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## Ensuring that people living with hepatitis B are heard

**This is an exciting time.** I can practically feel the buzz as people and organizations around the world are starting to prioritize hepatitis B, hepatitis delta and liver cancer. And I am proud to say that the [Hepatitis B Foundation](#) has played a leading role in making this happen. In 2022, our outstanding team worked tirelessly to advocate for people living with hepatitis B, to remove challenges to testing and treatment, and improve vaccination rates. And through it all, we continue to ensure that the voices of people living with hepatitis B are heard.

**2022 was truly a year of making change happen locally, nationally and globally.** In our home state of Pennsylvania, we kicked off our [Public Health Center of Excellence to Eliminate Hepatitis B](#), where we are implementing new, collaborative strategies to increase hepatitis B screening, vaccination and linkage to care. Nationally, we had a major win! In December 2022, the U.S. Public Health Service Commissioned Corps made the decision to accept applicants living with hepatitis B. This change happened in large part due to dogged advocacy by the Hepatitis B Foundation, and brings us one step closer to universal equity and inclusion for people with hepatitis B in the U.S.

**Globally, we continued to focus on improving access to treatment and addressing stigma and discrimination.** Through the Hepatitis B Foundation's Discrimination Registry, more than 400 people have documented their discrimination experiences, and we have begun to publish findings that we believe will play a role in changing future policy to end discrimination for people with hepatitis B. We also released our first global [#BtheVoice](#) stories, with very moving videos from five new storytellers living in Nigeria. And we launched our hepatitis B and hepatitis D global Community Advisory Boards! Our first board cohort of 25 dedicated people has completed intensive training and will be engaging with researchers and regulatory officials to create more patient-friendly clinical trials.

We convened two exceptional working groups last year, with leaders from around the globe. [The Princeton Workshop](#) in April 2022 focused on gaps, challenges, and opportunities to improve early detection of liver cancer. The [Expanding Treatment Workshop](#) in September 2022 discussed needs and strategies to simplify and expand hepatitis B treatment around the world. Results from these workshops are already being used to advocate for more research dollars and expanded treatment guidance for the future.

I could go on and on – to talk about our new multi-lingual patient guide, popular podcast, consult helpline... our small but mighty team has been busy! **We take seriously the fact that we represent 300 million people around the world living with hepatitis B. And we never forget that we couldn't do it without you.** So, thank you, from all of us, to all of you – our donors, partners, funders, and fellow advocates. We hope that as you read this report, you feel as proud of our progress and accomplishments as I do.

All my best,

**Chari Cohen, DrPH, MPH** ▶

*President of the Hepatitis B Foundation*

“LEADERSHIP IS THE CAPACITY TO TRANSLATE VISION INTO REALITY.

Warren Bennis

## Two new presidents and a new CEO

We experienced a year of progress at the Foundation and Blumberg Institute, along with changes in the top ranks. Three distinguished and dedicated individuals assumed leadership of our organizations.

**Chari A. Cohen, DrPH, MPH**, became president of the **Hepatitis B Foundation**, and **Randall N. Hyer, MD, PhD, MPH**, took the job as the **Blumberg Institute’s** new president on July 1, 2022. At the same time, **Louis P. Kassa III, MPA**, became president of the **Pennsylvania Biotechnology Center (PABC)** and chief executive officer of the PABC, Hepatitis B Foundation and Baruch S. Blumberg Institute.



Dr. Hyer had been senior vice president for global medical affairs at Moderna Inc. Along with heading Blumberg Institute, Dr. Hyer is a distinguished professor of experimental therapeutics, senior advisor to Hepatitis B Foundation and CEO of our spinout, Merlin Biotech.



Dr. Cohen, who was senior vice president, joined the Foundation in 2001 and helped develop its public health, policy and advocacy program into a formidable and internationally influential operation. She is principal investigator on numerous private and federal grants for research and public health, including a \$1.4 million, five-year grant from the U.S. Centers for Disease Control and Prevention to continue building our nationwide Hep B United coalition.



