

NIH director Dr. Francis Collins presides over the 119th meeting of the advisory committee to the director.

BOLD RECOMMENDATIONS ADDRESS PEOPLE, POLICY

ACD Aims to Change Research Culture, Inside and Out

BY CARLA GARNETT

If the convening of the 119th advisory committee to the NIH director (ACD) forecast the direction the agency is headed, then NIH is truly moving boldly into the future. Considering a host of issues from A—artificial intelligence, to Z—zoology (well, research using animals), NIH is determined to identify and support not only the brightest scientific minds, but also the most ethical medical science in the world. And NIH is determined to address anything—including workplace bias, harassment or foreign influence—that might present a barrier to those goals.

As usual, NIH’s biannual meeting with its most august set of advisors packed the day and a half with both the stimulating and the sticky. How can NIH ensure its IT

infrastructure is robust enough to keep pace with exponential data growth and the impact of AI? How do NIH researchers collaborate with scientists from other countries without compromising domestic resources?

“When you think about the number of topics that we’ve asked [the ACD] to wrestle with, it’s breathtaking,” NIH director Dr. Francis Collins told his advisors. “We range [across] deep questions about science—the ACD having been the author of the BRAIN Initiative, of Precision Medicine and All of Us, and now a whole new plan in artificial intelligence. But then on top of that, we hand you really hard questions about our workforce in terms of diversity, how to be sure we’re supporting the next generation of

SEE ACD, PAGE 6

PATIENT-SCIENTISTS

Couple Turns Hand of Fate into Hand of Hope

BY RICH MCMANUS



Drs. Sonia Vallabh and Eric Minikel

It turns out that not only can you tag-team a Wednesday Afternoon Lecture, but also you can tag-team a complete change of careers and an almost heroic attempt—via basic research—to thwart the timebomb ticking in a teammate’s genes—if you’ve got the right teammate.

There may not have been a more emotional presentation in series history than

SEE CAREER CHANGE, PAGE 4

Tisdale Explores Multiple Avenues Toward Curing SCD

BY DANA TALESNIK



Dr. John Tisdale

It’s a brutal, life-threatening condition. People living with sickle cell disease (SCD) endure chronic, debilitating pain. This inherited blood disorder has a cure, though it’s not widely available, a predicament that has inspired

NIH investigators to pursue novel treatments that would be more accessible, particularly in parts of the world where the disease is most prevalent.

SEE TISDALE, PAGE 8



CFC ends with fun competition. See story, p. 12.

ALSO THIS ISSUE

Briefs	2
NIDA Director Volkow Explains the Complex Brain Disease Known as Addiction	3
NINR Director’s Lecture Tackles Infection Control Research	5
Digest	9
Vanderbilt’s Denny Takes Reins as CEO of All of Us Research Program	10
Seen	12

NIDA Releases Key Findings of 2019 Teen Drug Use Survey

On Dec. 18, the National Institute on Drug Abuse released the key findings of the 45th annual Monitoring the Future (MTF) survey. More than 42,500 students from nearly 400 public and private schools across the country participated in 2019's MTF survey of drug use and attitudes among American 8th, 10th and 12th graders.



The survey showed that past-month marijuana vaping among 12th graders nearly doubled in a single year—the second largest one-year jump ever tracked for any substance in the history of the study. (The largest was from 2017 to 2018, with past-month nicotine vaping among 12th graders.) It also showed that marijuana continues to be the most commonly used illicit drug by adolescents. After remaining mostly stable for many years, daily marijuana use went up significantly since 2018 among 8th and 10th graders.

The encouraging news of the MTF survey is that the self-reported use of alcohol, cigarettes and many illicit drugs remains at historically low levels and misuse of prescription opioids has continued to decline as well.

The MTF survey, funded by NIDA, is conducted by researchers at the University of Michigan. For more information on the 2019 MTF survey, visit <https://www.drugabuse.gov/related-topics/trends-statistics/monitoring-future>.

ORWH Updates Online 'Inclusion Outreach' Toolkit

ORWH recently launched a revised Inclusion Outreach Toolkit to help researchers recruit and



Welcome



For New Principal Investigators

Explore NIH's Women's Inclusion History and Resources

Quick Links for Returning Principal Investigators



retain women participants in their clinical studies. Inclusion of diverse study populations is integral to the missions of ORWH, NIH and the entire biomedical research enterprise. Inclusion



Gates Foundation Consults with NIH on Global Health

Global health was on the menu at the Bill & Melinda Gates Foundation (BMGF)-NIH 6th annual consultative workshop held Dec. 19-20 on campus. Above, at a reception and dinner held at the Cloisters on the night before the workshop, NIH director Dr. Francis Collins entertains on guitar, accompanied by (unseen) pianist Dr. Chris Karp, director of global health discovery and translational sciences at BMGF. At right, Collins chats with Adm. Brett Giroir (l), HHS assistant secretary for health, and NIAID director Dr. Anthony Fauci prior to the workshop. Serving as panelists at the workshop were (below, from l) incoming BMGF CEO Dr. Mark Suzman, Giroir, Collins, Karp and Fauci.

PHOTOS: CHIA-CHI CHARLIE CHANG



ensures that the distribution of study participants by sex, gender, race, ethnicity and age reflects the population needed to accomplish the scientific goals of the clinical study.

The new version of the ORWH Inclusion Outreach Toolkit includes information on the history of inclusion at NIH, current policies, case studies and testimonials, regulations, checklists, seminars

and other resources. The information will help principal investigators and their research teams to fulfill their responsibilities for including women in clinical research.

You can explore the toolkit's resources at <https://orwh.od.nih.gov/toolkit>.

Addiction Is a Complex Brain Disease, Says Volkow

BY ERIC BOCK

Advances in medical imaging have revealed that addiction is a complex disease of the brain, said NIDA director Dr. Nora Volkow.

“By understanding how addiction affects different neuronal processes, we can gather insights that give us a better understanding of why the behaviors of people who are addicted are so disruptive to their lives and frequently that of others,” said

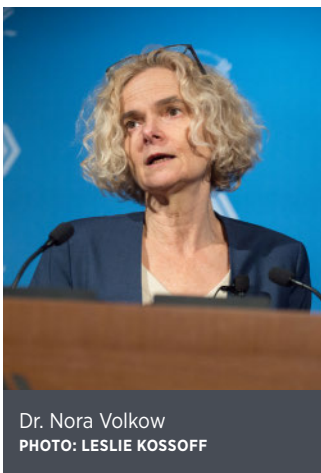
Volkow at the Clinical Center’s Contemporary Clinical Medicine: Great Teachers Grand Rounds Lecture held recently in Lipsett Amphitheater.

