPA), but there are no regulations for arsenic levels in food. Because rice is known to contain high levels of arsenic, researchers involved with the New Hampshire Birth Cohort estimated arsenic exposure from rice cereal relative to breast milk or formula in 6-12-month-old infants. They found that arsenic exposure from rice cereal was more than that from formula made with water containing arsenic levels higher than the EPA's maximum contaminant level. This study suggests infants should be fed cereals made with other grains. The investigators were also involved in another study which introduced a framework for short-term interventions to mitigate dietary arsenic exposure until arsenic in food can be regulated. [LINK] [LINK]

BMI and breast cancer risk. There is a known association between increasing body mass index (BMI) and the risk of developing breast cancer. To gain a better understanding of this association, a multi-center analysis using pooled data from almost 800,000 premenopausal women across 19 prospective cohort studies, including The Sister Study, estimated the association of premenopausal breast cancer with BMI. The analysis showed an inverse association between BMI and breast cancer risk in woman ages 18-24. The association was stronger for BMI at ages 45 to 54 years. The results suggest that the association between increased adiposity and reduced risk of premenopausal breast cancer is greater than previously had been shown. [LINK]

Meetings and Events

Past Events

- **Environmental Health in Africa: Opportunities to Expand Research Capacity in the H3Africa Consortium.** This workshop focused on building environmental health research capacity within the Human Heredity and Health in Africa (H3Africa) consortium. The NIEHS-sponsored workshop was held in conjunction with a joint meeting of the H3Africa consortium and the African Society of Human Genetics in Kigali, Rwanda, on September 16, 2018. Kimberly McAllister, Ph.D., program director in the NIEHS Genes, Environment, and Health Branch, and Bonnie Joubert, Ph.D., program director in the NIEHS Population Health Branch, co-organized the workshop. The workshop was designed to provide recommendations for environmental health sciences research and facilitate incorporation of environmental risk factors into existing studies. **Theme 2: Goal 2; Theme 3: Goals 3, 4**

- **Monocyte Activation Test for Pyrogen Testing of Medical Devices**. The PETA International Science Consortium and the National Toxicology Program Interagency Center for the Evaluation of Alternative Toxicological Methods (NICEATM) co-organized a meeting to discuss non-animal approaches for medical device pyrogen testing. The workshop was held in Bethesda, MD, on September 18-19. The workshop focused on the use of the monocyte activation test (MAT) as a standalone release test for medical devices that can replace the use of the Rabbit Pyrogen Test and the Bacterial Endotoxin Test when satisfying biocompatibility and sterility testing requirements. **Theme 1: Goal 6; Theme 2: Goal 1**
- **Environmental Mutagenesis and Genomics Society 49th Annual Meeting.** NIEHS was a diamond sponsor of this meeting, held in San Antonio, TX on September 22-26. The meeting featured the theme of "Maintaining Genomic Integrity in the Face of Environmental Insult." It featured 15 symposia on topics such as fetal effects of lead in pregnancy; chromosome positioning and DNA repair; genotoxicity and cancer in whales; and, controversies and challenges in risk assessment. **Theme 1: Goals 1, 2, 4**
- **Circulating Cell Free DNA: Applications in the Clinical and Toxicology Setting.** This workshop, sponsored by the NIEHS Inflammation Faculty, was held at NIEHS on September 24-25. The workshop was organized into three major sessions over one and a half days: technical isolation and features of ccfDNA, clinical applications using ccfDNA, and experimental and environmental applications. The workshop brought together experts investigating ccfDNA in the clinical and toxicology disciplines to share lessons learned and provide direction for a liquid biopsy tool to be utilized in environmental health science. **Theme 1: Goal 1; Theme 2: Goal 3; Theme 3: Goal 3**
- **Triangle Global Health Consortium Annual Meeting**. Over 300 global health professionals and students gathered at North Carolina State University in Raleigh on September 27, for this conference, the theme of which was "Looking Toward the Future: Innovation for Global Health Impact." The NIEHS was a platinum sponsor of the conference and staff across NIEHS divisions helped to organize and participated in the event. **Theme 2: Goals 2, 6; Theme 3: Goals 3, 4**
- **North Carolina Society of Toxicology Fall Meeting.** This conference, held on the U.S. Environmental Protection Agency (EPA) campus on October 15, featured talks on populations that are especially sensitive to toxicants. The program, organized by the NCSOT Executive Council, which includes many NIEHS staff, featured speakers, a poster session, and awards. **Theme 1: Goals 2, 4; Theme 2: Goals 4, 5**
- **Implementing Non-Animal Approaches to Human and Veterinary Vaccine Testing: Achieving Scientific and Regulatory Success for Rabies and Beyond.** Warren Casey, Ph.D., director of NTP Interagency Center for the Evaluation of Alternative Toxicological Methods (NICEATM), co-chaired the scientific committee for this meeting, held in Bethesda, MD on October 16-17. The event was co-organized by the International Alliance for Biological Standardization (IABS) and NICEATM. The workshop brought together scientific and regulatory leaders to develop recommendations to advance alternative methods for human and veterinary rabies vaccine testing. Additional sessions spotlighted state-of-the-science animal alternative for other antigens and future possibilities for advancing animal reduction and replacement initiatives. **Theme 1: Goals 1, 6; Theme 2: Goal 3; Theme 3: Goal 5**

