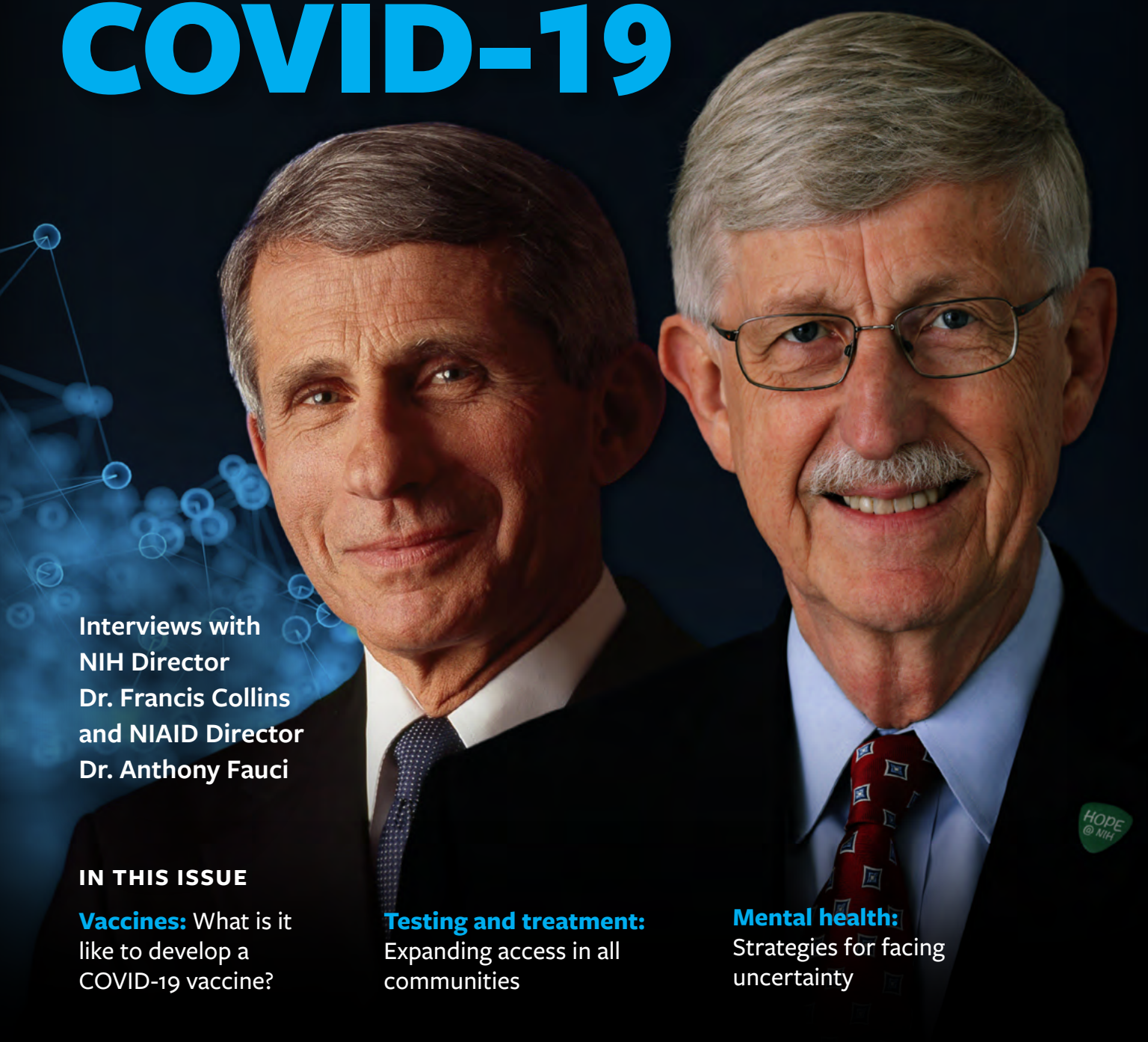
SPRING 2021

NIH MedlinePlus MAGAZINE

Trusted Health Information from the National Institutes of Health

How NIH is battling

COVID-19



Interviews with NIH Director Dr. Francis Collins and NIAID Director Dr. Anthony Fauci

IN THIS ISSUE

NIH recognizes its COVID-19 heroes

A special message from NIH Director Dr. Francis Collins

WELCOME TO NIH MEDLINEPLUS MAGAZINE!
Written with health consumers in mind, this magazine shares emerging research and health updates from the National Institutes of Health. I am honored to be on the cover of the spring 2021 issue along with my colleague Anthony S. Fauci, M.D. Inside, we provide the latest NIH news on COVID-19.

Since news of SARS-CoV-2—the virus that causes COVID-19—first emerged, we at NIH have worked around the clock to respond to it from all research angles: vaccines, testing, treatment, health disparities, mental health, and more. Nearly every one of NIH's 27 institutes and centers has contributed in some way over the last year-plus to COVID-19-related research, with the ultimate goal of improving the health of all Americans.

In this issue, we recognize the heroes in the NIH community whose tireless work has advanced the science around COVID-19 and related health research areas. Those include Dr. Fauci, his team at the National Institute of Allergy and Infectious Diseases, and many of the directors, researchers, and other integral NIH community members who are interviewed in this issue.

NIH Director Francis S. Collins, M.D., Ph.D.

We are grateful to our entire NIH staff and community and to you, our readers. A key part of addressing COVID-19 is giving people access to trusted health information like that from NIH MedlinePlus magazine, which is produced by NIH's National Library of Medicine. Make sure to explore the magazine's website, magazine.medlineplus.gov, and NIH's COVID-19 website, covid19.nih.gov, for the latest updates about COVID-19.

Thank you for reading!

Francis S. Collins, M.D., Ph.D.
Director, National Institutes of Health

NIH MedlinePlus
MAGAZINE

WHO WE ARE

The National Institutes of Health (NIH) is the **nation's premier medical research agency**, with 27 different institutes and centers. The National Library of Medicine (NLM) at NIH is a leader in research in biomedical informatics and data science research and the world's largest medical library.

NLM provides **free, trusted health information** to you at medlineplus.gov and in this magazine. Visit us at magazine.medlineplus.gov

Thanks for reading!

CONTACT US

Email
NLMCommunications@nlm.nih.gov

Phone
508-907-7000

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Editor's note: For the latest COVID-19 guidance, visit the Centers for Disease Control and Prevention website (cdc.gov).

IMAGES: NIH

Trusted Health Information from the National Institutes of Health

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From left to right: President Joe Biden meets with NIH's Anthony S. Fauci, M.D.; White House Coronavirus Response Coordinator Jeff Zients; NIH's Francis S. Collins, M.D., Ph.D.; and Kizzmekia S. Corbett, Ph.D.

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to your health
NEWS, NOTES, & TIPS FROM NIH

The COVID-19 vaccines: What you need to know

RESEARCH Vaccines work by teaching your body's immune system to recognize and fight back against germs, such as a virus, that can cause serious illness. By getting vaccinated, you develop protection against a dangerous illness without having to get sick.

What is an mRNA vaccine?

The Moderna and Pfizer vaccines are messenger RNA vaccines, also called mRNA vaccines. They contain genetic material or "instructions" that teach cells in your body to make a harmless piece of spike protein. That piece of protein, in turn, tells your immune system to produce the antibodies needed to protect you. After the piece of protein is made, the cell breaks down the instructions and gets rid of them.

How long have researchers been studying mRNA vaccines?

The Pfizer and Moderna COVID-19 vaccines that are currently available in the U.S. use technology that researchers at the National Institutes of Health have been studying for decades. This technology can fight the spike proteins that stick out from the surface of the COVID-19 virus.

What is a viral vector vaccine?

The Johnson & Johnson vaccine, which is a viral vector vaccine, works in a similar way. Instead of RNA, it carries a slightly different version of another virus than the one that causes COVID-19. This different virus, called a "viral vector," carries the same type of important instructions that mRNA vaccines do. Once the instructions are inside your cells, they tell them to make a harmless piece of spike protein, which then triggers your immune system to make protective antibodies.

Can the COVID-19 vaccines give you COVID-19?

The COVID-19 vaccines cannot give you COVID-19. The symptoms that sometimes come after you've had a vaccine shot are normal and a sign that your immune system is working. Call your health care provider or 911 if you are concerned about an allergic or other reaction, which is very rare.

How do I know if I'm fully vaccinated?

People are considered fully vaccinated two weeks after their second shot in a two-dose series, like the Pfizer or Moderna vaccines, or two weeks after a single-shot vaccine, like the Johnson & Johnson vaccine.

In the lab of National Institutes of Health-supported researcher Jason McLellan, Ph.D., whose work at the University of Texas-Austin supported COVID-19 vaccine development.

IMAGE: UNIVERSITY OF TEXAS-AUSTIN

Where can I learn more about getting a COVID-19 vaccine?

Visit vaccines.gov or your local state health website to learn where and when you can get a COVID-19 vaccine. If you have more questions about the COVID-19 vaccine, visit the Centers for Disease Control and Prevention website and talk to your health care provider. ■

SOURCES: National Institutes of Health; Centers for Disease Control and Prevention; Vaccines.gov

Your COVID-19 Glossary

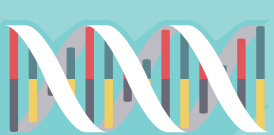
HEALTH TIPS

EFFICACY—how well something, like a vaccine or treatment, works in a clinical trial.
VARIANT— a virus that has changed from its original version. A variant usually has a change in genetic material, which results in a different amino acid.
ANTIBODY—a protein our immune systems make to fight off germs. Antibodies can stay in our bodies and protect us from future infection.
UNDERLYING CONDITION— a condition that someone already has, like diabetes or asthma, that puts them at greater risk for complications from an infection.
THERAPEUTIC AGENT— a therapy or treatment for a medical condition. A therapeutic agent can help you feel better and fight off a disease.
BASIC RESEARCH—science that helps us understand living systems and life processes better. This knowledge leads to better ways to predict, prevent, diagnose, and treat disease. Basic research was key to COVID-19 vaccine development.