What nearly every abused drug that results in addiction—whether it be cocaine, alcohol,

opioids or nicotine—has in common is not only that they activate the reward circuit of the brain but also that their repeated use modifies the function of the prefrontal cortex. The prefrontal cortex, which is necessary to exert self-regulation and to assign saliency value to stimuli in the environment, doesn’t develop fully until the mid-twenties. The prefrontal cortex, in coordination with the reward circuit, fuels behaviors “that are indispensable for survival.” If a person is hungry, procuring food becomes a salient motivating behavior and eating is experienced as rewarding. Normally, people stop thinking about food once they’ve eaten and food loses its incentive value, which is assigned by the ventral component of the prefrontal cortex (orbitofrontal cortex).

Addiction, however, changes how the prefrontal cortex assigns incentive values to behaviors associated with drug-taking, fixating them. Volkow noted that people who are addicted cannot degrade the intense motivation to take the drug once they have consumed it, which results in compulsive drug-taking behavior. People with addictions often report they can no longer control their behavior, even when taking the drug is no longer pleasurable.

Most drug experimentation occurs before people reach their mid-twenties. Volkow said this reflects the normal development of the human brain. When people are younger, they are learning about the world and experimenting with different things. For many, this might include experimenting with drugs. During this time, adolescents’ brains are



Dr. Nora Volkow
PHOTO: LESLIE KOSSOFF

rapidly developing and their experiences, including drug-taking, influence some of these developmental changes.

Marijuana, for example, interferes with the endogenous cannabinoid system. Cannabinoids are neurotransmitters that play an important role in nervous system function and in brain development. The consequences of altering a developing brain’s endogenous cannabinoid system during brain development aren’t well-studied but are believed to contribute to future susceptibility to substance use disorders.

In the U.S., the majority of adolescents are exposed to alcohol, about half are exposed to marijuana and another 30 percent are exposed to vaping devices at least once in their lives, she reported.

During childhood and adolescence, the brain is “particularly sensitive to deprivation, social stressors and the effects of drugs,” Volkow said. The environment people grow up in, if adverse, can make them more likely to become addicted to drugs as they transition to adulthood. If the environment is supportive, it can provide them with resilience and protect them against addiction. This explains why adverse environments during childhood and adolescence increase the odds of many diseases and other negative outcomes. Social deprivation, for instance, is one of the worst things that can happen to brain development in children.

“Maximizing that understanding provides us an opportunity to intervene with those children who have been brought up in adverse conditions and to tailor prevention interventions,” Volkow said.

• • •

“If we want to prevent people from taking drugs, we have to ensure that there are social support systems that provide them with opportunities to grow and develop.”

-DR. NORA VOLKOW

• • •

She said researchers are trying to understand why some people exposed to drugs become addicted and others do not.

“There are people [whose genetic susceptibility is] so powerful [that it] can overpower resilient environments, making them liable to addiction,” Volkow said. “There are environments that are so stressful and adverse that [they] can make people vulnerable to become addicted, even though they don’t have the genetic [susceptibility].”

While all drugs activate the dopamine reward neurocircuitry, which in turn modulates the

prefrontal cortex, they also have very distinct effects on the brain. Understanding how drugs affect the brain gives researchers the opportunity to develop general as well as drug-specific treatments, Volkow said.

Right now, medications are the most effective treatments for addiction to opioids, nicotine and alcohol. Even though medicine-based treatments work, Volkow said their use is not widespread. The public and medical institutions still see addiction as a choice, rather than a disease.

“If we want to prevent people from taking drugs, we have to ensure that there are social support systems that provide them with opportunities to grow and develop,” Volkow concluded. “If we want to get people to go and stay in treatment and to recover, we need to integrate them into meaningful social environments that respect and accept them. If we don’t, they’ll relapse.” **R**



ON THE COVER: *Repurposing and Robots.* The National Center for Advancing Translational Research supports repurposing approved drugs for new therapeutic uses, a strategy that can accelerate translation from bench to bedside.

IMAGE: NCATS

The NIH Record

Since 1949, the *NIH Record* has been published biweekly by the Editorial Operations Branch, Office of Communications and Public Liaison, National Institutes of Health, Department of Health and Human Services. For editorial policies, email editor or phone (301) 496-2125.

Editor: Rich McManus
Rich.McManus@nih.gov

Associate Editor: Carla Garnett
Carla.Garnett@nih.gov

Staff Writers:
Eric Bock • Eric.Bock@nih.gov
Dana Talesnik • Dana.Talesnik@nih.gov

Subscribe via email: listserv@list.nih.gov Follow: <http://nihrecord.nih.gov/>



The *NIH Record* is recyclable as mixed paper.

NIH National Institutes of Health
Turning Discovery Into Health

Career Change

CONTINUED FROM PAGE 1

the one given recently by husband-and-wife team Dr. Sonia Vallabh and Dr. Eric Minikel, concerning Vallabh's diagnosis as a carrier of a gene that puts her at high risk of suffering the disease that rapidly killed her mother in the prime of life.

Two years after they got married in August 2009, Vallabh, a Harvard-trained lawyer, and Minikel, an urban planner who had been a Chinese major as an undergrad, learned that Vallabh carried the gene for fatal familial insomnia, the prion disease that took her mother at age 52.

Their wedding had been the last time Vallabh had publicly enjoyed the mother—"who was a force behind the event"—she always knew. "It was the last family event for which she was healthy." By February 2010, her mom's vision began blurring and she was losing weight. By March, she was unable to finish a sentence. By June, she was on a feeding tube. She died in December.

Nonetheless, "she lasted twice as long as the median survival time" for people with her diagnosis, Minikel said.

"She had no diagnosis during her lifetime, only at autopsy," said Vallabh.

"It was a horrible bombshell for us as we awaited" results of Vallabh's genetic testing, she said. "It was a 50-50 risk for me. Most people choose to walk away and not get tested. I was advised to walk away from it.

"We realized immediately that we really needed to know," she explained. "We couldn't go back to the time when we didn't know [I was at risk]. The only path available was forward."

In 2011, Vallabh learned that the mutant variant she bore within her genes put her at more than 90 percent risk of prion disease.

"It usually occurs at midlife and is always fatal," she said, describing the disease course. "You are healthy for decades and then there's an amazingly steep downhill. Most patients die within a year of diagnosis."

The couple had little scientific background, so they Googled "prion." Thus began "a pretty engrossing quest that we would be shadowed by for the rest of our lives."

They began taking night classes in science.

"I left my job within months of my diagnosis," said Vallabh. "I became a lab tech at Massachusetts General Hospital, starting out on the bottom rung of a scientific career.

"Our initial goal was to become savvy consumers of scientific information," she said. "We needed to know, ourselves, about any new developments or trials, and be proactive."