- **Artificial Intelligence in Environmental Health Science and Decision-Making Summit**. The summit brought together environmental health scientists and experts in artificial intelligence and big-data science at the NC Biotech Center in Durham October 18-19 to identify and prioritize environmental health research questions that could be investigated with artificial intelligence. Several NIEHS scientists attended the summit, as well as serving on the planning committee and presenting. **Theme 1: Goal 7; Theme 2: Goals 1, 2**
- **Annual Meeting of NIEHS/EPA Children's Environmental Health Centers.** Raising the Visibility of the Science was the theme that guided the meeting held Oct. 22-23 at NIEHS. The partnership between Kimberly Gray, Ph.D., from NIEHS, and Nica Louie, from the U.S. Environmental Protection Agency (EPA), was praised by Gwen Collman, Ph.D., director of the NIEHS Division of Extramural Research. Center members shared research findings and strategies for community engagement in various focus areas, such as the effects of early life exposure on growth and development, and how changes in genetic programming may alter risk for obesity. **Theme 1: Goals 1, 5; Theme 2: Goals 2, 3; Theme 3: Goal 3**
- **Fall 2018 WTP Awardee Meeting and Workshop.** Enthusiastic participants engaged in large and small group dialogues about the state of opioid-related hazards in the workplace at the meeting held Oct. 24-25 at NIEHS. Organizers included sessions on treatment and recovery, intervention strategies and risk awareness, education for workers, public health measures, and better opportunities for paid time off after injury. Presenters stressed the importance of mental health resiliency and eliminating the stigma associated with misuse. **Theme 2: Goals 2, 3, 5; Theme 3: Goals 1, 3**
- **NIEHS Science Days.** Science days was held Nov. 1-2 at NIEHS, and featured 13 science talks by trainees, 89 posters, and the Mentor of the Year award. Day two featured an awards ceremony as well as a grants workshop. In 2018, Assistant Scientific Director Hans Luecke, Ph.D., took over the event from Special Assistant Joel Abramowitz, Ph.D., who organized the first 15 years of Science Days. The event is an important part of the NIEHS culture. This year, the steering committee worked to focus the proceedings exclusively on trainees. **Theme 2: Goal 2; Theme 3: Goals 1, 2, 5**
- **New Approaches for Characterizing Mitochondrial Signaling in Response to Environmental Stress Grantee Meeting.** This one-day meeting was hosted at NIEHS on November 7. The conference helped to disseminate information from the grantees' research developing new approaches for characterizing mitochondria-cell signaling, encouraged collaborations between the investigators and with intramural scientists, and helped to develop strategies to ensure wider adoption of these novel methods among environmental health science researchers. **Theme 1: Goals 1, 2; Theme 2: Goal 1; Theme 3: Goal 3**
- **North Carolina Genetics and Environmental Mutagenesis Society Fall Meeting.** The day-long meeting, held Nov. 7 at the North Carolina Biotechnology Center, focused on elements that regulate how genes are turned off and on. The meeting kicked off with a talk on the effects of air pollution on cells, given by Shaun McCullough, Ph.D., from the U.S. Environmental Protection Agency Environmental Public Health Division. McCullough underscored the importance of his research with a startling statistic from the World Health Organization (WHO). NTP's Janine