SOURCE: National Institutes of Health

DID YOU KNOW?

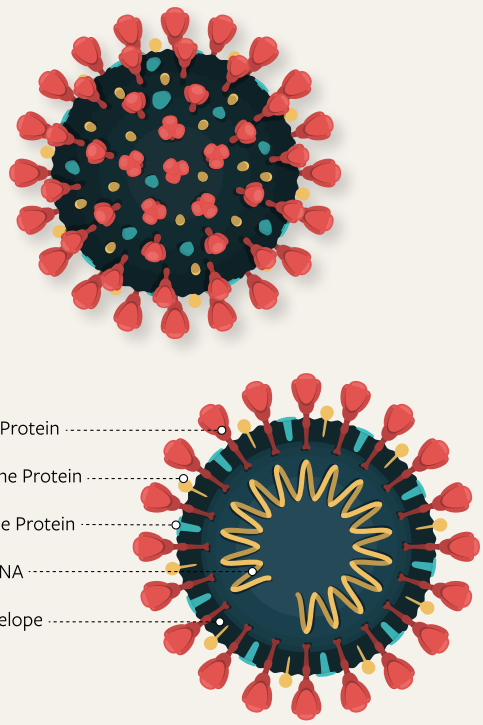
COVID-19 vaccines **do not change or interact with your DNA** in any way.



SOURCE: Centers for Disease Control and Prevention

IMAGES: ADOBE STOCK

SARS-CoV-2: Up close



RESEARCH **The genetic blueprint material for SARS-CoV-2 is called RNA (yellow spirals). The RNA contains information to specify the amino acids that make up the proteins, which are the actual building blocks for the virus particle. The RNA is protected in the virus envelope (black outer ring) until a potential host cell is found. The envelope is made up of several proteins, including envelope protein (blue spikes); membrane protein (yellow spikes); and spike glycoprotein or spike protein (red, tall spike). The spike glycoprotein helps the virus latch onto and gain entry into the host cell, so that the virus can infect the cell.**

SOURCES: National Institutes of Health; Scripps Research

RESEARCH is the KEY

Insights from NIH Director Dr. Francis Collins

How NIH has responded to the worst pandemic in more than 100 years

SINCE THE FIRST NEWS of SARS-CoV-2, the virus that causes COVID-19, surfaced, the National Institutes of Health (NIH) has spearheaded research to help understand, treat, and protect people from the virus, and examine its wider impact on our health and communities.

NIH Director Francis S. Collins, M.D., Ph.D., spoke about how the organization's 40,000-plus staff and the greater research community have responded to everything from vaccines and testing to mental health and health disparities. He also explains what's next on the horizon for COVID-19 research and how NIH is already preparing for future pandemics.

How is NIH promoting testing and vaccination in communities around the U.S., especially with underserved and vulnerable populations who are more likely to be affected by COVID-19?

African Americans, Latinos, and Native Americans have shouldered an unduly serious burden from this terrible pandemic, and we at NIH need to be doing everything we can, through research, to understand ways to intervene and provide assistance.

With regard to clinical trials, we want to be sure that if we're testing a treatment or a vaccine, that those interventions are being tested in all communities, including the most vulnerable populations. We've worked hard to include that kind of community engagement, to try to be sure that those hard-hit groups have a chance to have their questions answered and to consider signing up. In the face of this urgent situation, that has been challenging, but I think we've made real progress.

For this effort, I've got to say, much credit goes to the institutes at NIH that have taken this on—particularly to Gary Gibbons [M.D.] of the National Heart, Lung, and Blood Institute and Eliseo Pérez-Stable [M.D.] of the National Institute on Minority Health and Health Disparities. They have also co-led CEAL, which stands for the Community Engagement Alliance Against COVID-19 Disparities. It focuses on addressing misinformation around COVID-19 and questions like, how do we build trust [within] these hard-hit communities by engaging with their community leaders so that we can really listen to their concerns and provide answers to the skepticism that has existed in those communities?

With regard to testing, one of the reasons that this disease has hit [underserved] communities so hard is because they haven't really had access to point-of-care testing that would tell a person, "It would be better not to go to work today because you're already infected with this virus, and if you do go out in the community, there's a chance of further spreading it." We've put together a program called RADx-UP—Rapid Acceleration of Diagnostics for Underserved Populations—which is already out in the field. More than 60 different [funding] awards have been made to try to do this kind of community engagement and make testing available. We will be able to assess how convenient access to testing will be received, and how it can change the course of community spread.

IMAGES: NIH

> "We want to be sure that if we're testing a treatment or a vaccine, that those interventions are being tested in all communities, including the most vulnerable populations."
>
> – Francis S. Collins, M.D., Ph.D.

Can you describe the Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) program?

In March 2020, looking at the landscape of what was being done to develop treatments, there were a lot of small studies and hundreds of ideas about therapeutic agents that might work. But there was no prioritization process, no coordinated way to get those agents into clinical trials that would be well-designed, randomized, placebo-controlled—all the things you need if you're really going to trust the answer. That is not what was needed for the worst pandemic in 102 years.

I called up a lot of my colleagues in academia and in industry, and in a very short period of time, we assembled a group to talk about whether all sectors could become real partners in this effort. After an initial positive discussion, it took just two weeks for this partnership to come into being. It's called ACTIV. This has intensely involved about a hundred people, about half of them from industry and half from government and academia. They pretty much dropped everything else. They organized themselves into four very intense working groups on preclinical issues, clinical issues, clinical trials, and vaccines. The Foundation for NIH provided expert program management, which made the whole enterprise work remarkably well.

All of that has now gotten us to the point where we do know a lot of treatments that don't work—and that's really important—and a few that really do: remdesivir, dexamethasone, high-dose heparin for hospitalized patients, and monoclonal antibodies for outpatients. That's a pretty impressive

How to combat COVID-19 stress: Dr. Collins shares his tips

On music: "Music is a great way to unload some of the stress. For me, that can happen by playing my baby grand piano or my guitar. I seek those out when I need to get up out of my home office chair, and at least for a few minutes use a different part of my brain."

On physical activity: "I have a trainer who Zooms in twice a week at 5:45 in the morning. By the end of an hour, I have been completely reduced to a puddle of sweat by weight training and cardio. But it makes me feel alive again and ready to face the day. And on the weekend, if it's not too cold, I'll get on my bike with my wife, Diane, and we'll pedal 15 to 20 miles together."

On finding support with relationships: "I'm very fortunate to have a soul mate in Diane, who is walking this road with me. She has the amazing ability, when I'm having a tough day, to provide a listening ear and wise counsel. I hope I do the same for her sometimes too."

Above: Dr. Collins performs with opera singer Renée Fleming in 2018.

Dr. Collins on Bike to Work Day in 2018.

menu, but it's not big enough. We're still deep into that, even a year later, because this is not over and we want to be sure we have tested every idea.

How is NIH research tackling the issue of mental health right now?

There are so many consequences of COVID-19 that have made life extremely difficult for everybody across the world, and certainly that includes the U.S. Hardly anyone has been untouched, whether it is by their own illness or that of a family member, the economic distress that's fallen on so many people, or consequences of isolation and being in a circumstance that none of us expected would be part of our daily life but now is. You can't look at this circumstance and not [see] that [an impact on] mental health is one of the big consequences of COVID-19. Certainly, surveys have shown that the vast majority of people are feeling significant stress.

NIH, of course, has an entire institute devoted to these issues—the National Institute of Mental Health (NIMH)—and NIMH has worked hard to get information out there about resources that can help people who are struggling with anxiety, depression, and fear.

This won't be our last pandemic, so we need to identify what we can learn from this and what kind of interventions would be most helpful for people who are going through this kind of struggle, both now and in the future. So, as part of our agenda, along with vaccines and drugs that might be effective treatments, we also need the mental health issues to get the same kind of attention. We're working hard on that. Josh Gordon [M.D., Ph.D.], the director of NIMH, has been front and center, and is helping to design the next generation of pandemic research studies at NIMH.

Many people have been working around the clock on the vaccine and other COVID-19 research. Who are some of the NIH heroes who are part of this process?

There are many! Some of the first who come to mind are those at NIH's Vaccine Research Center (VRC) who, within a day after the posting of the sequence of the genome of the SARS-CoV-2 virus, went about designing what the vaccine would look like. They built on work they had pursued for many years, using messenger RNA as the way in which the vaccine could be developed. Then they collaborated with the company Moderna. And within 63 days of the initial posting of the viral genome sequence, the first patient was getting injected with a phase 1 vaccine. Among those VRC heroes are Kizzmekia Corbett [Ph.D.], Barney Graham [M.D., Ph.D.], and John Mascola [M.D.], who led that effort under Tony Fauci [M.D.]'s able oversight. And look where we are now.

I have to mention Dr. Fauci himself as one of our heroes, not only for his scientific leadership, but also the way in which he has been out there fearlessly in the public view, providing information that is absolutely based upon evidence and truth.

There are countless other folks who have been heroic. Across every NIH institute, people have dropped everything from the kind of research they were doing and pushed forward in new directions to try to discover things that we needed to know about.

How does NIH track and prevent future pandemics?

We need to learn the lessons from this dreadful experience so that, if there's a future pandemic, we will be as prepared as possible. We're already considering what those lessons might be. One of the things we really have not developed for this pandemic, because the time has been so short, is an array of really powerful antiviral drugs that would be very specific in knocking out this coronavirus. We need to push that agenda right now and are starting that process.

IMAGES: NIH

Technicians review test results in the Clinical Center's Department of Laboratory Medicine.