Mr. Kassa, who came on board in 2014, had been executive vice president and chief operating officer of the Hepatitis B Foundation, Blumberg Institute and PABC. Under his leadership, the PABC has grown to more than 90 member companies and nonprofits and last year opened a second incubator, B+labs, in Philadelphia’s University City.

**Timothy M. Block, PhD**, founding president of the organizations, is now executive chair of the Foundation's Board of Directors, which also governs the PABC and Blumberg Institute. Dr. Block currently is conducting a research sabbatical at Yale University.

# Partnerships for discounted prescriptions in the U.S.



Hepatitis B certainly can be managed, and people can live a long and healthy life. For people who need treatment, it takes consistent antiviral medication to keep viral loads down. Unfortunately, the cost of these drugs can be a barrier to treatment.

That's why the Foundation worked with online pharmacies to offer *tenofovir disoproxil fumarate* and *entecavir* at more affordable prices for the uninsured or underinsured living in the U.S.

Due to the Foundation's urging, both **Rx Outreach** and **DiRx** are now offering two front-line medications for chronic hepatitis B infection deeply discounted.

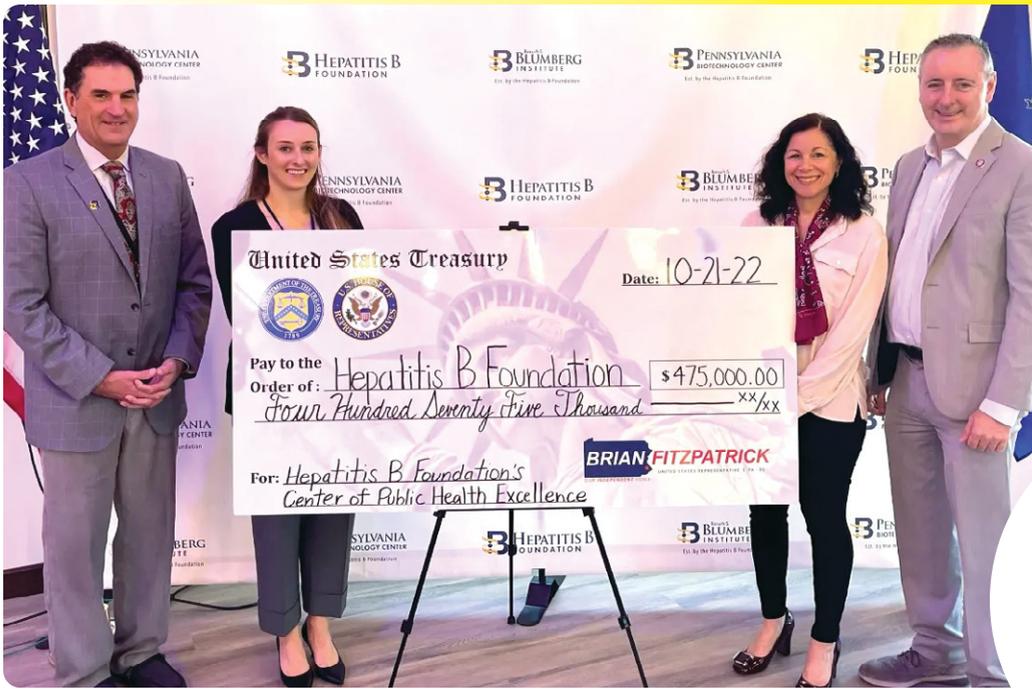
**Rx Outreach** launched its hepatitis B assistance program in December 2021 by offering generic *Viread*® (*tenofovir*) and generic *Baraclude*® (*entecavir*) free for one year to eligible individuals. Approximately 100 individuals benefited from this free program. Additionally, people living with hepatitis B in the U.S. who have trouble affording their medication can now purchase *tenofovir* for \$25 a month and *entecavir* for \$45 a month, which are deeply discounted rates compared to the monthly average retail price of \$1,188.

**DiRx** launched its program in April 2022 and now offers 30-count supplies of *entecavir* for \$33, and *tenofovir* for \$21. They also offered a preliminary promotion of the first 30 days free.