Santos, Ph.D., discussed her work on rotenone and health impacts. Lead organizer and GEMS President-elect Carol Swartz, D.V.M., Ph.D., from Integrated Laboratory Systems, Inc., encouraged audience members to attend the poster session and the afternoon talks by early-career scientists. The final talk, on the impact of tobacco smoke exposure on the epigenome, was by NIEHS postdoctoral fellow Suzanne Martos, Ph.D., from the Environmental Epigenomics and Disease Group. She described the methods she uses the characterize smoking-related changes in immune cells. **Theme 1: Goals 1, 5; Theme 2: Goal 3; Theme 3: Goal 3**

- **Anacostia Community Forum**. For the latest in a series of community forums, Linda Birnbaum, Ph.D., director of NIEHS and the National Toxicology Program, visited southeast Washington, D.C. The forum series, now in its twentieth year, has brought NIEHS directors face-to-face with community members across the nation so they can listen to concerns firsthand. The focus of the forum was the Environment and Breast Cancer: Transforming Data into Action Community Forum, and it was held on November 8. Dozens of community members attended the public forum, which was hosted by the Georgetown Lombardi Comprehensive Cancer Center. As with other NIEHS community forums, most of the 90-minute meeting was reserved for the audience to voice concerns and ask questions on a wide variety of topics related to breast cancer. In the end, the event was as much about building community as it was about providing answers. **Theme 2: Goals 2, 4, 5, 6**
- **13th Breast Cancer and the Environment Research Program (BCERP) Annual Meeting**. The meeting, hosted by Georgetown University in Washington, D.C. on November 8-9, coincided with the Anacostia Community Forum. It brought together a multidisciplinary network of community partners, breast cancer advocates, epidemiologists, clinicians, communications researchers, and basic scientists to examine the effects of environmental exposures that may predispose a woman to breast cancer throughout her life. The two-day event featured celebrated speakers, sessions on environmental exposures and breast cancer, a training workshop, and research posters. In addition to those from NIEHS and NCI, experts from academic and community organizations across the United States attended the meeting. **Theme 1: Goal 5; Theme 2: Goals 2, 5, 6; Theme 3: Goal 3**
- **APHA Annual Meeting and Expo – Creating the Healthiest Nation: Health Equity Now.** More than 12,000 attendees gathered for the meeting at the San Diego Convention Center in San Diego on November 10-14. As in years past, representatives from NIEHS were among the presenters highlighting environmental health, and occupational health and safety. The meeting, which kicked off Nov. 10, is the largest annual gathering of public health professionals. They convened to discuss new research and best practices in the field of public health. This year's theme highlighted the importance of social justice and equity in achieving national public health goals. Aubrey Miller, M.D., senior medical advisor at NIEHS, spoke at a session titled "Empowering and Involving Academia, Public Health, and At-Risk Communities in Vital Health and Exposure Research after Environmental Disasters." Chip Hughes, director of the NIEHS Worker Training Program (WTP), shared community needs and worker training efforts in Puerto Rico after Hurricane Maria. Shoji Nakayama, M.D., Ph.D., described the evolving Japan DR2 Program, in partnership with NIEHS, and their response to the devastating tsunami that struck