In 2014, they enrolled at Harvard Medical School to pursue Ph.D.s, despite being advised against it.

"We found mentors at Broad [Institute of MIT and Harvard] right away," said Vallabh.

They also had confidence in their strategy of learning not just about the science of prion disease, but also about the regulatory environment they would need to negotiate in order to run trials, validate biomarkers, recruit patients and advance therapies.

"We were interested in building a motivated cohort of people in my position—at-risk children of a deceased parent," she explained.

Presently, Vallabh observes, "We realize that while we are very far from the end of this quest, we are also very far from the beginning."

"The first thing we needed to know was 'What is it and what are we going to do about it?'" said Minikel, taking over the narrative from his wife.

Prion disease is fairly rare, resulting in about one of every 5,000 deaths in the U.S., he reported. Fifteen percent of cases have a genetic cause and 85 percent arise sporadically.

"What are we up against with Sonia's mutation?" they wanted to know. While all

mutations are risk factors rather than the cause of prion disease, said Minikel, "Sonia is among those [whose mutation] almost always results in disease—about 90 percent of the time."

Nonetheless, Vallabh used the word "lucky" repeatedly:

- All prion diseases work the same way, by misfolding proteins in a way that harms neurons; if you can lower the amount of abnormal protein, you have a chance at limiting or blocking the disease. There is both a good model of the disease—the mouse—and some promising therapies in ASOs—antisense oligonucleotides. "We are lucky to have a target we know is essential to the disease, and is also pretty much dispensable for normal life," Vallabh said.

- The FDA has been receptive to their strategy, which mimics the path trodden by HIV therapy: reduce prion-related protein (PrP) with ASOs against PrP RNA, then measure PrP levels in cerebrospinal fluid. "[The FDA] has enthusiasm for the need for prevention, and enthusiasm for the need for a plan, but it has to be data-dependent," Vallabh said.

- A large pharmaceutical company has given thumbs-up to their approach and is offering "a serious investment," said Minikel. He also noted the benefit of laying groundwork in academia, where there were no concerns about data confidentiality.

- Their mentor at Harvard, Dr. Stuart





Asked what the most difficult part of switching careers was for him and his wife, Minikel began, “So many different moments to choose from...”

Schreiber, allowed them to cut to the chase in their Ph.D. work (they both earned doctorates last year), focusing on prion disease. “We’d be 5 years behind where we are right now if we had hesitated [to get Ph.D.s],” Minikel said.

- Their first clinical research study was over-enrolled within 2 days with volunteers who are at risk of genetic prion disease. They also have more than 200 people enrolled in their registry.


- Studies in animals indicate that prevention may be possible in both the genetic and sporadic forms of prion disease, if therapy can begin early enough, before symptoms arise. “This is not a totally inactionable disease,” said Minikel.

Perhaps their greatest piece of luck was unearthed during the Q&A, when they were asked about the most difficult part of switching careers.

Minikel was funny: “So many different moments to choose from...” he began.

Vallabh arrived at the heart of what made their pivots possible: “It’s by having a teammate. I couldn’t do this alone.”

The auditorium erupted in applause.

The full talk is available at <https://videocast.nih.gov/summary.asp?Live=35113&bhcp=1>. 

Stone Discusses Infection Control Research

BY JO-ANN KRIEBEL

Dr. Patricia Stone recently presented the final NINR Director’s Lecture of 2019. In her talk “Informing Health Policy Through Science to Improve Healthcare for Older Adults,” she discussed the trajectory of her research career in health outcomes with a focus on infection control among older adults.

“I was convinced that nursing mattered in quality outcomes,” said Stone, describing her motivation to pursue a research career after more than 15 years in clinical nursing, including working as an adult nurse practitioner.

She began her research in infection prevention following the publication of the National Academies’ (then the Institute of Medicine) report *To Err Is Human: Building a Safer Health System* on preventable medical errors.

According to the report, every year nearly 100,000 patient deaths were linked to or caused by preventable errors. Issues such as severe nursing shortages, an aging workforce, increased demand for services and poor working conditions resulted in difficulty recruiting and retaining qualified nurses, which in turn contributed to these errors.

In her first RO1 research grant, Stone examined the relationship between nurses’ working conditions and Magnet hospital certification. She discovered that increased nurse staffing was related to patient safety outcomes, or more plainly, “What’s safe for the patient and safe for the nurse is also good for the system.”

Following this first study, Stone continued her infection prevention research, including exploring the impact of mandatory reporting of hospital-acquired infections and qualitative research on practices in infection-control departments.

She then began studying infection control in nursing homes, including the integration of infection control and palliative care at end of life, as well as infection control in home health care.

Stone noted the policy implications of her work, which has influenced federally mandated reporting of hospital infections and CMS final rule 483, which requires nursing homes to employ a specialist in infection prevention.

She encouraged those interested in research to start small, ask important questions, learn from mistakes and build upon successes. Most importantly, she emphasized the need for researchers to always be thinking about how their results will affect patient outcomes.

Stone is the Centennial professor in health policy at Columbia University School of Nursing. Her lecture is available at https://www.youtube.com/watch?v=5-r6M4HpqQI&feature=emb_logo.

DIRECTOR’S
LECTURE



Dr. Patricia Stone

PHOTO: MARLEEN VAN DEN NESTE

ACD

CONTINUED FROM PAGE 1

researchers in the best possible way...and then some really thorny policy issues like conversations on sexual harassment. And you seem really capable of wrapping your arms around all of those things and always providing just the right kind of insight we need.”

In his director’s report, Collins summarized the previous 6 months worth of research advances, VIP visits to NIH and senior staff changes, including a new chief executive officer for All of Us, Dr. Joshua Denny (see story on p. 10).

Leading the first day’s docket was an interim report from the ACD working group established in June 2019 to look at ways to enhance rigor and reproducibility in animal research. NIH principal deputy director Dr. Lawrence Tabak, who cochairs the group, presented.

“Often animal studies serve as a foundation for human clinical trials, so there is an inherent cost when reproducibility and/or translatability fail,” he said, framing the group’s charge to identify areas where research rigor could be strengthened.

A Focus on Institutions

NIH chief officer for scientific workforce diversity Dr. Hannah Valentine, who co-chairs the ACD working group on diversity, gave a 3-part update—implementing 2018 recommendations, highlighting the NIH Distinguished Scholars Program and outlining 2019 recommendations from June’s NIH Advancing Diversity Programs Conference (ADPC).

“We’d all realized that prior efforts had been focused on the individual,” Valentine said. “And while those were important—especially for building the pipeline—and need to continue, they are necessary but not sufficient. The time has come to focus on the institution—creating institutional culture change.”