Along with those companies, thanks to our advocacy, the Mark Cuban **CostPlus Drug Company** now offers *entecavir* at 0.5 mg – \$39.30 (30 days), \$75.60 (60 days), \$111.90 (90 days) and *tenofovir* for \$18.30 (30 days), \$33.60 (60 days), \$48.90 (90 Days).

➔ You can find more information about prescription assistance programs in the U.S. on [hepb.org](https://hepb.org) under **Treatment and Management**.





From left: Lou Kassa, Catherine Freeland, Chari Cohen, and Rep. Brian Fitzpatrick

**Community Project Funding**

**156** messages sent to Congress and other policy makers



## Advocacy wins in D.C. and Pa.

The Hepatitis B Foundation received \$475,000 in Community Project Funding to create a Center of Public Health Excellence focused on hepatitis B elimination in the Fiscal Year 2022 Omnibus Appropriations Act that Congress passed in March. The funding was secured by our local Congressman, Rep. Brian Fitzpatrick.

The Center will provide expert resources, training, capacity building and technical assistance for state and local partners on how to best prevent, treat and control hepatitis B and increase the rate of adult vaccination and testing. Dr. Chari Cohen is the program director and Catherine Freeland is assistant director.

One month later, universal hepatitis B vaccination for adults aged 19-59 became official policy. Our organization had conducted a dissemination campaign to raise awareness of the new recommendation among stakeholder groups. One element was launching the **Hepatitis B Vaccination and Screening Advisory Council**, which is composed of key stakeholders from the provider and patient advocate communities and hepatitis B experts.

In December, the U.S. Public Health Service Commissioned Corps announced it is updating

its medical standards to accept future applicants living with chronic hepatitis B and HIV. After being contacted by an applicant who was denied a position in 2020 due to his hepatitis B status, the Foundation had advocated alongside partners for a change in this policy, meeting with senior administration officials and Members of Congress until the issue was addressed.

Grassroots advocates participated in a number of other advocacy efforts led by the Hepatitis B Foundation, including a petition and sign-on letter calling for Optum to return the hepatitis B drug Vemlidy to its health insurance formulary. We also continued to letters urging members of Congress and President Biden to help end hepatitis B discrimination in the military, and campaigns around universal adult hepatitis B screening, funding for hepatitis B and liver cancer, and other issues at the federal and state level.



## Bringing communities to the table

To further its work as the world's leading nonprofit dedicated to hepatitis B and liver cancer, the Hepatitis B Foundation has formed two new Global Community Advisory Boards (CAB).

At the Foundation's invitation, **81** people worldwide, primarily people living with hepatitis B and delta infections, applied to serve on the advisory boards. One, which is dedicated to hepatitis B, has **14** members, and the other, with **9** members, is devoted to hepatitis delta, or hepatitis D. Members represent Albania, Australia, Canada, Cameroon, Ghana, India, Israel, Mongolia, Nigeria, Philippines, Romania, Senegal, Taiwan, Tanzania, Uganda, the U.K. and U.S.

The Foundation will help CAB members share their perspectives, experience and expertise with those engaged in drug development and clinical research in hepatitis B and D. A primary goal is to ensure that the voices of those living with these diseases are central to decision-making by industry, government and nonprofits, and to drive progress toward cures for hepatitis B and D.

CAB members will serve a two-year term consisting of intensive training, followed by engagement with researchers, clinical trial developers, and regulators. CAB members will lead and participate in discussions about current and future hepatitis B treatment, represent the advisory boards at public events and conferences, and contribute to outreach and education in their home communities. The Foundation's team already has seen great strides in advocacy and participation from CAB members and looks forward to the positive impact they will have on treatment and drug development.