Fukushima. John Balbus, M.D., senior advisor for public health at NIEHS, spoke on a federal agency panel about NIEHS activities to address environmental health equity. **Theme 2: Goals 2, 3, 4, 5, 6; Theme 3: Goal 3**

- **2018 Hans L. Falk Memorial Lecture.** As the invited speaker for the lecture, Margaret McCarthy, Ph.D., professor and chair of the Department of Pharmacology at the University of Maryland School of Medicine, talked about the discoveries she and her research group are making related to the cellular mechanisms behind sex differences in brain development. Deputy Chief of the NIEHS Neurobiology Laboratory Serena Dudek, Ph.D., hosted the Nov. 13 seminar at NIEHS. The Falk lecture series was established in 1986 as a way to feature scientists who have made distinguished contributions to research related to environmental health sciences. The series honors one of the first scientific staff members to join NIEHS, the late Hans L. Falk, Ph.D. **Theme 1: Goal 1, 2, 4**
- **SOT Contemporary Concepts in Toxicology Conference: Future Tox IV Predictive Developmental and Reproductive Toxicology for Health Children.** This meeting focused on bringing together basic, clinical, and regulatory scientists to bridge the translation from historical approaches to Tox21 implementation relative to risk assessment and regulatory decision-making for matter pertaining to developmental health, lifestage progression, and the human reproductive cycle. The meeting was held in Arlington, VA November 14-16. Nicole Kleinstreuer and Thad Schug served on the organizing committee. Linda Birnbaum, director of NIEHS and NTP, served on the executive committee. NIEHS was a platinum level sponsor of the event. **Theme 1: Goals 1, 6; Theme 2: Goal 1**
- **Annual Superfund Research Program (SRP) meeting.** This meeting was held Nov. 28-30 in Sacramento, California and emphasized innovative research to promote environmental health, particularly research driven by early-stage investigators and trainees. The meeting was hosted by SRP centers at the University of California (UC) Davis, UC Berkeley, and UC San Diego. At a program for Research Translation and Community Engagement Cores, SRP grantees discussed culturally appropriate methods for addressing tribal needs and communicating risk with tribes and on affected tribal land. Scientific sessions featured talks by graduate students and postdoctoral researchers. Among them were nine talks by KC Donnelly Externship Award Winners, including seven of the 2017 Winners. Training opportunities in big data, nonacademic career opportunities, and academic survival skills were also presented. **Theme 2: Goals 2, 4, 6; Theme 3: Goals 1, 3**
- **Annual Partnerships for Environmental Public Health (PEPH) meeting.** Nearly 150 researchers, communicators, and public health professionals gathered at the meeting held Dec. 13-14 at NIEHS. The meeting's focus, Reporting Back Research Results, reflected a critical need to ensure that individuals and communities that are part of a research study have access to their data and information on what it means for their health. A variety of presenters shared their perspectives on the roles and expectations of partners in reporting back. **Theme 2: Goals 2, 3, 6; Theme 3: Goal 3**
- **Toward Understanding the Interplay of Environmental Stressors, Infectious Disease, and Human Health Workshop.** John Balbus served on the organizing committee of the workshop,

convened by the Standing Committee on the Use of Emerging Science for Environmental Health Decisions held in Washington, D.C. January 15-16. Dr. Linda Birnbaum, director of NIEHS and NTP, gave a talk entitled "The Impacts of Environmental Exposures on Infectious Diseases." This workshop brought together infectious disease, global public health, toxicology, environmental epidemiology, and science policy experts to explore the growing body of research on the links between environmental stressors, infectious disease, and human health. The workshop featured presentations, panel discussions, and breakout sessions to engage scientists and decision makers in this important, cross-disciplinary issue. Many NIEHS grantees and NAEHS Council members also served as moderators, panelists, and speakers during the workshop. **Theme 1: Goal 5; Theme 2: Goals 1, 3; Theme 3: Goal 3**