Making diversity/inclusion strategies integral components of senior-level performance plans, rewarding innovators in those areas and developing metrics and templates were among ideas that saw significant progress since 2018, she said.

The ADPC recommended replicating and sharing programs that have strong evidence of effectiveness and looking into grant applications/renewals as ways to incentivize

institutional culture change.

NIH deputy director for extramural research Dr. Michael Lauer presented updates on the Next Generation Researchers Initiative.

He talked about added flexibility for individuals applying for support as early-stage investigators (ESIs). The current definition is 10 years past terminal research degree or from completion of clinical training; recently childbirth—the reason most applicants cite when asking for more time—was added as an automatic 1-year extension.

Lauer also described a new kind of ROI award, named in honor of the late NIAMS director Dr. Stephen Katz, to encourage ESIs to pursue entirely new research directions. Applications for the 5-year funding specifically disallow preliminary data.

In fiscal year 2018, NIH for the first time met its goal of funding at least 1,100 ESIs, with more than 1,280 ES grantees, said Lauer. More than 1,300 ESIs were funded in FY19.

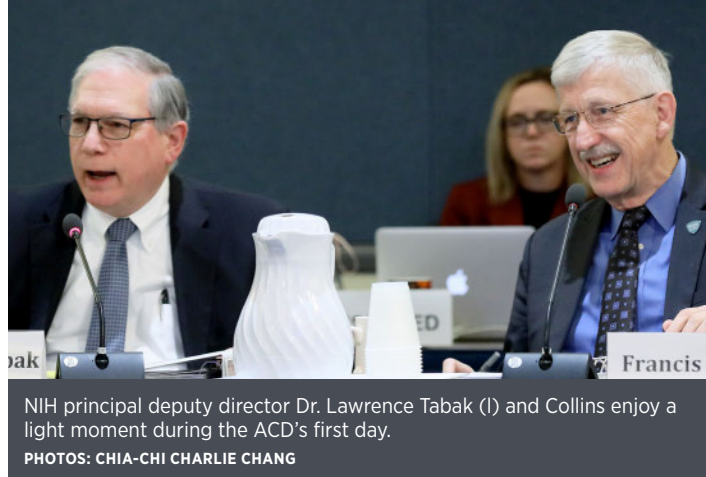
Workplace Climate Conditions

Leading what could potentially set the stage for significant shifts in workplace conditions of research enterprises nationwide, NIH conducted a Workplace Climate and Harassment Survey of its own staff early in 2019. The survey aimed to assess the environment for employees and provide evidence-based data for NIH leadership as well as the ACD working group charged with exploring the issue.

The goals were to measure harassment prevalence at NIH, get a snapshot of the workplace climate, determine its impact on mental and physical health and gain perspectives on reporting harassment. Valentine reported findings from the survey, which asked about all kinds of discriminatory behavior, including unwanted sexual attention, gender harassment and sexual coercion.

Among key findings were:

- 1 in 5 respondents had experienced at least 1 incident of sexual harassment in the past 12 months
- Women who are trainees (fellows and students), younger individuals, sexual and gender minorities and individuals with disabilities are the most vulnerable populations



NIH principal deputy director Dr. Lawrence Tabak (I) and Collins enjoy a light moment during the ACD's first day.

PHOTOS: CHIA-CHI CHARLIE CHANG

experiencing the highest incidence of sexual harassment

- More than half of respondents who experienced harassment did not talk to anyone about it
- Respondents who felt their supervisors were not supportive were more likely to experience harassment and workers who were being bullied were also more likely to experience gender and sexual harassment.

Next steps include release of an executive summary early in 2020, sharing the data with the NIH workforce, deeper analysis of the data and implementation of action plans for key findings.

Collins said he hoped ACD members and other colleagues in science and research would consider adapting the survey instrument for their own institutions, so that NIH could have comparative data about similar organizations. NIH will be releasing the survey, together with a user manual, early in the new year.

Internally, NIH has instituted a broad range of resources to prevent and redress harassment of all types. In 2018, NIH reviewed 232 intramural allegations of harassment; 43 of those were sexual. In 2019 (through November), NIH reviewed 271 allegations; 68 were sexual. NIH has also moved forward to make it possible for individuals at grantee institutions to contact NIH directly about harassment. Externally, in 2018, NIH reviewed 28 incidents; in 2019, 105 inquiries were reviewed at more than 50 institutions.

Report Presented on Changing Culture

The first day’s deliberations ended with the final report of the working group on changing culture to end harassment, presented by the group’s three co-chairs—ACD members Dr. Francis Cuss (ret.) of Bristol-Myers Squibb and Dr. Kristina Johnson of State University of New York and NIH associate director for science policy and acting chief of staff Dr. Carrie Wolinetz.

Four key themes from the report include:



ACD members (from l) Dr. Dina Katabi, Dr. Roy Wilson and Dr. James Hildreth take in the reports.

- Increase transparency and accountability in reporting of professional misconduct, especially sexual harassment
- Establish mechanisms for restorative justice
- Ensure safe, diverse and inclusive research and training environments
- Create system-wide change to ensure that the above occurs.

NIH will continue working with stakeholders to develop best practices for establishing safe, diverse and inclusive research environments. Notably, Wolinetz also co-chairs the subcommittee on safe and inclusive research environments (SIRE) of the National Science and Technology Council's joint committee on research environments. SIRE has representation from several federal departments and agencies and builds on interagency or agency-specific efforts. One committee goal is to coordinate and facilitate sharing of best practices.

"Implementing this much-needed cultural change requires essentially a partnership between NIH, the NIH-funded institutions and other scientific societies," said Cuss. He also noted that his working group felt "an enormous sense of urgency" to provide immediately actionable recommendations.

The report provided detailed recommendations to address each key theme.

For example, to increase transparency and accountability, the report recommended eight measures, including that NIH should:

- Create a parallel process to treat professional misconduct, including sexual harassment, as seriously as research misconduct
- Establish a hotline and web-based form for reporting sexual harassment and inappropriate behavior by any principal investigator or key personnel funded by NIH

- Establish clear and transparent standard operating procedures to respond to reports or findings of professional misconduct, including sexual harassment, or change in PI status in extramurally funded laboratories.

Vigorous discussion ensued. Ultimately the ACD voted to support the recommendations, recognizing that a few of them may require additional legal authorities. NIH will continue to institute the kind of policies and cultural changes advocated by the working group.

"Science thrives in safe, diverse and inclusive research environments," Collins said, in a statement following release of the report to the public, "and sexual harassment goes against the very core of what NIH and the institutions we fund represent. Ensuring a culture where we are maximizing talent at all levels is at the heart of the NIH mission to improve human lives. This report lays out a framework to make that culture a reality."