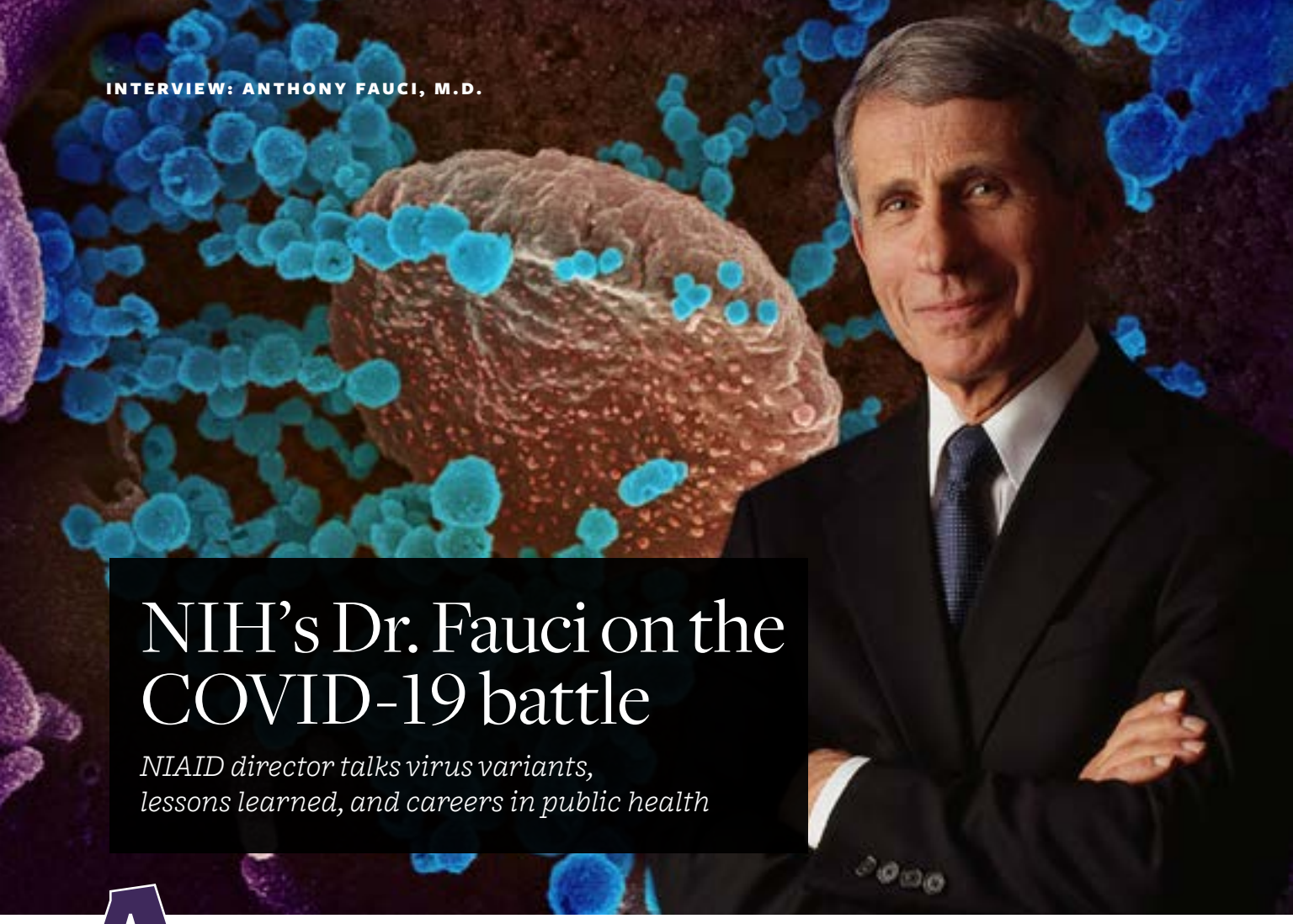
I think we've also learned some really interesting things about how to do science quickly. One example is the development of new diagnostic tests. We were asked by Congress in April 2020 to really pull out all the stops with new technologies that would allow us to diagnose COVID-19 in people in a few minutes. That was the program called RADx—Rapid Acceleration of Diagnostics. And what Bruce Tromberg [Ph.D.] and his team at the National Institute of Biomedical Imaging and Bioengineering did, which had never really been done before, was turn NIH into a venture capital organization. We said, "OK folks, we have money, and we have experts. Bring your best ideas about how that kind of technology can be developed." To date, we have managed to support no fewer than 28 brand-new technologies to do diagnostic testing for COVID-19, and collectively those are contributing about 2 million tests a day—including the first home tests.

What is something that you wish more people knew about NIH?

When you hear about a breakthrough in cancer research, or maybe in nutrition, in diabetes, or a basic science discovery about the brain, if it happened in an American academic institution, it's extremely likely it was funded by NIH. I wish everybody knew that taxpayer money is making possible advances across the board, in ways that have greatly, over the decades, enhanced human life and survival.

I also don't think a lot of people know that we run a hospital, NIH's Clinical Center, which is the largest research hospital in the world. Great things happen there: the first development of chemotherapy, the first human gene therapy, the development of lithium and ketamine for depression, and many more milestones. It's an amazing place, and the people who work there are truly dedicated to trying to find answers to [address] human suffering. That's why we call ourselves not just the National Institutes of Health, but the National Institutes of Hope. ■

> "That's why we call ourselves not just the National Institutes of Health, but the National Institutes of Hope."
>
> **– Francis S. Collins, M.D., Ph.D.**



NIH's Dr. Fauci on the COVID-19 battle

NIAID director talks virus variants, lessons learned, and careers in public health

Anthony Fauci, M.D., director of the National Institute of Allergy and Infectious Diseases (NIAID), is no stranger to pandemics or infectious diseases. He has served as NIAID's director since 1984 and has worked there for more than five decades.

One important skill he has brought to the COVID-19 pandemic response is his ability to explain complex health information in clear, actionable ways. "If people really want to know what's going on," says National Institutes of Health (NIH) Director Francis S. Collins, M.D., Ph.D., "they know that Tony's going to tell them those facts, even if they're not the facts that everybody necessarily wants to hear." Dr. Fauci recently sat down to talk about the latest COVID-19 facts and science, focusing on how new variants of the virus might affect the public, especially when it comes to vaccines.

You and Dr. Collins were recently vaccinated against COVID-19 here at NIH. How was that experience?

After the first dose, my arm, about seven hours after the vaccination, felt a bit achy. That lasted until the following day, and toward the end of the second day, it was completely gone. And that was great. Twenty-eight days later, we got the boost. That was a little bit different. I felt a little achy but not anything that interfered with my going to work or functioning on my typical 17-hour day. It didn't bother me. However, when I got home that evening, I felt chilly. I don't think I had a fever at all, but I felt chilly. So, a combination of 24 hours of the arm hurting again, a little bit of a fatigue, a little bit of a muscle ache, a little chilliness, and then by the afternoon of the second day, it was completely gone.

Why is it essential for people to get the vaccine?

That's really very important. First of all, we're dealing with a vaccine that has a 94% to 95% efficacy, and virtually 100% efficacy against severe disease, like hospitalization and death. So, the vaccine is extremely important, for your own health, for the health of your family, and for those around you who might be in a situation where they have underlying conditions. It's also important for society in general, because the more people who get vaccinated, the closer you're going to get to what's called herd immunity. Namely, if we get about 70% to 75% of the population vaccinated,

"The vaccine is extremely important, for your own health, for the health of your family, and for those around you who might be in a situation where they have underlying conditions."

– Anthony Fauci, M.D.

Dr. Fauci receives the COVID-19 vaccine at NIH.

we're going to have such an umbrella of protection in society that the virus won't have anywhere to go. It would not be able to find any susceptible people.

Do you still need to wear a mask in public after you've been vaccinated?

If you have been fully vaccinated, the Centers for Disease Control and Prevention (CDC)'s guidance now says you can resume most activities outdoors and indoors that you took part in prior to the pandemic without wearing a mask, except where masking is required by state, local, tribal, or territorial laws, rules, and regulations. You still need to follow rules of your workplace and local businesses.

The CDC still advises travelers to wear masks while on airplanes, buses, or trains, and calls for wearing masks in some indoor settings, including hospitals, homeless shelters, and prisons. Masks are required in these settings as it is conceivable that you could be vaccinated and get infected but not know it, because the vaccine is protecting you against symptoms. You still might have some virus in your nasopharynx [upper part of your throat, behind your nose] that could infect unvaccinated or other vulnerable people in congregate settings.

What is a COVID-19 variant, and how is NIH studying and tracking these variants?

There are a lot of terms that sometimes get interchanged—variant, strain, lineage—they all really mean the same thing. As SARS-CoV-2 replicates, changes in its genome (often called a mutation) can occur, and some result in a change in an amino acid that makes up a viral protein. Most mutations don't have any functional impact on the virus, but every once in a while, you get a constellation of mutations that does have significance in one way or another. This is often referred to as a variant. Some of these variants can spread more easily or have the potential to be resistant to particular treatments or vaccines. These are the variants that we are watching very closely.

Dr. Fauci (right) and Dr. Clifford Lane discuss AIDS-related data in 1987.

Multiple variants of the virus that causes COVID-19 have been documented in the U.S. and globally during this pandemic. We are monitoring multiple variants; currently there are six notable variants in the U.S., some that seem to spread more easily and quickly than other variants. So far, studies suggest that our currently authorized vaccines work against the circulating variants. The Alpha variant, also known as B.1.1.7, was first recognized in the United Kingdom and is now the most common variant in the U.S., surpassing in prevalence the original viruses that originally entered this country. Cases of COVID-19 caused by other variants first seen in other parts of the world have occurred

IMAGES: NIAID-RML; NIAID

in relatively small numbers in this country.