- **Triangle Global Health Career Day.** This event was held at NIEHS on February 1. The event, organized by the Triangle Global Heal Consortium, provided attendees with the opportunity to speak one-on-one with representatives from global health organizations to learn more about their work, hiring practices, and current opportunities. The day's activities also included skill-building sessions, time for networking with local leaders in global health, and information and advice on entering into the field. **Theme 3: Goals 1, 2, 4**
- **28th Annual Triangle Consortium for Reproductive Biology (TCRB) Meeting.** This meeting was held at NIEHS on February 9. The TCRB meeting brought together regional scientists who conduct basic, translational, and clinical research in reproduction, and male and female reproductive tract development and disease. Principal investigators, postdoctoral fellows, and graduate and undergraduate students attended from area universities and institutions. **Theme 1: Goal 1; Theme 3, Goal 1**
- **4th International Conference on One Medicine One Science (iCOMOS).** NIEHS sponsored an interactive session at the meeting in Chiang Mai, Thailand February 11-14. The session, coordinated by Kimberly Thigpen Tart and Aubrey Miller, explored One Medicine One Science (OMOS) issues related to disasters and public health emergencies and described the Disaster Research Response (DR2) framework developed by the U.S. National Institute of Environmental Health Sciences and National Library of Medicine to support and facilitate critical research in the aftermath of such events. The workshop included presentations, case studies, and discussion of the landscape of environmental health issues presented by natural and man-made disasters and public health emergencies, priority areas, and development of potential solutions. **Theme 2: Goals 1, 5; Theme 3: Goals 3, 4**

Upcoming Events

- **DR2 Tucson Workshop,** Tucson AZ, February 28-March 1
- **The Promise of Single Cell and Single Molecule Analysis Tools to Advance Environmental Health Research,** Washington DC, March 7-8
- **58th Annual SOT Meeting and ToxExpo,** Baltimore MD, March 10-14
- **Challenges in Initiating and Conducting Long-Term Health Monitoring of Populations Following Nuclear and Radiological Emergencies in the United States: A Workshop,** Washington DC, March 12-13

- **3rd International Workshop on Chronic Kidney Disease of unknown origin (CKDu) in Mesoamerica and other regions,** San Jose, Costa Rica, March 20-22
- **Evidence on Integration in Chemical Assessments: Challenges Faced in Developing and Communicating Human Health Effect Conclusions,** Washington DC, March 28-29
- **5th Annual Women's Health Awareness Day,** Durham NC, April 6
- **NIEHS Career Symposium,** RTP, April 26
- **Converging on Cancer**, Washington DC, April 29-30
- **Emerging Advances in Artificial Intelligence for Environmental Health Research and Decisions,** Washington DC, June 6-7
- **STP 38th Annual Symposium: Environmental Toxicologic Pathology and One Health,** Raleigh NC, June 22-27
- **The Fidelity of DNA Replication: From Basic Mechanism to Disease**, RTP, August 29-30