Collins's full statement and a summary of the group's work are posted online at <https://go.usa.gov/xda3h>.

Sharing, Protecting Resources

On day 2, the group took on 4 topics, 2 involving information technology.

Data science associate director Dr. Susan Gregurick talked about the current state of NIH's IT ecosystem and bold plans for expansion, including leveraging the cloud for biomedical research.

The STRIDES (Science and Technology Research Infrastructure for Discovery, Experimentation and Sustainability) Initiative is enabling NIH enterprise-wide access to the cloud.

"Harmonizing data still presents a challenge and is still a very active area of research," Gregurick said.

Continuing the tech theme, Verily engineering director and ACD member David Glazer gave the final report from the working group on artificial intelligence.

"What can NIH do to maximize the opportunity for AI to make a difference in biomedicine?" he asked, reiterating his group's initial charge.

"We have these two parallel revolutions—generating data and analyzing data," Glazer explained. "We want to have these things not

only working side by side, but also informing and changing each other." The term "ML-BioMed," he said, has been coined as a way to discuss "fusing the biomedicine and machine learning revolutions."

Later in the morning, Lauer returned to discuss the latest on foreign influence on research integrity.

"It's important to keep in mind that we routinely collaborate productively with investigators in foreign countries," he noted. "We rely on productive research collaborations. The individuals we have identified as violating the laws and policies represent a small proportion of scientists working in and with U.S. institutions. We must not reject brilliant minds working honestly and collaboratively to provide hope and healing."

Lauer recalled the specific infractions that raised red flags in August 2018: failure of visiting scientists to disclose substantial foreign resources and financial conflicts of interest, potential diversion of intellectual property and peer review violations.

"It's getting worse," he reported. "We are seeing more, and some of the types of problems we are seeing are even more severe...In nearly all these cases, American institutions are unaware—or have a misleading impression of what [is going on]."

The last topic of the session addressed formulation of an NIH-wide Strategic Plan for 2021-2025. NIH deputy director for program coordination, planning and strategic initiatives Dr. James Anderson outlined rules of engagement for developing the new plan, which will lay out NIH objectives and priorities for the next 5 or 6 years.

"The new plan will represent an update of the first plan," he explained, "but will not be a complete overhaul."

At the NIH director's behest, the new vision will also include several bold predictions, as did the first plan.

"Even though we may put forward some things that will fail to hit," Collins concluded, "I like the idea of putting out some really bold ideas so that people might go, 'Wow, you might be able to do that?' ...Even with the risks of not achieving the goals, I think it's worth it to cast a bold vision."

Meeting materials are available at <https://acd.od.nih.gov/meetings.html>. To view archived ACD proceedings online, visit <https://go.usa.gov/xdcCq> for day 1 and <https://go.usa.gov/xdcCc> for day 2. **B**

Tisdale

CONTINUED FROM PAGE 1

“It’s time to envision broadly available cures for this disease,” said Dr. John Tisdale, senior investigator in the National Heart, Lung and Blood Institute, who continues to pioneer several strategies in the lab and clinic to cure SCD. He spoke recently to a packed Masur Auditorium at the 14th annual Philip S. Chen, Jr., Ph.D. Distinguished Lecture on Innovation and Technology Transfer.

SCD is a single-gene disorder that produces abnormal hemoglobin. “This causes red blood cells that are very fragile,” explained Tisdale, “resulting in a severe anemia of red cells that also become rigid and don’t pass through the circulation, causing frequent, severe pain, organ damage and, ultimately, early mortality in the 40s, even in the modern era.”

While rare in the United States, afflicting about 100,000 Americans, SCD is rampant globally. More than 20 million people have the disease worldwide, with the highest rates in sub-Saharan Africa and India. Current treatments are limited to supportive care with blood transfusions and pain medication, said Tisdale, who underscored the need for more clinical trials to test new treatments.

The existing cure, a bone marrow transplant, is most effective in patients who have a fully matched sibling, but most SCD patients lack an ideal donor. And for the millions suffering with SCD around the world, most live in places that lack adequate blood banks, making a bone marrow transplant or blood transfusion unavailable to them.

For the lucky patients who have a transplant donor and access to the procedure, the infusion of new bone marrow stem cells produces all types of blood cells for the patient’s lifetime, explained Tisdale. While the greatest chances of success are with a healthy matched sibling, there’s growing success with half-matched family members.

“In the modern era, children can expect a 95 percent chance of being cured with a bone marrow transplant if they have a matched sibling,” said Tisdale, “but some of these children had an apparent cure even when their bone marrow wasn’t completely replaced by their donor.”

This result led Tisdale’s team to study whether SCD patients could be cured without ablating—using radiation or chemotherapy to destroy—bone marrow stem cells.

They’re currently testing a new drug showing long-term tolerance in the lab that is given in conjunction with another drug to protect against graft vs. host disease, a severe, potentially deadly complication of transplant. In the first 9 of 10 transplant patients, the chemotherapy-free transplant using these drugs resolved anemia and sickle cell symptoms while preventing graft vs. host disease, reported Tisdale. In further testing, SCD reversed in 87 percent of patients, most of whom are now off immunosuppression and pain medication.

The low toxicity from this chemotherapy-free approach makes it a viable option for adults with severe SCD and related organ damage, said Tisdale. The therapy could be used even in patients on dialysis or with significant heart disease.

In their journey toward improved treatments, Tisdale’s team next sought to determine how much corrected bone marrow would be enough to fix SCD. In long-term follow-up with 100 transplant patients, they identified three patients who, despite robust initial engraftment, experienced steady decline. When white cells that came from the donor fell below 20 percent, Tisdale said, the patients had recurrent anemia and symptoms.

The protocol results led Tisdale to examine whether gene therapy could help achieve that modest 20 percent mark. Autologous gene therapy removes and corrects the patient’s own bone marrow by adding a beta globin gene. When infused into the patient through an engineered viral vector, the corrected gene prompts the body to start producing healthy hemoglobin.

Tisdale had been studying gene therapy strategies for 25 years. “We really had a lot of work to do before we moved [gene therapy from the lab] to the clinic,” he said.

One major hurdle was figuring out if hematopoiesis (blood cell generation) from genetically modified cells was sustainable. Long hours in the lab led Tisdale to find that



Tisdale continues to pioneer several strategies in the lab and clinic to cure SCD.

PHOTOS: CHIA-CHI CHARLIE CHANG

a polyclonal model of blood formation that yielded long-term correction was indeed possible with gene transfer, a strategy incorporated into the first successful gene therapy trials in humans.