We are keeping a close eye on all of these, especially the Beta (B.1.351), Gamma (P.1), and Delta (B.1617.2) variants that may be able to evade the immune system and certain antibody therapies to a greater extent than the original virus and other variants. To be sure that we don't get caught behind the eight ball, companies are already making variations of the vaccine directed against certain variant strains.

The pandemic has inspired many people to consider careers in public health. What advice do you have for an interested young person or professional? How do they become the next Dr. Fauci?

If public health, and science, and medicine, is something that you might even have the slightest inclination to pursue, I strongly encourage young people to pursue it. It really has to be one of the most exciting careers you could possibly imagine, if it suits you. The reason is, it combines science and health in a way that has enormously broad implications.

> "Public health really has to be one of the most exciting careers you could possibly imagine, if it suits you."
>
> — ANTHONY FAUCI, M.D.

When I graduated from medical school and did multiple years of residency, including a chief residency and then a fellowship in infectious diseases, I was taking care of individual patients. It was very exciting. I still see individual patients. But the excitement and the thrill you get when you're working on something that has implications for millions if not billions of people, I mean, there can be nothing more exciting than that.

Everything that we do, all of us, from NLM to NIAID to any of the other 25 institutes and centers, all of us who get involved in that are having an impact, literally, on billions of people. So, when I see a young person who has even the slightest interest, I say, you better pursue it, because you're not going to imagine how exciting this could be.

What are some lessons we have learned from this pandemic?

Well, there are always lessons that are learned, if you do it right, from one [pandemic] to another.

Microscopic image of a cell (blue, large circles) infected with SARS-CoV-2, the virus that causes COVID-19 (red, small circles).

I think one of the things that really was [evident] was the importance of the chain of fundamental basic and clinical research. I mean, to be able to use the fundamental structural biology that we focused on with HIV, the same investigators collaborated with each other and used that structure-based vaccine design. That never would have happened if we hadn't had fundamental basic research that started off decades ago. So, to me, that's such a good example of the need to continue to fund fundamental basic research.

But then there are a lot of, also, public health lessons learned: the importance of a global health strategic network and surveillance, especially the ability to do rapid, extensive, comprehensive genomic surveillance.

Are there any NIH-specific sources you can recommend for people looking for trusted health information?

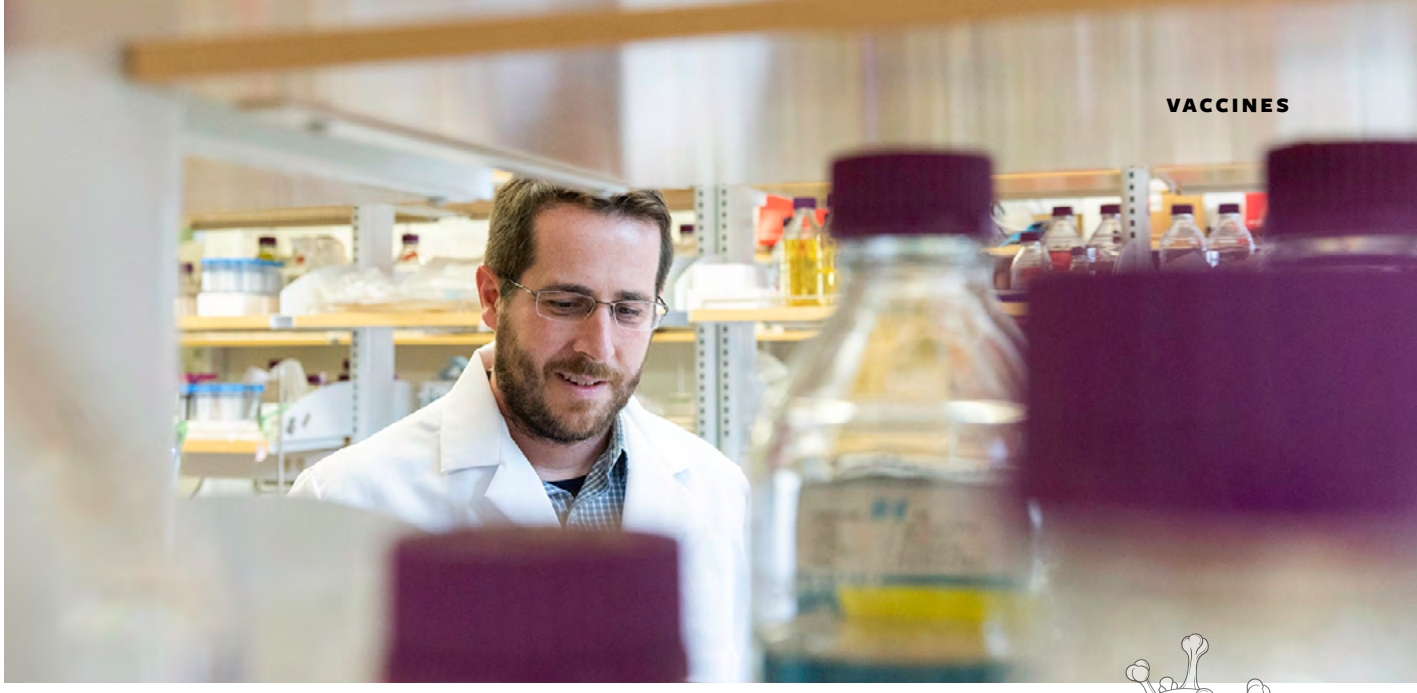
Well, particularly when you're dealing with clinical trials, I think ClinicalTrials.gov, GenBank, and then [especially for scientists and researchers] the National Library of Medicine (NLM)'s PubMed, which I use 20 times a day.

Do you have a final message that you would like to convey to the public?

This is a global pandemic, and it needs to be addressed at a global level. So, we should concentrate not only on controlling it in our own country, but we've got to control it globally, otherwise it's going to continue to come back to the U.S. with mutants and new versions of the virus. So, it will end, but it will end depending upon the effort that we put into it. ■

This interview has been edited for length and clarity. For the latest COVID-19 guidance, visit the Centers for Disease Control and Prevention website (cdc.gov).

IMAGES: NIAID; UNIVERSITY OF TEXAS-AUSTIN; ISTOCK



ALL IN THE SPIKE:

How past virus research gave a head start to the COVID-19 vaccine

Dr. Jason McLellan explains key role of past cold, MERS vaccine studies

It's not often that we can feel thankful for the common cold. But in the case of COVID-19, past research on the common cold virus and other viruses has been critical to COVID-19 vaccine development.

In a way, it was a perfect storm—in a good way, says Jason McLellan, Ph.D. Dr. McLellan began his vaccine research at the National Institutes of Health (NIH) in 2008. After first working to try and develop an HIV vaccine, he switched to working with Barney Graham, M.D., Ph.D., the deputy director of NIH's Vaccine Research Center.

With Dr. Graham, Dr. McLellan studied vaccines for dangerous respiratory viruses, including RSV (respiratory syncytial virus), which can be deadly in children, and MERS-CoV (Middle East Respiratory Syndrome coronavirus), a virus very similar to SARS-CoV-2, which causes COVID-19.

"MERS is also caused by a coronavirus like SARS-CoV-2, with these large, protruding spike proteins on the virus' surface," Dr. McLellan, now at the University of Texas-Austin, explains. These spikes grab onto the surface of human cells and then dramatically lengthen as they force their way inside.

Targeting the spike

An effective COVID-19 vaccine would need to target these spikes to prevent them from attaching to our cells. It was critical to get a clear image of the spike's structure so the body could learn to recognize and fight it, he says.

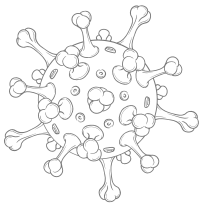
"There are lots of decisions that go into making a vaccine. With the coronavirus, we knew we had to concentrate on the changing spike, specifically the spike before it infects the cell. The more information you have, the better, and having a detailed picture is very helpful," Dr. McLellan says.

However, it was very difficult to get an image of the MERS-CoV spike protein.

"It had eluded scientists for a long time," Dr. McLellan says. Basically, the MERS-CoV spike protein is a shape-shifter, making it challenging for scientists to capture a high-resolution image.

So Dr. McLellan, Dr. Graham, and Andrew Ward, Ph.D., turned to a similar coronavirus: HKU1, which causes the common cold. Its spike protein also transforms from one shape to another, like the one from MERS-CoV. In 2016, Dr. Ward's lab used a technique called cryogenic electron microscopy to capture the first high-resolution image of this virus' spike protein.

For Dr. McLellan and his team of researchers, the game-changer for the MERS vaccine came with determining, through genetic engineering, how to lock the spike protein in the shape it takes



before combining with a human cell. Although their discovery, called the 2P mutation, was aimed at fighting MERS, when the COVID-19 pandemic struck three years later, it gave vaccine developers a big head start.

"It helped research on a COVID vaccine to move very quickly," Dr. McLellan says. The Moderna, Pfizer, Johnson & Johnson, and Novavax vaccines all use the 2P mutation his team created.

A key role in the pandemic fight

So how does it feel to have played an important part in the effort to stem a global pandemic?

"It's been mixed," Dr. McLellan says. "The pandemic is devastating in the deaths it's caused and the economy shutting down, but I feel honored that everything we worked on contributed to the response."

More importantly, he adds, "I think it's led to an increased appreciation for science in the U.S., and the value of doing basic science research. We don't always know what will be important. Right now, we're working on diseases people have never heard of, hoping it can benefit us in the future." ■

"We want to educate the public about what clinical trials are and to encourage trust in science."

– Monica Webb Hooper, Ph.D.

NIH's CEAL initiative: Combating misinformation during COVID-19

Program focuses on communities of color

Gary Gibbons, M.D.