Awards and Recognition

NIEHS

- **Federal Energy and Water Management Awards -** The Federal Energy and Water Management Awards recognize individuals, groups, and agencies for their outstanding contributions in the areas of energy efficiency, water conservation, and the use of advanced and renewable energy technologies at federal facilities.
    - National Institute of Environmental Health Sciences (NIEHS) **(Amanda Askins, Debi Del Corral, Kyle Stancil, and Victor Thompson)** NIH and NIEHS completed construction of the Department's first net-zero energy facility, designed to generate enough solar photovoltaic power generation to more than offset total energy consumption on an annual basis—cutting costs, conserving energy resources, and improving the sites security and resilience. It is on pace to meet Leadership in Energy and Environmental Design Platinum certification through the U.S. Green Building Council.
- **Lisa Rider, M.D.,** Deputy Chief and Staff Clinician, Environmental Autoimmunity Group, was honored by the Myositis Association (TMA) for 15 years of significant impact on myositis research. On its silver anniversary, TMA established the 25th Anniversary Research Award for Outstanding Contributions to Myositis Research, honoring scientists with 5, 15, and 25 years of impact in the field.
- The United States Green Building Council (USGBC) has given its highest honor to our Institute's newest building. **Building 110** was awarded LEED Platinum certification, the highest-level recognition for evaluating overall sustainability. The building has proven to operate as a NZE by generating 38% more energy than it used during the first year of occupancy. With the Leadership in Energy and Environmental Design (LEED) Platinum certification, it has now been awarded the highest-level recognition by the most widely-recognized system for evaluating overall sustainability.
- **Chandra Jackson, Ph.D.,** head of the NIEHS Social and Environmental Determinants of Health Equity research group, was named a JPB Environmental Health Fellow by Harvard University's T.H. Chan School of Public Health. Fifteen winners of the highly competitive fellowship were

announced Oct. 1. Over a three-year period, these fellows will receive up to $240,000 each, as well as mentoring and training in methods, new technologies, leadership, and scientific communication. Jackson will be affiliated with both NIEHS and Harvard during the fellowship. The fellowship program recognizes promising junior faculty who are committed to developing solutions and supporting policy changes that address environmental, social, and economic health disparities in the United States.

- **Joyce Goldstein, Ph.D.**, a National Institutes of Health Scientist Emeritus, was awarded the 2018 North American Scientific Achievement Award by the International Society of the Study of Xenobiotics (ISSX) in Honor of Ronald W. Estabrook, recognizing her major scientific contributions to the field of xenobiotics, or substances foreign to the body. Joyce A. Goldstein, Ph.D., heads the Human Metabolism Group and holds a secondary appointment in the NIEHS Epigenetics and Stem Cell Biology Laboratory.
- **Kathy Laber, D.V.M.,** head of the NIEHS Comparative Medicine Branch (CMB), received the Joseph J. Garvey Management Award Oct. 28 from the American Association for Laboratory Animal Science (AALAS), at the group's annual meeting in Baltimore. The Joseph J. Garvey Management Award recognizes outstanding accomplishments in administration, management, or support of programs related to the care, quality, or humane treatment of animals used in biomedical research. Garvey was the first executive secretary of AALAS, and the award in his name was first presented in 1984.
- **William Suk, Ph.D.,** Director of the NIEHS Superfund Research Program (SRP), departed in mid-December for a six-month stay in Thailand, thanks to a coveted Fulbright U.S. Scholar Program award, sponsored by the U.S. State Department. Suk will serve as a Fulbright lecturer in international and public health in collaboration with Mahidol University and its Chulabhorn Research Institute (CRI), both in Bangkok. The grant will allow him to pursue a broad environmental health agenda in the region.
- **2018 Science Days Awards**
    - **Best Poster Presentations**
        - **Gregory Whitehead**, biologist in the Immunity, Inflammation, and Disease Laboratory (IIDL) — "Airway Neutrophils Attenuate Adaptive Immune Responses through a TGF-dependent Mechanism."
        - **Ru Pin Chi, Ph.D.**, Intramural Research Training Award (IRTA) fellow in the Reproductive and Developmental Biology Laboratory (RDBL) — "Wnk1 in the Uterus: Elucidating Functions in Morphology and Pregnancy Using a Mouse Model."
        - **Fei Zhao, Ph.D.**, visiting fellow in RDBL — "Unexpected Contribution of the Male Tract Mesenchyme to the Female Reproductive Tract."
        - **Chitrangda Srivastava, Ph.D.**, visiting fellow in IIDL — "GLIS3: An Essential Player in Polycystic Kidney Disease."
        - **Irina Evsyukova, Ph.D.**, research fellow in the Neurobiology Laboratory — "Sex-specific Effects of Locus Coeruleus Norepinephrine Loss on Hippocampus-dependent Learning."