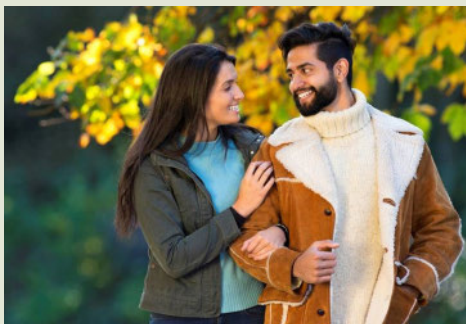
At least 27 SCD patients have undergone experimental gene therapy, with promising results. Meanwhile, Tisdale continues to develop new, more efficient viral vectors to improve success rates.

Yet another tantalizing approach is gene editing. Still in the early phases of development, this procedure takes the patient’s bone marrow and allows either cutting a gene that represses fetal hemoglobin to permit its reactivation in place of the sickle hemoglobin or cutting and correcting the disease-causing mutation.

“[The CRISPR-Cas9 gene-editing tool] has really revolutionized basic molecular biology due to its accuracy and ease of use, and it’s relatively inexpensive,” said Tisdale. “We’re hopeful this will pave the way for new therapeutics.”

While gene therapy clinical trials continue, Tisdale is also focused on testing drugs that could reactivate fetal hemoglobin in an effort to find a treatment that is more readily available to resource-poor areas where the disease is more prevalent.

“It should be easy, unlike cancer, with so many genetic mutations that differ so much from patient to patient,” said Tisdale. “We have one gene; it’s the same in every patient. We don’t need custom-made reagents for each patient...We should be able to fix this.” **R**



Dietary supplements containing zinc and folic acid do not appear to aid fertility.

Zinc, Folic Acid Supplement Does Not Improve Male Fertility

Dietary supplements containing zinc and folic acid—marketed as a treatment for male infertility—do not appear to improve pregnancy rates, sperm counts or sperm function, according to a study by NICHD. The study appears in the *Journal of the American Medical Association*.

The authors note that most so-called fertility supplements contain zinc and folic acid. Zinc is an essential mineral for sperm formation, and folate, the natural form of folic acid, depends on zinc to help form DNA in the sperm. Previous studies of these nutrients as a treatment for male infertility have produced conflicting results.

In the current trial, researchers enrolled 2,370 couples planning infertility treatments in 4 U.S. cities and their surrounding areas. The men were assigned at random to receive either a placebo or a daily supplement containing 5 milligrams of folic acid and 30 milligrams of zinc.

Live births did not differ significantly among the two groups: 404 (34 percent) in the supplement group and 416 (35 percent) in the placebo group. Similarly, the groups did not differ among various measures for sperm health, such as sperm movement, shape and total count. However, the proportion of sperm DNA fragmentation—broken DNA in the sperm—was higher in the supplement group (29.7 percent) compared to the placebo group (27.2 percent). Studies have linked a high rate of sperm DNA fragmentation to infertility.

Men in the supplement group also had a higher proportion of gastrointestinal symptoms, compared to the placebo group: abdominal discomfort (6 vs. 3 percent), nausea (4 vs. 2 percent) and vomiting (3 vs. 1 percent).

“Our study is one of the first randomized, placebo-controlled trials to assess whether folic acid and zinc supplements help to improve male fertility,” said Dr. Enrique Schisterman of NICHD’s Division of Intramural Population Health Research, who conducted the trial, along with colleagues. “Our results suggest that these dietary supplements have little to no effect on fertility and may even cause mild gastrointestinal symptoms.”

Changed Route of Immunization Improves Efficacy of TB Vaccine

Tuberculosis (TB), an ancient disease, is the leading infectious cause of death globally, yet the world’s only licensed TB vaccine, bacille Calmette-Guérin (BCG), was developed a century ago. Given to infants via a needle placed just under the skin, BCG protects babies from a form of the disease called disseminated TB but is far less effective at preventing pulmonary TB, the major cause of illness and deaths, in teens or adults.

Now, researchers from NIAID and their colleagues have shown that simply changing the dose and route of administration from intradermal (ID) to intravenous (IV) greatly increases the vaccine’s ability to protect rhesus macaques from infection following exposure to *Mycobacterium tuberculosis* (*Mtb*), the bacterium that causes TB. The findings provide a new understanding of the mechanisms of BCG-elicited protection against tuberculosis infection and disease. In addition, the findings support investigation of IV BCG administration in clinical trials to determine whether this route improves its effectiveness in teens and adults.

To control *Mtb* infection and prevent clinical disease, a TB vaccine must elicit strong, sustained responses from the immune system’s T cells, specifically those in the lungs. However, the standard, ID, route of BCG administration may not generate enough of these critical cells in the lungs. The NIAID researchers and their colleagues hypothesized that administration of BCG by IV or aerosol (AE) routes would overcome this hurdle and thus confer substantially better protection from infection and/or disease in rhesus macaques following challenge with virulent *Mtb*.

In their study, groups of animals received the BCG vaccine by ID, AE or IV routes. The scientists assessed immune responses in blood and in fluid drawn from the lungs for a 24-week period following vaccination. IV BCG vaccination resulted in the highest durable levels of T cells in the blood and lungs.

Six months after vaccination, the researchers exposed groups of vaccinated rhesus macaques (immunized via ID, AE or IV routes) and a group of unvaccinated macaques to a virulent strain of *Mtb* by introducing the bacteria directly into the animals’ lungs. They then tracked the infection and disease development over 3 months. Nine out of 10 animals vaccinated with IV BCG were highly protected; 6 showed no detectable infection in any tissue tested and 3 had only very low counts of *Mtb* bacteria in lung tissue.

All unvaccinated animals and those immunized via ID or AE routes showed signs of significantly greater infection.

The investigators concluded that IV BCG conferred an unprecedented degree of protection in an animal model of severe TB and “represents a major step forward in the field of TB vaccine research.”

New MS Treatment Trial Compares Stem Cell Transplant to Best Available Drugs

A clinical trial has begun testing an experimental stem cell treatment against the best available biologic therapies for severe forms of relapsing multiple sclerosis (MS). The trial, sponsored by NIAID, will compare the safety, efficacy and cost-effectiveness of the two approaches.

MS is an autoimmune disease in which a person’s own immune cells attack the central nervous system. The experimental treatment involves using a mixture of four chemical agents to remove these immune cells. Some of the person’s own blood-forming stem cells, which were extracted before treatment, are then infused back into the individual. These cells repopulate the immune system, allowing it to reset itself so that the new immune cells no longer attack the central nervous system. This form of treatment is called autologous hematopoietic stem cell transplantation, or AHSCT.