RACIAL AND ETHNIC MINORITY COMMUNITIES IN THE U.S. are disproportionately affected by COVID-19, meaning they have been hit harder by the pandemic than other groups. That's why the National Institutes of Health (NIH) launched a grant program for outreach and engagement in September 2020. In April 2021, the program—the NIH Community Engagement Alliance (CEAL) Against COVID-19 Disparities—announced $29 million in additional grants. CEAL is currently funding programs in 22 states plus the District of Columbia and plans to expand to more states this summer.

CEAL teams are focusing on people in the African American, Hispanic/Latino, American Indian/Alaska Native, and Native Hawaiian and Pacific Islander communities. These populations account for more than half of COVID-19 cases in the U.S.

The program's goal is to combat "the misinformation that we're all exposed to" and the distrust of COVID-19 research, said Monica Webb Hooper, Ph.D. Dr. Webb Hooper is deputy director of the National Institute on Minority Health and Health Disparities, which is leading the program along with the National Heart, Lung, and Blood Institute (NHLBI).

"We want to co-create information to educate the public about what clinical trials are and to encourage trust in science," Dr. Webb Hooper said. People may get the idea "that racial minority groups are just completely uninterested in participating in research, and it's not true. But we have to earn their trust."

To do that, CEAL teams will partner with a range of local leaders—"those who live, work, and worship in the same communities where the disease has caused the highest rates of sickness and death," said Gary Gibbons, M.D., director of NHLBI.

The effort also has personal significance for Dr. Webb Hooper.

"I have three parents who are in vaccine clinical trials," she said. "They're African American and older adults. They're aware of what happened in the past with those horrific studies, such as the Tuskegee study. But they thought it was important to contribute to the scientific mission and to public health by participating and being there—being part of the solution." ■

IMAGES: NHLBI; NIMHD

What is it like to participate in a COVID-19 vaccine trial?

Dr. Stephaun Wallace shares his perspective as an African American epidemiologist

"I thought about what would represent the greater good for me as well as for the community."

– Stephaun Wallace, Ph.D., M.S.

Stephaun Wallace, Ph.D., M.S., has spent much of his life thinking about infectious diseases.

He is a research epidemiologist, or scientist who studies diseases and how they spread, at the Fred Hutchinson Cancer Research Center at the University of Washington. Last year he started coordinating COVID-19 trials around the world through the National Institutes of Health (NIH)-supported COVID-19 Prevention Network. He also experienced COVID-19 in a personal way by joining a COVID-19 clinical trial.

Considering a clinical trial

Before participating, Dr. Wallace says he called the clinical trial site staff, asking questions about trial registration and requirements.

He also realized that, as a person of color who meets with diverse communities in his work, being a trial participant could help him address mistrust, due in part to historical ethical offenses and betrayals by medical institutions.

"When we talk about the past, there are parts that impact people whether they experienced those events or not," Dr. Wallace says.

"I thought about what would represent the greater good for me as well as for the community," he added. "I say this as someone with two master's degrees, a Ph.D., and tons of experience talking about this globally. Yet I still sat there as a Black man, wondering, 'What does this really mean for me?' "

Ultimately, he decided to join the trial. He thought about how meaningful it was for science, and for diverse representation in clinical research.

By participating, "I felt like I could also show people what this means and what this looks like, in addition to talking about it in various spaces," Dr. Wallace says.

The NIH Community Engagement Alliance (CEAL) Against COVID-19 Disparities was developed to address COVID-19 trials and research mistrust and misinformation. CEAL focuses on underrepresented communities including Black, Hispanic/Latino, and American Indian/Alaska Native populations. The CEAL website offers tools for researchers and scientists to support and inform these communities.

Clinical trial experience

Dr. Wallace was part of the Novavax trial. It was a double-blind study, meaning one group got the vaccine and one got a placebo (a shot with no medication). Dr. Wallace says he had very few side effects, other than a mild headache, which made him wonder if he might have been part of the placebo group.

He later learned that he was in the vaccine group. The results of the phase 3 trial, announced in January 2021, indicated an 89.3% effectiveness. The results pleased Dr. Wallace, though he said he would have been supportive regardless.

"The goal of phase 3 trials is to determine if something does, in fact, work," he said. "I'm glad [this vaccine] did, and did it reasonably well. But even if it had not, I would have been glad to be part of something that contributed to science and to responding to this pandemic." ■

IMAGE: COURTESY OF STEPHAUN WALLACE, PH.D., M.S.

Data guides health discovery:

An interview with NLM Director Patricia Flatley Brennan

NLM's GenBank, MedlinePlus, ClinicalTrials.gov are key in NIH pandemic fight

Patricia Flatley Brennan, R.N., Ph.D., leads the National Library of Medicine (NLM), part of the National Institutes of Health (NIH). NLM's hardworking experts and vast repositories of information have been crucial to global efforts to combat COVID-19. Dr. Brennan shared the latest on NLM's work to help foster and accelerate discovery, link people to clinical trials, and more.

What is the mission of NLM?

NLM is a platform for biomedical discovery. We bring together literature, genomic databanks, and researchers to serve science, scientists, clinicians, and the public. And we support discoveries globally. There's not a biomedical discovery, a public health advance, or a clinical care action in the past 30 years that hasn't benefited from our resources in some way.

NLM is a leader in biomedical and health data science research, and the world's largest biomedical library. We conduct and support research in computational biology and computational health sciences. We also provide one of the most important functions that libraries serve in society—we are an archive of medical knowledge across the ages. Our holdings range from books and journals over 10 centuries old to the latest electronic genomic descriptions of the virus causing this awful pandemic.

We think of NLM as a door through which people pass and connect to data, literature, information, expertise, and sophisticated mathematical models, or images that describe a clinical problem. This intersection of information, people, and technology allows us to foster and accelerate discovery. That has been critical in the last year as we helped the country and NIH respond quickly to the coronavirus pandemic.

Patricia Flatley Brennan, R.N., Ph.D., is the director of the National Library of Medicine.

How is NLM helping NIH and the scientific community improve their understanding of COVID-19?

NLM staff provide special expertise that has been helping the rest of NIH respond to the COVID-19 pandemic. Our data scientists are helping researchers create reliable ways of collecting and managing data associated with complex studies and genetic sequencing efforts. Through our research and databanks, we are working with teams across NIH, other government agencies, and the larger scientific community to ensure that they have the full perspective of biomedical information available related to coronaviruses, which has been invaluable. So, it isn't just our literature, our databases, it's our staff in Bethesda that are helpful here.

Here's one example: One of our NLM researchers is using computer vision and machine learning to identify lung abnormalities to distinguish between pneumonia caused by a bacteria or virus, and unique visual features associated with COVID-19. To do this, we collected large numbers of X-ray images—essentially a library of images—and studied their different patterns of light and dark shading using computer tools. By repeatedly doing this, we can sort them into various piles and identify lung X-rays with a similar shading pattern indicating inflammation from coronavirus, which looks very different than those piles associated with signs of viral or bacterial pneumonia. This model helps us understand new X-rays and helps clinicians make a COVID-19 diagnosis faster, because of what we've learned from our library of images.

What is NLM's GenBank, and what role has it played in aiding the global response to COVID-19?

GenBank is the repository for all publicly available genomic sequences in the U.S. It has been crucial both in the process of developing vaccines and treatments, and in tracking emerging virus variants. As early as January 2020, only a month after the first patient was identified as having COVID-19, we already had the full genomic sequence of the coronavirus. This allowed us to provide a reference genome [a reference to what the genetic structure of the virus looks like] to scientists trying to develop new vaccines or new treatments.

We've continued to gather samples of coronavirus over the past year, and now we have almost 300,000 sequences of the SARS-CoV-2 virus. The GenBank sequence database helps researchers and public health authorities see if the virus is changing in a way that might require different kinds of treatment or prevention.

IMAGES: NIH; ADOBE STOCK

Clinical trials help researchers understand, treat, and prevent COVID-19. How does NLM help researchers, health care professionals, and the public learn more about COVID-19 studies?

NLM maintains a database of all the clinical trials around the world: ClinicalTrials.gov. People who are interested in participating in a clinical trial can visit the website to learn about more than 5,000 clinical studies related to COVID-19, ranging from vaccines and treatments to testing. The ClinicalTrials.gov website provides contact information for studies sponsored by NIH, other federal agencies, nonprofit organizations, and private industry. It's a resource you can use to learn more about participating in a clinical study and find questions to ask the research team if you are interested in learning more. Questions such as, what will I have to do? What tests or procedures are involved? How long will the study last? Who will oversee my medical care while I am participating in the trial? Who will pay for my participation? Will I be reimbursed for other expenses?

> "There's not a biomedical discovery, a public health advance, or a clinical care action in the past 30 years that hasn't benefited from our resources in some way."
>
> – Patricia Flatley Brennan, R.N., Ph.D.

How does the MedlinePlus website help consumers learn about COVID-19 and other health issues?

In addition to NIH MedlinePlus magazine, we also have our MedlinePlus website. This resource, which is available in English and Spanish, offers trusted, authoritative information for patients and families on thousands of health topics, including COVID-19. We recently added several new pages about COVID-19, including an overview, COVID-19 testing, and COVID-19 vaccines. These pages provide up-to-date information from NIH and other federal agencies like the Centers for Disease Control and Prevention. ■

NIH ramps up testing for at-risk populations

RADx-UP funds COVID-19 community and rapid test pilot programs

As the U.S. continues to battle COVID-19, some communities have faced more difficulties than others. This is especially true when it comes to diagnostic testing access and COVID-19 outcomes. African American people, for example, are nearly three times as likely to be hospitalized for COVID-19 compared with White people. They are nearly twice as likely to die from it too. Hispanic and Latino people share similar odds.

In response, NIH launched a project last fall called Rapid Acceleration of Diagnostics-Underserved Populations (RADx-UP). This project increases access to COVID-19 diagnostic tests in underserved communities most affected by the pandemic.