        - **Melissa Wells, Ph.D.**, biologist in the Signal Transduction Laboratory — "From Yeast to Human: The Conservation of an RNA Binding Domain."
        - **Alexander Foo, Ph.D.**, visiting fellow in the Genome Integrity and Structural Biology Laboratory — "Influence of Hydrophobic Cargo Binding on the Structure, Stability, and Allergenicity of the Cockroach Allergen Bla g 1."
        - **Payel Sil, Ph.D.**, IRTA fellow in IIDL — "The Role of LC3-associated Phagocytosis in T Cell-mediated Contact Dermatitis."
        - **Barbara Nicol, Ph.D.**, visiting fellow in RDBL — "RUNX1 and FOXL2 Play Complementary Roles in Maintaining Fetal Granulosa Cell Identity in the Mouse Ovary."
        - **Brian Elgart**, postbaccalaureate fellow in the Molecular Genomics Core — "Purification of Plasma Circulating Cell-free DNA and Development of Molecular Assays for Clinical and Toxicology Studies."
    - **Best Oral Presentation**
        - **Monica Pillon, Ph.D.,** visiting fellow in the Signal Transduction Laboratory — "Structure of the Essential Multi-Enzyme RNA Processing Complex Grc3/Las1 Reveals the Molecular Basis for Catalysis."
    - **Mentor of the Year**
        - **Kelly Ferguson, Ph.D., M.P.H**., Epidemiology Branch
    - **Fellow of the Year**
        - **Monica Pillon, Ph.D.,** Signal Transduction Laboratory
- **Bevin Blake**, predoctoral fellow in the Reproductive Endocrinology Group in DNTP was awarded the 2019 UNC Grad School Impact Award
- **Natalie Saini, Ph.D.,** and **Dmitry Gordenin**, **Ph.D.,** in the NIEHS Mechanisms of Genome Dynamics Group, led by Gordenin, co-authored a review article that was awarded the Editor's Choice Award from the journal Environmental and Molecular Mutagenesis. The article, titled "Somatic Mutation Load and Spectra: A Record of DNA Damage and Repair in Healthy Human Cells," is featured on the cover of the journal's October 2018 issue
- **Symielle Gaston, Ph.D.,** is one of five recipients of the 2019 William G. Coleman Jr., Ph.D., Minority Health and Health Disparities Research Innovation Award. This program, run by the National Institute on Minority Health and Health Disparities, provides one year of support for potentially high-impact projects by NIH researchers. Gaston works with Chandra Jackson, Ph.D., who leads the NIEHS Social and Environmental Determinants of Health Equity Group. Her project is titled "Identification and Characterization of Environmental Factors Contributing to Disparities in Sleep Health and Cardiometabolic Dysfunction."
- **Nicole Kleinstreuer, Ph.D.,** NICEATM Deputy Director, received the 2019 SOT Achievement Award. This award is presented to an SOT member who, within 15 years since obtaining their highest degree, has made significant contributions to toxicology. Kleinstreuer's research focuses on mathematical and computational modeling of biological systems and perturbations that result in adverse health outcomes. She has made key contributions to strategies that combine in

vitro high throughput assay data with computational models to predict the likelihood of toxicity. She also represents the National Institute of Environmental Health Sciences (NIEHS) on ICCVAM.