“For many people with MS—a chronic, debilitating, unpredictable and currently incurable disease—daily life can be a challenge,” said NIAID director Dr. Anthony Fauci. “AHSCT has the potential to halt the progress of relapsing MS, eliminate the need for a person to take lifelong medication and allow the body to partially regain function. However, we need to be certain that the benefits of this form of treatment outweigh its serious risks.”

It is estimated that MS affects more than 2.3 million people worldwide, mostly women, including more than 1 million people in the United States. Symptoms of the disease vary widely and may include motor and speech difficulties, weakness, fatigue and chronic pain. The most common form of the disease is relapsing-remitting MS, which is characterized by periods of mild or no symptoms interspersed with symptom flare-ups, or relapses. Incomplete recovery from relapses often leads to increasing disability. Over years, the disease can worsen and shift to a progressive form that may also include relapses.

The Food and Drug Administration has approved more than a dozen drugs for the treatment of relapsing forms of MS. These drugs vary in efficacy, safety and cost. For many people with severe forms of relapsing MS, first- and second-line drugs fail to adequately control the disease. Previous studies have suggested that AHSCT may be an effective and durable treatment for these individuals. But it has never been formally compared head-to-head with the available third-line drugs, which are highly effective but can have harsh side effects. AHSCT also carries the risks of serious side effects, and even death.

Given these risks and benefits, investigators aim to determine whether AHSCT is an appropriate treatment option for people with severe forms of relapsing MS who would otherwise receive one of the best available third-line biologic drugs.

Denny Appointed CEO of All of Us Research Program

Dr. Joshua Denny has been selected as chief executive officer of the All of Us Research Program.

Currently a physician-scientist at Vanderbilt University Medical Center, he brings a depth and breadth of experience in research and leadership. His areas of expertise include internal medicine, genomics, bioinformatics and pharmacogenomics. He also has experience with other large research efforts, including the Electronic Medical Records and Genomics Network, the Pharmacogenomics Research Network and the Implementing Genomics in Practice Network.

Denny is a member of the National Academy of Medicine, the American College of Medical Informatics and the American Society for Clinical Investigation, as well as a recipient of the Vanderbilt Chancellor Award for Research, the Homer Warner Award from the American Medical Informatics Association (AMIA) and the AMIA New Investigator Award. He has a medical degree, a master's degree in biomedical informatics and a bachelor's degree in molecular biology, all from Vanderbilt.

In his new role, Denny will draw on his many skills and interests to oversee one of the largest and most comprehensive precision medicine research platforms in the world.

All of Us is working to gather data from one million or more people living in the United States to accelerate research and improve health. By taking into account individual differences in lifestyle, environment and biology, researchers will uncover paths toward better disease diagnosis, treatment and prevention for all.

Denny has been an important member of the All of Us team since the program's inception. In his first role as a member of the advisory committee to the (NIH) director's precision medicine initiative working group, he helped develop the program's scientific blueprint. He then led the program's initial prototyping project and now serves as principal investigator for the Vanderbilt-based All of Us Data and Research Center, which acquires, organizes and provides secure access to the program's diverse dataset.

"All of Us offers the once-in-a-generation



Dr. Joshua Denny

PHOTO: VANDERBILT UNIVERSITY MEDICAL CENTER

potential to radically accelerate our biomedical knowledge and improve health for everyone, worldwide," Denny said. "I'm thrilled to be a part of it."

He will continue collaborating with both All of Us deputy director Dr. Stephanie Devaney, who has been

promoted to chief operating officer, and Eric Dishman, the program's current director, who will transition to a new role as chief innovation officer.

"Josh, Stephanie and Eric have worked together on All of Us from the beginning and share a common devotion to its goals and core values," said NIH director Dr. Francis Collins. "I could not be more pleased to have them at the helm as we look forward to a new stage of scientific discovery."—**Kate Horowitz**

Four Named to NIDDK Advisory Council

Four new members recently joined NIDDK's advisory council.

Tracey Brown joined as a public member representative to serve on the council's diabetes, endocrinology and metabolic diseases subcommittee. She is chief executive officer of the American Diabetes Association.

Dr. Iain Drummond joined the council's kidney, urologic and hematologic diseases

subcommittee. He is a professor and senior scientist at the MDI Biological Laboratory.

Dr. Penny Gordon-Larsen joined the digestive diseases and nutrition subcommittee. She is professor of nutrition at the Gillings School of Global Public Health at the University of North Carolina at Chapel Hill and past president of the Obesity Society.

Dr. Gary Wu joined the digestive diseases and nutrition subcommittee. He is the Ferdinand G. Weisbrod professor of gastroenterology at the Perelman School of Medicine at the University of Pennsylvania and co-director of the university's Center for Molecular Studies in Digestive and Liver Disease.

NIA Division Director Haaga Retires

Dr. John G. Haaga, director of NIA's Division of Behavioral and Social Research (BSR), retired on Dec. 31 after 16 years of federal service. Colleagues appreciated his clever use of amusing anecdotes to illustrate his points and deftly sway the course of scientific discussions. As an expert in demography, he is best known for calling attention to the growing socioeconomic and regional differences in health disparities in the United States.

Haaga arrived at NIA in 2004 to become deputy director of BSR. He was acting division director from 2015 to 2016, and director from 2016 to 2019. Under his leadership, the division supported research and training grants in behavioral, cognitive, population and social sciences, and health services research related to healthy aging, as well as age-associated diseases and conditions.

He grew the research portfolio by introducing new initiatives and starting new



New members of NIDDK's advisory council are (from l) Tracey Brown, Dr. Iain Drummond, Dr. Penny Gordon-Larsen and Dr. Gary Wu.



NIA's Dr. John G. Haaga recently retired after 16 years of federal service.

funding streams, resulting in more grants, centers and networks. He encouraged staff to focus on key topics such as rural health and socioeconomic disparities. In addition, Haaga also served as coordinator of the trans-NIH Common Fund program in health economics.

“With increased overall funding, including the substantial increases in funding for Alzheimer’s disease and related dementias research over the past several years, John managed during a period of rapid growth for BSR,” said NIA director Dr. Richard Hodes. “Even beyond NIA and NIH, John and BSR are recognized as a leading force in behavioral and social research on health.”

Before joining NIA, Haaga worked with the Population Reference Bureau, a nonprofit research and education organization, from 1997 to 2004, and he was staff director for the committee on population at the National Academy of Sciences from 1994 to 1997.

In the early 1990s and 1980s, Haaga’s international projects took him to Bangladesh, Malaysia, Kenya, Indonesia, India, Lesotho and Botswana. From 1991 to 1993, he directed research in family planning and maternal and child health for the Population Council. From 1985 to 1991, Haaga was a policy analyst with RAND, and from 1981 to 1984, he was deputy director of the Cornell Nutritional Surveillance Program.