"There are populations that are facing a disproportionate burden of this pandemic, not only as it relates to health, but other factors including the economic burden, the social burden, and the employment burden," says Monica Webb Hooper, Ph.D., deputy director of the National Institute on Minority Health and Health Disparities.

RADx-UP studies COVID-19 testing patterns in communities across the country. To do this, it collects data on differences in infection rates, disease progression, and outcomes.

"The overall goal is to understand the factors that lead to the disproportionate burden and to develop testing interventions to decrease disparities in COVID-19," Dr. Webb Hooper says.

Monica Webb Hooper, Ph.D.

Groups at the center of this research include:

- Racial and ethnic minority populations
- Underserved rural populations
- Those of lower socioeconomic status
- Sexual and gender minority populations
- People who do not have access to regular health care.

Other groups are people with preexisting medical conditions, pregnant women, children, homeless populations, people managing disabilities, and individuals in the criminal justice system.

"So many of these populations are those who have been left behind or are not the regular focus of projects. We want to make sure that RADx-UP is as inclusive as possible and that we're thinking about those who might be particularly vulnerable and underserved," Dr. Webb Hooper says.

Over the past several months, RADx-UP has awarded organizations across the U.S. millions of dollars in grants to fund research in COVID-19 testing, rapid test pilot programs, and community initiatives.

Examples include:

- A Massachusetts program that launched community health vans so testing could reach at-risk citizens where they live.
- A Montana program that partnered with African American churches on COVID-19 education and testing.

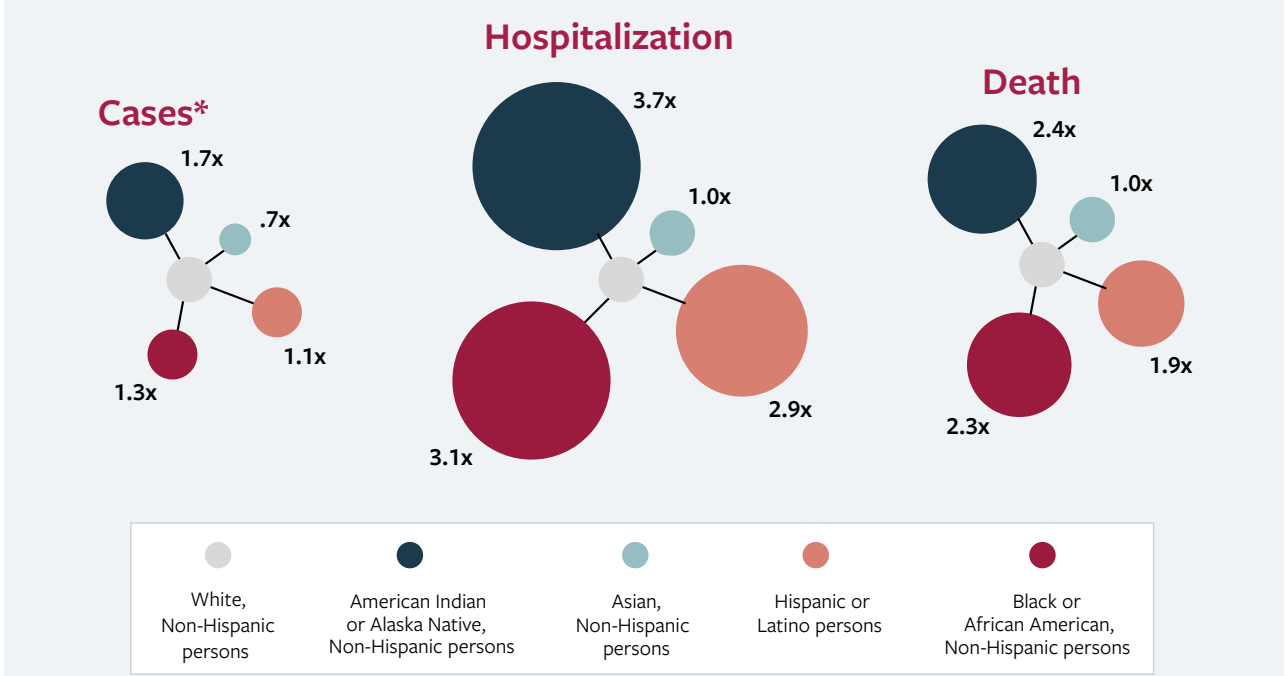
- A California program at San Diego State University called "Communities Fighting COVID-19." The project has built upon its network of multilingual, trained health workers.
- A project in New Mexico focused on expanding access to testing for miners.

"By definition, health disparities are differences you can change. They don't have to exist," Dr. Webb Hooper says. "The pandemic is a prime example of that. It's allowed the country and the world to witness significant disparities roll out in real time in the context of a crisis, and it's highlighted how this is something that needs to be addressed." ■

> "We want to make sure that RADx-UP is as inclusive as possible."
>
> **– Monica Webb Hooper, Ph.D.**

The data behind COVID-19 health disparities

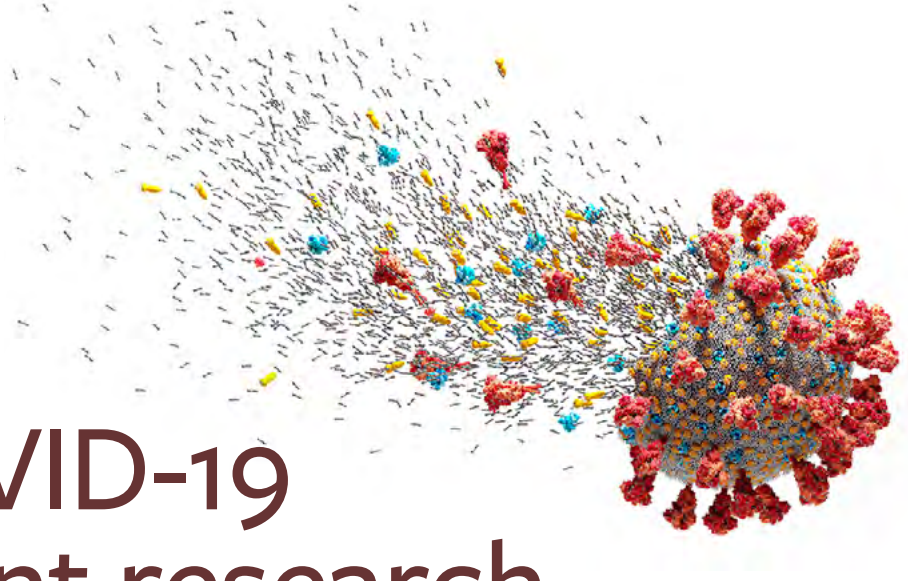
African Americans, Native Americans have higher rates of hospitalization, death than Whites



* Race and ethnicity are risk markers for other underlying conditions that affect health, including socioeconomic status, access to health care, and exposure to the virus related to occupation, e.g., among frontline, essential, and critical infrastructure workers.

SOURCE: Centers for Disease Control and Prevention

IMAGES: ISTOCK; NIMHD; ADOBE STOCK



The latest in NIH COVID-19 treatment research

Medicines for other conditions may show promise

Though the COVID-19 vaccine is an important tool in stopping the spread of the virus, treatments are still essential to saving lives during the pandemic. National Institutes of Health (NIH)-supported researcher Susan Baker, Ph.D., studies COVID-19 treatments through basic research. The research is part of NIH's Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) program. Dr. Baker spoke about some recent findings and what her hopes are for future treatments of the virus that causes COVID-19 and other viruses.

What is the goal of your current COVID-19 treatment research?

We're trying to identify new ways to stop the virus. We are looking at repurposing existing drugs and also starting from scratch to identify a compound that would eventually be turned into a drug to combat COVID-19. We believe antiviral drugs can be very effective, but it can take a long time to develop them. The upside is if we identify such a drug, it could block many different kinds of coronaviruses, not just the virus that causes COVID-19. A broad-spectrum drug would help both in this pandemic and against future emerging viruses.

Tell us about your recent research in COVID-19 treatments.

My collaborators screened a library of drugs that were approved by the Food and Drug Administration for treating other conditions and identified a compound that can block the replication of SARS-CoV-2 in cells. My group tested this drug and found that it blocks one of the viral proteases (or viral enzymes) that is necessary for replication. If this drug can be evaluated in clinical trials in patients with COVID-19, we will learn if it can be used to treat patients in this current pandemic. While this is exciting, there is still much work to be done to identify effective treatments for COVID-19.

What is your hope for the future of COVID-19 treatment research?

I hope we can discover an effective way to treat people with the virus that causes COVID-19 and reduce the incidence of severe disease. In addition, we may be able to treat people with mild symptoms and limit the spread of the virus. Stopping the spread of the virus is important for keeping people out of the intensive care unit. If someone without symptoms were to test positive, my hope is that we could give them a drug to immediately stop the virus from spreading in that person, or from spreading to others.

Why is it important to continue research on COVID-19 treatments now that vaccines are available?

There are a few reasons. A new variant of the COVID-19 virus could emerge that available vaccines cannot stop. Or another coronavirus could emerge. We want to have drugs available that can target the proteins shared by all coronaviruses. This drug may block newly emerging viruses that could cause a new pandemic. That's why it's important to keep investing in basic research to understand these issues and to develop effective treatments against all coronaviruses. ■

"We want to have drugs available that can target the proteins shared by all coronaviruses."

– Susan Baker, Ph.D.

5 questions about Long COVID

Symptoms can last weeks or even months

While most people with COVID-19 recover completely, thousands of people who survived COVID-19 are still struggling to return to their baseline even months later. As a result, the National Institutes of Health (NIH) is funding research to study the longer term health effects of COVID-19, including the condition known as Long COVID.

What is Long COVID?