# Hep B United progress continues, grant renewed



**Hep B United** had a tremendous year in 2022. The coalition grew its membership and expanded its programming to better serve the communities most impacted by hepatitis B. These efforts were made possible after the U.S. Centers for Disease Control and Prevention awarded a **\$1.4 million, five-year grant** to the Hepatitis B Foundation in August 2021 to continue leading and growing Hep B United. Already the grant has allowed the coalition to form two new work groups to address the high rates of chronic hepatitis B among the Native Hawaiian and Pacific Islander communities, and among people who inject drugs. A Health Equity work group was also formed to give guidance on equitable programming and reducing stigma and discrimination. The grant includes continued partnership in the development and dissemination of the Know Hepatitis B campaign, a national multi-lingual campaign led by CDC.

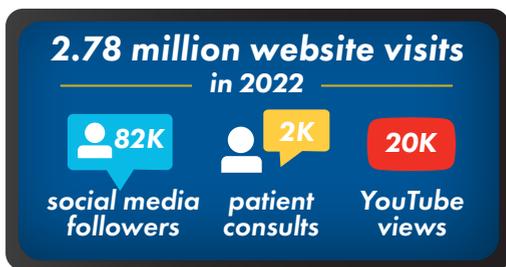
## Hep B United has now grown to more than 50 national organizations and local hepatitis B coalitions across 44 states and Washington, D.C.

In 2022, Hep B United hosted **10** training and technical assistance webinars, reaching over **1,011** attendees live and **1,630** YouTube views.

And for the second year, Hep B United collaborated with the **TB Elimination Alliance** to host a Mini-Summit from Oct. 25-27, 2022. The themes for the Summit – one for each half day – were *Access to the People, Reaching All Populations*, and *Adjusting Beyond a Pandemic Focus*. Each half day had more than **150** participants in attendance while sessions focused on a range of topics including the changes to vaccine guidelines, best practices from the field and discussions on what our communities are facing today.



## A growing reach for our outreach efforts



**Hepatitis B can be an overwhelming and confusing diagnosis.** Our trained staff answer questions about test results, transmission, vaccinations and care, and help patients to understand what their diagnosis means for their health and their future. *We guide people with hepatitis B as they face their diagnosis and provide guidance for telling loved ones, finding care, starting a family and hope for a bright future ahead.*

▲ Phone consult callers were mostly patients (65%). Of those we had information on, 26% were ages 19-34. Callers were from 18 states (plus D.C.) and three countries. Most common call topics were test results, vaccine, transmission, newly diagnosed, medication access help, finding a doctor, possible exposure and treatment options.



## In their own words: Our storytelling campaigns keep growing

We launched the **#justB** storytelling campaign in 2017 and we continue to be amazed and pleased with the positive response from the hepatitis B community.

Each **#justB** story reflects a unique personal experience and an important message about hepatitis B. Many stories are translated and recorded into languages such as Chinese, Vietnamese, Korean, Arabic, French, Mandingo/Mandinka, Twi, Yoruba, Tagalog, Khmer, Mongolian and Chuukese to reach some of the communities most burdened by the disease.

We hosted our sixth in-person **#justB** storytelling workshop in partnership with StoryCenter in 2022. We welcomed five new storytellers: **Adama**, a U.S. immigrant from Africa who was unaware of his hepatitis B status until many years after losing his mother to the infection; **Chelle**, a mother and medical provider who experienced discrimination in the U.S. army as well as after the birth of her children; **DHE**, a young man who struggled with his mental health after diagnosis;





◀ #justB storytelling workshop

**B the Voice** storytelling campaign ▼



Starting with a dose of hepatitis B vaccine within the first 24 hours of birth can prevent a lifetime of infection.



FK, a woman who discusses the importance of screening and how her diagnosis has impacted her romantic relationships; and Wendy, a mother and businesswoman in a fast-paced field whose diagnosis motivated her to better prioritize her health and well-being. Their self-made videos add to the rich library of stories we have created to ensure that we are representing a diverse group of voices.

▶ Watch the stories at [hepbstories.org](https://hepbstories.org).