Haaga earned a Ph.D. in public policy in 1983 from the RAND Graduate School in Santa Monica, Calif; an M.A. in international relations in 1978 from Johns Hopkins University; and a B.A. in modern history with first-class honors in 1974 from Oxford University in the United Kingdom.

In retirement, he will serve on the Maryland Commission on Aging, to which he was recently reappointed by Gov. Larry Hogan, and pursue other volunteer efforts, such as teaching graduate courses on

demography, economics and social policy. Haaga said that he also has several writing projects about demography and history in mind.

While reflecting on the scientific accomplishments during his tenure and considering what remains to be solved, Haaga said that the recent decline in life expectancy is a complex puzzle that needs urgent attention. Young adults are diagnosed with chronic diseases earlier and reporting disability earlier than baby boomers did, and they are dying younger.

“Discovery is great, but turning discovery into health is the NIH mission,” Haaga said. “We must all rededicate ourselves to figuring out what is going on and turning it around.”

NCI’s Linet Says So Long

Dr. Martha Linet, senior investigator and former chief of NCI’s Radiation Epidemiology Branch, retired in January after 33 years of service to the institute.

Linet was an international leader in epidemiology and expert on the etiology of pediatric and adult leukemia, lymphoma and brain tumors, as well as the health effects of ionizing and non-ionizing radiation and benzene exposure.

She helped initiate numerous studies, including occupational cohorts of workers exposed to ionizing radiation and benzene, and international consortia for the study of leukemia and lymphoma.

“Dr. Linet’s ability to design and direct large and complex epidemiologic field studies has resulted in critical discoveries that improved public health,” said Dr. Stephen Chanock, director of the Division of Cancer Epidemiology and Genetics.

Upon retirement, Linet will continue to support research and mentorship in DCEG as an NIH scientist emerita.



Dr. Martha Linet

NIH Toastmasters Mark Golden Anniversary

The NIH Toastmasters Club-3421 fosters leadership development and communications training through mentoring via weekly meetings.

Recently the club celebrated its golden anniversary at a local restaurant. The daughter of founding president the late Dr.



Padman Sarma, formerly of NCI, gave the keynote speech. Above, current president Dr. Ashok Kulkarni of NIDCR presents Nalina Sarma with a plaque commemorating the event. All are welcome to attend meetings, which are held Fridays on campus. In this inclusive environment, topics range from the “Fluorination Mechanism of Diaryliodonium” to “Mindfulness.” For information, email officers-3421@toastmastersclubs.org. Learn more at <https://3421.toastmastersclubs.org>. Follow the group on Twitter @nihtc.

VOLUNTEERS

Alcohol Drinkers Needed for Study

NIAAA seeks volunteers who drink any amount of alcohol for a study on brain-gut relationship and alcohol use. There are 6 outpatient visits and compensation is provided. For more information, call the Clinical Center Office of Patient Recruitment, 1-866-444-2214 (TTY/ASCII 1-800-877-8339). Read more online at <https://go.usa.gov/xn7rd>. Refer to study 17-AA-0093.

Have Biliary Tract Carcinoma?

Do you or someone you know have biliary tract carcinoma? Have previous treatments failed? National Cancer Institute researchers are testing a new treatment to see if it helps the immune system fight cancer cells. Treatment and research procedures are provided at no cost. Travel expenses may be provided. Call 800-411-1222 or email PRPL@cc.nih.gov. Refer to study 17-C-0082. Read more online at <https://go.usa.gov/xpKfg>.

Nagy To Give NIAAA Keller Lecture, Jan. 28

Dr. Laura E. Nagy will deliver the 24th annual Mark Keller Honorary Lecture on Tuesday, Jan. 28 at 1:30 p.m. in Lipsett Amphitheater, Bldg. 10. The title of her talk is “Inflammation and Cell Death in Alcohol-Associated Liver Disease.”

Nagy is currently a professor of molecular medicine at the Cleveland Clinic Lerner College of Medicine at Case Western Reserve University and a staff member in the departments of inflammation and immunity and gastroenterology and hepatology at the Cleveland Clinic. In addition, she is an adjunct professor of nutrition at Case Western Reserve University.

Nagy is an internationally recognized leader in the field of alcohol research who has made major contributions to our understanding of alcohol’s impact on organ and immune system interactions. In particular, she has made significant contributions to understanding the innate immune system’s role in the progression of alcohol-associated liver diseases (ALD).

She also has done pioneering work on alcohol’s impact on adipose tissue and on the interaction between adipose tissue and the liver in the development of ALD. Her laboratory consistently produces new and innovative insights into mechanisms of alcohol damage to the liver by following unique avenues of research.

NIAAA established the Mark Keller Honorary Lecture Series as a tribute to Keller’s pioneering contributions to the field of alcohol research. Honorees have made significant contributions to our understanding of how alcohol affects the body and mind, how we can prevent, diagnose and treat alcohol misuse and alcohol use disorder and how today’s scientific advancements can provide hope for tomorrow.



Dr. Laura E. Nagy will discuss “Inflammation and Cell Death in Alcohol-Associated Liver Disease” at the annual Keller Lecture on Tuesday, Jan. 28 at 1:30 p.m. in Lipsett Amphitheater, Bldg. 10.



Milonee Mehta of NIA’s team, dy-NIAmic, “Faces the Cookie,” one of several 60-second challenge events in the CFC finale.

CFC Finale Showcases Surprise Talents

NLM’s Team L-eye-brarians—Aresh Pahlavan and Miranda Jarnot—took first honors in the Combined Federal Campaign (CFC) Minute-to-Win-It competition. The CFC is the federal workforce’s annual charity drive.

Eleven NIH teams faced off in a series of 60-second challenges, featuring thrilling events such as Separation Anxiety, where contestants sorted colored beads into jars, and This Blows, a cup-blowing race. See video from the championship “Balloon Pyramid” round at <https://go.usa.gov/xdqKN>.

“Thanks to today’s participants, volunteers—the CFC keyworkers, coordinators and organizers—and everyone who pledged to CFC. We appreciate your support!” said Debra Gale, NIH’s CFC program manager.

NEI served as host IC in 2019, organizing events including a 5K walk/run and a karaoke contest to promote NIH’s push toward its \$2 million charity fundraising goal. See all CFC event photos and videos at <https://go.usa.gov/xdqKQ>.



Minute-to-Win-It champions Aresh Pahlavan (l) and Miranda Jarnot



Runners up Ana Perez Mejia and Eli Flores of NEI’s Eye Team



NEI’s Flores and NLM’s Jarnot go head-to-head in “Balloon Pyramid,” the championship round of the CFC Minute-to-Win-It grand finale.

PHOTOS: DUSTIN HAYS