Long COVID is a range of symptoms that can last weeks or months after first being infected with the virus that causes COVID-19 or can appear weeks after infection.

What are the symptoms?

They can include fatigue, shortness of breath, difficulty thinking or concentrating (sometimes called brain fog), sleep disorders, fevers, gastrointestinal symptoms, anxiety, and depression. New symptoms may start well after the time of infection, and symptoms can change over time.

Who can get Long COVID?

Anyone who has had COVID-19 can get Long COVID, regardless of age or prior health conditions.

How long does it last?

Symptoms can last for weeks or months after first being infected and can range from mild to severe. Researchers are working to understand more about recovery from COVID-19.

How is it being studied?

In December 2020, Congress approved $1.15 billion in funding over four years for NIH to support research into Long COVID and other longer term health effects of COVID-19. In February 2021, NIH launched a new program to identify the risk factors and causes of Long COVID in order to help understand how it can be prevented or treated in the future. ■

SOURCE: National Institutes of Health

Q: Why is COVID-19 testing still important now that vaccines are available?

A: AS WITH OTHER VIRUSES, like the seasonal flu, we test even though vaccines are available. If you become ill, you're tested for the flu, and the outcome determines your treatment plan. The same will likely be true with COVID-19. The vaccines approved by the U.S. Food and Drug Administration have certainly become the focus of combating COVID-19. What we still don't know about the vaccines is how long they provide protection. Also, we know that not everyone will be vaccinated, and that is another reason testing will remain an important part of our public health efforts to control the pandemic. ■

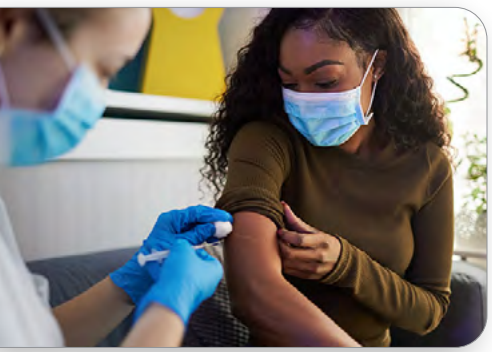
– Monica Webb Hooper, Ph.D., deputy director of the National Institute on Minority Health and Health Disparities

IMAGES: COURTESY OF SUSAN BAKER, PH.D.; ISTOCK; ADOBE STOCK

9 tips to address COVID-19 at work

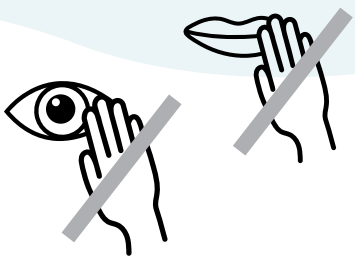
How to stay safe as in-person work resumes

HEADING BACK TO YOUR WORKPLACE SOON? Here are some tips from the National Institutes of Health and Centers for Disease Control and Prevention (CDC) for staying safe during COVID-19. Always be sure to check the latest CDC and local guidelines.



1. Get vaccinated

Getting a COVID-19 vaccine will help protect you and your co-workers. You are considered fully vaccinated either two weeks after your second dose of the Moderna or Pfizer vaccines, or two weeks after your single dose of the Johnson & Johnson vaccine.



2. Watch what you touch

It's always important to follow health best practices at work. So continue to avoid touching your nose, mouth, and eyes. In addition, avoid sharing work equipment, such as phones and desks, unnecessarily. Frequently clean and disinfect touched objects and surfaces.

When in-person meetings are necessary, they should be held in open, well-ventilated spaces.

3. Follow workplace guidelines

Be prepared and ask about your organization's COVID-19 requirements before returning to work. Some workplaces may still require things like masks or other respirators even for fully vaccinated people.

4. Keep your hands clean

Wash your hands frequently with soap and water for at least 20 seconds. Or use hand sanitizer that contains at least 60% alcohol, particularly after coughing, sneezing, blowing your nose, and using the restroom.

7. Advocate for what you need

If you are at increased risk for severe illness, or you care for or live with someone who is, ask your manager for special accommodations that will allow you to do your job safely.

5. Follow the latest travel regulations

If you're traveling domestically or internationally for work, make sure to pay close attention to the COVID-19 requirements of the state and country you're visiting.

8. Stay home if you're sick

If you're not feeling well, stay home. If you think you may have been exposed to COVID-19, monitor your symptoms, self-isolate, and follow CDC-recommended steps.

6. Rethink meetings

Conduct meetings via phone, video chat, or email when you can. When in-person meetings are necessary, they should be held in open, well-ventilated spaces.

9. Mind your mental health

Practice stress relief when you feel anxiety building. Take deep breaths, exercise, or do something that helps keep you calm. Take advantage of community health resources or support services offered by your employer. ■

SOURCES: National Institute of Environmental Health Sciences; Centers for Disease Control and Prevention

IMAGES: ISTOCK; ADOBE STOCK

Managing the uncertainty of COVID-19

NIH TRACKS SHORT- AND LONG-TERM IMPACT ON MENTAL HEALTH

"Coping with the pandemic has changed from a sprint to a marathon," says Joshua Gordon, M.D., Ph.D., director of the National Institute of Mental Health (NIMH).

Last spring, many people were looking for ways to survive a short period of social isolation. As we passed the one-year mark of the COVID-19 pandemic in March 2021, people have to contend with a new normal of not fully knowing what will happen next.

"[We are] adjusting to a new reality and learning ways to build resilience over time," says Dr. Gordon.

The whole picture

When thinking about mental health during difficult times like these, Dr. Gordon says it's important to look at the whole picture.

"The likelihood that one will suffer mental health symptoms or a diagnosable mental health illness in the aftermath of a disaster or a stressful period of time is influenced by a wide range of factors," says Dr. Gordon. "No one factor explains that risk or resilience by itself."

For example, NIMH research around the pandemic is considering factors like age, past mental illness, family structure, education, economics, and geography. These factors can have an impact on whether or not people have long-term mental health repercussions from COVID-19 as well.

One such study is the Adolescent Brain Cognitive Development (ABCD) Study, a long-term effort that began in 2015. Its goal is to study the brain development of 10,000 children from childhood to adulthood. Research sites in 21 states have looked at how certain factors—such as video games, sleep patterns, education, and more—impact brain development. A questionnaire has been added to learn about COVID-19's impact on kids and teens.

Depression affects about 16 million U.S. adults every year.

SOURCE: Centers for Disease Control and Prevention

Other age groups

Because of their heightened risk for COVID-19, older adults have had to isolate themselves in an extreme way, Dr. Gordon says. They may also be more likely to live alone. As a result, they have had to adjust to new ways of keeping in touch with friends and loved ones, and doing daily tasks. For example, they may have had to get food delivered instead of going to the store, keep medical appointments while potentially exposing themselves to risk, and rely on others more than they might like.

Parents of young children, Dr. Gordon says, have had to figure out "how to balance work and child rearing in ways they hadn't ever imagined they'd have to."

For everyone, uncertainty has made this pandemic experience especially challenging. "It's never been clear at any point during the past year how long this would really last," says Dr. Gordon. "And that uncertainty is the hardest thing to get used to."

Strategies for managing the future

To cope with that uncertainty, Dr. Gordon encourages good mental health practices that you can carry with you beyond the pandemic.

First, make sure you are sleeping well and eating nutritious foods. It's also helpful to find activities "that give you joy and pleasure," he says. That could be cooking, doing yoga, bird watching, or arts and crafts. Research has shown that even a simple walk, while practicing social distancing measures, may pick up your mood. Sticking to routines and turning off the news can also help.

Dr. Gordon notes that it's still important to reach out to people around you, and to check in with your neighbors and friends. If you can, try to connect with loved ones on phone and video calls and stay updated on the latest Centers for Disease Control and Prevention guidelines. As more people are vaccinated, those guidelines may allow for added types of safe social gathering for certain people, like those who are vaccinated.

Finally, Dr. Gordon stresses the importance of self-care. "Take breaks from work, child care, and elder care to take care of yourself," he says. ■

Joshua Gordon, M.D., Ph.D., is the director of the National Institute of Mental Health.

IMAGES: NIMH; ISTOCK

Children and the pandemic: NIH explores mental health impact on American youth

Ongoing ABCD Study looks at academic, economic factors

COVID-19 has likely had some mental health impact on most of us, especially children and adolescents. The National Institutes of Health (NIH) is now funding research to understand exactly what that impact is.

The long-term Adolescent Brain Cognitive Development (ABCD) Study, led by NIH, is one such effort. In 2015, researchers at sites in 21 states began studying 10,000 9- and 10-year-olds. Their goal was to find out how video games, sleep patterns, education, and more affected their brain development. The study will follow these participants until they are 18 years old.

Researchers are now including a COVID-19 exposure questionnaire as part of the study. The responses will help show how factors like economic or regional differences contributed to the impact of the pandemic on children, says Joshua Gordon, M.D., Ph.D., director of National Institute of Mental Health.

Academic experiences can also impact children's mental health, especially during COVID-19, Dr. Gordon says. He notes that economic differences can play a part in that too. For example, students who have more access to technology or academic support at home could have better outcomes.

"For children, there are a lot of unknowns here," Dr. Gordon says. "The ABCD Study's goal is to explore those unknowns." ■

Your stories:

How have YOU managed stress during COVID-19?

As COVID-19 forced us all to change our daily lives, people began finding new ways to connect and prioritize their mental health. Here are some of their stories.

"My friends and I have regular board game nights once a month. Luckily, we have the technology to take that online."

Kevin Gbolie - Community Manager - Washington, DC

"I knew that so many other people my age were struggling to adapt to this new and crazy life. I created the 'Survive Your Mind' podcast so everyone could talk about their mental health."