Grantees/Others

- **2018 NIH Director's awards for High-Risk, High-Reward Research program:** The NIH Director's New Innovator Award, established in 2007, supports unusually innovative research from early career investigators who are within 10 years of their final degree or clinical residency and have not yet received a research project grant or equivalent NIH grant.
    - **Justin Kim, Ph.D.,** Assistant Professor in the Department of Cancer Biology at Dana-Farber Cancer Institute and the Department of Biological Chemistry and Molecular Pharmacology at Harvard Medical School, aims to develop new chemical technologies for discovering and modulating protein-protein interactions.
    - **Po-Ru Loh, Ph.D.,** Assistant Professor of Medicine in the Division of Genetics and Center for Data Sciences at Brigham and Women's Hospital and Harvard Medical School and Associate Member of the Broad Institute, will develop and apply new bioinformatics and statistical methods to a phenomenon known as somatic mosaicism.
    - **Prashant Mishra, M.D., Ph.D.,** Assistant Professor of Pediatrics at the University of Texas Southwestern Medical Center, will address a critical need in the study of mitochondrial diseases.
- **Teresa K. Woodruff, Ph.D.,** vice chair for research in the department of obstetrics and gynecology at Northwestern University Feinberg School of Medicine, has been elected to the National Academy of Medicine, an independent organization of professionals from the fields of health and medicine and natural, social, and behavioral sciences. Being elected to the academy is considered one of the highest honors in the fields of health and medicine and recognizes individuals who have demonstrated outstanding professional achievements and commitment to service.
- **Cheryl Lyn Walker, Ph.D.,** Baylor College of Medicine, Center for Precision Environmental Health, was awarded the ACT Distinguished Scientist in Toxicology Award. This award recognizes an individual who has made outstanding contributions to toxicology and improvement of public health and/or the environment. The DSA winner becomes the keynote speaker at the Awards Ceremony and Luncheon during the Annual Meeting.
- **Stephanie Kim** of Boston University (BU) was announced as the 21st recipient of the annual Karen Wetterhahn Memorial Award. The announcement was made Nov. 29, during the SRP Annual Meeting in Sacramento, California. Kim was recognized for her research on the effects of exposure to contaminants on cells and molecular pathways that lead to metabolic disorders such as obesity and diabetes. She is pursuing a doctoral degree under the guidance of BU SRP Center researchers Jennifer Schlezinger, Ph.D., and Stefano Monti, Ph.D. This annual SRP award recognizes an outstanding trainee who demonstrates the qualities of scientific excellence exhibited by Karen Wetterhahn, Ph.D. An expert in the mechanisms of metal toxicity, Wetterhahn founded the Dartmouth SRP Center program in 1995 and served as the center director for its first two years.

- **SOT Awards**
    - **Cheryl Lyn Walker, Ph.D.,** Baylor College of Medicine – Distinguished Toxicology Scholar award by the Society of Toxicology. This award recognizes an SOT member who has made substantial and seminal scientific contributions to the understanding of the science of toxicology and is actively involved in toxicological research.
    - **Oliver Hankinson, Ph.D.,** University of California-Los Angeles – Education Award. This award recognizes an individual who is distinguished by the teaching and training of toxicologists and who has made significant contributions to education in the broad field of toxicology.
    - **Sven E. Jordt, Ph.D.,** Duke University Medical Center - Leading Edge in Basic Science Award. This award recognizes a scientist who, based on his/her research, has made a recent (within the last five years), seminal scientific contribution/advance to understanding fundamental mechanisms of toxicity. The recipient should be a respected basic scientist whose research findings are likely to have a pervasive impact on the field of toxicology.
    - **Stephen H. Safe, Ph.D.,** Texas A&M University – Merit Award. This award recognizes an SOT member who has made distinguished contributions to toxicology throughout an entire career in areas such as research, teaching, regulatory activities, consulting, and service to the Society.
    - **Wade H. Powell, Ph.D.,** Kenyon College – Daniel and Patricia Acosta Undergraduate Educator Award. This award, sponsored by the SOT Endowment, recognizes an SOT member who is distinguished by outstanding contributions to the teaching of undergraduate students in toxicology and toxicology-related areas and whose efforts support SOT's strategic efforts to "Build for the Future of Toxicology." In 2019, the award's name honors Daniel and Patricia Acosta in recognition of their contributions to the SOT Endowment Fund and their attainment of Paracelsus Circle Visionary status.