Paul Macrina - Student - Drexel University

"Bringing a pandemic puppy into the family has been so good for all of us. We've spent time together instead of in our separate corners of the house."

Susan L.P. Srikonda - Marketing Communications - Columbus, OH

"I send greeting cards to members of my church and community. On every card, I handwrite an inspiring message to brighten the days of people. **Happiness is like jam—you can't spread even a little without getting some on yourself!"**

Raymond Herzog - Retired Electronics Engineer - Middleburg Heights, OH

"As a nurse in a hospital that was hit hard, I try to decompress on days off with my young sons. Instead of focusing on their time away from school, we focus on the extra family time. Focus on gratitude, not the things we are missing."

Ashley Fitzpatrick - Nursing Manager, Cardiac Lab - Closter, NJ

"From the time my alarm goes off in the morning until I get into bed at night, I'm communicating with my fellow teachers. I can't imagine doing this year without them."

Nicole Sheehan - Grade 3 Teacher - Norfolk, MA

4 strategies for coping with pandemic stress

Find ways to support your family and yourself

"We've been emphasizing all along the need to take care of yourself physically, meaning eat right and sleep right," says Joshua Gordon, M.D., Ph.D., director of the National Institute of Mental Health. Just as important is supporting your mental health, he says. These strategies can be helpful even when the pandemic is over.

Here are some ways to promote mental wellness:

1 **MAKE TIME FOR MOVEMENT:** Take a walk or join an outdoor exercise or online dance class. Exercise helps your body release mood-boosting endorphins and connect you to others safely. Make sure to follow Centers for Disease Control and Prevention guidelines for your activities to keep yourself and others safe.

2 **SET GOALS:** It can be hard to feel motivated during extended social isolation. Set smaller, achievable goals to help keep you focused and feel accomplished. For example, agree to read one book a month, take a walk twice a week, or cook dinner at home for a full week.

3 **GET MENTAL REST:** Just as you need to get enough sleep, you also need mental rest to recharge your body. Try a new hobby or do something creative to give your mind a break from work and other stressors.

4 **SEEK OUT A PROFESSIONAL:** For people with new or existing mental health concerns that are getting in the way of your daily life, reach out to a health care provider. "It's important to recognize that when you're having such anxiety and depressive symptoms that you're having trouble working, caring for your children, or functioning every day, that's the time when you need to reach out to those around you and seek help," Dr. Gordon notes.

Talk it out: Need-to-know mental health resources

You don't have to face difficulty alone

Are you or someone you know dealing with intense depression, anxiety, thoughts of suicide, or another mental health crisis? You don't have to face it alone! Call or text one of these free hotlines to get the help you need.

National Suicide Prevention Lifeline

Call 1-800-273-TALK (8255) or visit suicidepreventionlifeline.org

Crisis Text Line

Text "HOME" to 741741 or visit crisistextline.org

Disaster Distress Helpline

Call 1-800-985-5990, text "TalkWithUs" to 66746, or visit DisasterDistress.samhsa.gov

IMAGES: ADOBE STOCK

from the lab

LATEST RESEARCH UPDATES FROM NIH

Antibodies offer clues about severe COVID-19 cases in children, adults

THE MAJORITY OF CHILDREN who get COVID-19 have mild disease. But a small percentage develop a serious version called severe multisystem inflammatory syndrome (MIS-C). MIS-C affects the heart, lungs, kidneys, brain, and other parts of the body. Symptoms occur weeks after the first symptoms of COVID-19. MIS-C usually affects children between ages 3 and 12.

Thankfully, there's treatment to help children with MIS-C. But why do only some children experience this severe reaction?

A recent study, funded in part by the National Institutes of Health, looked at the immune system's response to SARS-CoV-2, the virus that causes COVID-19, to see if differences might explain why children and adults get severe disease.

Severe multisystem inflammatory syndrome, which can happen as a result of COVID-19, may affect a child's heart, lungs, kidneys, and brain.

Researchers Lael Yonker, M.D., and Galit Alter, Ph.D., took blood from 25 children who had mild COVID-19 and 17 children who had MIS-C and compared the antibodies in the samples. They also assessed the antibodies in 60 adults with COVID-19, including 26 who had severe disease.

The researchers expected the children's antibodies to look different from those in adults. To their surprise, they found the antibodies were similar in adults and children with mild COVID-19 disease.

However, the researchers did find a different antibody response between adults and children with severe disease. Children with MIS-C had high levels of a type of antibody called IgG that normally helps control infection. But in this case, the antibody activates cells called macrophages and drives the severe response. Adults with severe COVID-19 showed increased levels of another type of antibody, IgA, which interacts with a different kind of immune cell, the neutrophil, resulting in life-threatening complications in adults.

This study should help clinicians better understand different COVID-19 outcomes and could lead to better treatments for severe COVID-19 complications in people of all ages. ■

SOURCE: National Institute of Allergy and Infectious Diseases

IMAGES: ADOBE STOCK

Participants were part of a larger study on social and emotional development.

Pandemic fear: Young adults with past childhood anxiety at greater risk

COULD A CHILD'S PERSONALITY HOLD CLUES to how well they will handle stressful events as a young adult? A recent study has found early risk factors that predicted anxiety in young adults during the COVID-19 pandemic.

Researchers looked at data from 291 young adults who were already being tracked from toddlerhood to young adulthood. The participants were part of a larger long-term study on social and emotional development.

The research found that those who were extremely cautious, fearful, and uneasy with unfamiliar people and situations as children were more likely to suffer from increased anxiety during the pandemic. However, those who had been uneasy only as toddlers did not report problems with anxiety. The National Institute of Mental Health led the study.

Previous studies have shown that children who show fearfulness are at greater risk of anxiety disorders later in life.

The participants were studied at two different points after stay-at-home orders were issued in the U.S. At the first evaluation, 20% of participants reported problems with increased anxiety. At the second, 18.3% reported anxiety. The participants had an average age of 18.

The findings suggest that addressing social fear in children and anxiety in adolescents may help prevent future anxiety disorders. ■

SOURCE: National Institute of Mental Health

IMAGES: ADOBE STOCK; NIDDK

New study finds another good reason to wear a mask

WE KNOW THAT WHEN WE WEAR A FACE MASK, we protect ourselves and others from the virus that causes COVID-19. A new study by the National Institutes of Health (NIH) suggests that one way masks may protect us is by increasing the humidity of the air we inhale. The higher level of humidity, which comes from our breath, may increase our protection against diseases such as COVID-19.

The study researchers cited prior research that higher humidity can help the lungs clear out germs and mucus, which helps delay and reduce infection.

"The increased level of humidity is something most mask-wearers probably felt without being able to recognize it, and without realizing this humidity might actually be good for them," said the study's lead author, Adriaan Bax, Ph.D., NIH Distinguished Investigator.

Dr. Bax and his team tested four common types of masks. They tested N95 masks, three-ply disposable surgical masks, two-ply cotton-polyester masks, and heavy cotton masks. All four types increased the level of humidity of inhaled air, but to different levels. At lower temperatures, the humidifying effects of all the masks greatly increased. At all temperatures, the heavy cotton masks led to the most increased level of humidity.

"This research supports the importance of mask-wearing as a simple yet effective way to protect the people around us and ourselves from respiratory infection," said Griffin P. Rodgers, M.D., director of NIH's National Institute of Diabetes and Digestive and Kidney Diseases. ■

SOURCE: National Institute of Diabetes and Digestive and Kidney Diseases

NIDDK's Joseph Courtney, Ph.D., who worked with Dr. Bax on the study, breathes into a sealed box while wearing a mask.

NIH *on the* web

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Get the facts from NIH's CEAL website

MISINFORMATION AROUND COVID-19 can contribute to people spreading and getting sick from the disease. That's why resources like those from the NIH Community Engagement Alliance Against COVID-19 Disparities (CEAL) website are critical.

The CEAL website offers fact sheets, videos, and infographics to address confusion around certain COVID-19 health and research questions. They can be used by health professionals, community leaders, or the public to help inform those around them. These resources, offered in English and Spanish, explain how vaccines work, why minority participation is important in clinical trials, and how contact tracing can help prevent the spread of the virus in your community.

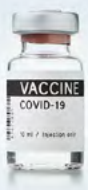
By offering these resources and working with communities across the U.S., CEAL aims to improve COVID-19 outcomes in diverse communities around the U.S., especially those who have been more affected by COVID-19. ■

CDC's COVID-19 website has latest guidelines

TO STAY UP TO DATE on the latest COVID-19 guidelines, visit the Centers for Disease Control and Prevention (CDC)'s COVID-19 website.

The CDC has clear, simple information about how to get you and your family vaccinated, where you can find vaccine and testing sites near you, and who is eligible for the vaccine.

The CDC COVID-19 website also has information about the latest mask-wearing guidelines so that you can stay safe and keep others safe from COVID-19. ■



LOOKING FOR COVID-19 VACCINES? Find a location near you with vaccines.gov. Just put in your zip code and press search! ■

Find clinical trials in your area

UPDATED DAILY, the National Library of Medicine's ClinicalTrials.gov gives vital access to information about public and private clinical trials on COVID-19 and other diseases and conditions. Clinical trials work to find the best ways to prevent, diagnose, or treat diseases and medical conditions.

ClinicalTrials.gov allows you to search by topic, location, or trials that are recruiting. The site hosts a database where people can search for trials of interest and researchers can discover other research, while also sharing their research. You don't have to register or provide personal identification to use the site. ■

IMAGES: ADOBE STOCK, CDC

NIH is here to help

The National Institutes of Health (NIH)—the nation's medical research agency—includes 27 Institutes and Centers and is a part of the U.S. Department of Health and Human Services. It is the primary federal agency for conducting and supporting basic, clinical, and translational medical research, and it investigates the causes, treatments, and cures for both common and rare diseases. For more information about NIH and its programs, visit www.nih.gov.

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