The Foundation launched the international **B the Voice** storytelling campaign in 2020 to engage global storytellers in a more accessible way. It complements the #justB campaign, which focuses on U.S. residents. We added five new stories to the **B the Voice** story bank in 2022, which were captured through interviews with Catherine Freeland, MPH, PhD(c), during her recent trip to Nigeria for the birth dose implementation project. Sonia, Ismail, John, Gold and Dayo provided voice interviews and the Foundation team paired the audio with photos taken in Nigeria. They discuss stigma, discrimination, lack of access to treatment and mental health concerns.

▶ Watch their stories at [hepbstories.org](https://hepbstories.org).





## Saving the next generation in Nigeria from hepatitis B

**We continue working to eliminate hepatitis B and reduce the numbers of new cases around the world, and a major component is expanding the use of vaccines to prevent infections in newborn babies.**

Catherine Freeland, MPH, PhD(c), the Foundation's associate director of public health research, went to Nigeria last year to work on a long-term initiative to increase the use of timely hepatitis B vaccine birth dose, which will save countless babies from becoming infected.

Nigeria has one of the highest burdens of hepatitis B in the world and is one of the world's fastest-growing countries by population. In 2022, we co-led an innovative program, working with global partners that include the U.S. Centers for Disease Control and Prevention (CDC), to train community health workers in Nigeria on the importance of timely birth dose administration.



The primary goal is to ensure that more babies are given the hepatitis B vaccine within their first 24 hours of life by making the birth dose more accessible in health care facilities. The program

also is educating pregnant women in Nigeria on the importance of the hepatitis B birth dose and empowering them to request the vaccine for their baby after delivery.

Ms. Freeland and the other project leaders hope this initiative will serve as a model that can be replicated in globally. They are confident that improving access and awareness regarding hepatitis B birth dose will prevent future generations from hepatitis B infection and eventually save millions of lives.



## Education programs are back in person

With pandemic restrictions mostly lifted, our academic programs gained momentum last year, serving college undergrad, post-grad and high school students.

The [Blumberg Institute](#), in partnership with the [Hepatitis B Foundation](#), hosts a 10-week college internship program every summer. This highly competitive program provides a unique opportunity for students in their junior or senior year who are considering graduate school, medical school or industry research careers, to participate in an innovative educational program. In 2022 we had students from Villanova, the University of South Carolina, University of Pittsburgh and more participate. This experience allows participants the opportunity to gain a personal perspective on the entire scientific process: from formulating and testing hypotheses, to working with a mentor in a state-of-the-art research lab, to presenting and publishing research findings.

We also hosted our two-week High School Science Enrichment Program for talented Pennsylvania high school

students interested in learning about biotechnology, public health and biomedical research in the context of hepatitis B and liver cancer. Students participated in the program to gain a unique hands-on lab experience under the guidance of senior scientists with the Institute and companies operating in the PABC. Along with lab research, students learned about public health issues, enjoyed guest lectures and attended professional seminars.

From September to June, about **30 top students** from the Central Bucks School District's three high schools come to our campus daily for an Advanced Placement chemistry class, followed by work in labs on site. Now in its fifth year, the program has helped students gain admission to, and excel at, some of the nation's elite colleges and universities.

## Sunrise Education Fund launched by board member

In 2022, we launched the Sunrise Education Fund, our effort to "Get Kids in Lab Coats," to boost our education programs and help create the next generation of scientists and researchers. The founding sponsor is [Nathaniel Brown, MD](#), a member of our Board of Directors.

➔ Learn more here: [www.blumberginstitute.org/sunrise](http://www.blumberginstitute.org/sunrise).

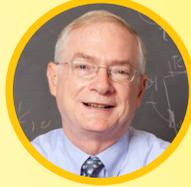


## Blumberg Institute strengthens its faculty

**Ian Henrich, PhD**, joined the Blumberg Institute's faculty this year as an assistant professor in experimental therapeutics. He received his doctorate in pharmacology from the University of Pennsylvania School of Medicine in 2018 and was a postdoctoral researcher at Children's Hospital of Philadelphia.



A prominent member of Princeton University's faculty for many years, **Thomas E. Shenk, PhD**, has joined the Blumberg Institute's faculty as a distinguished professor of experimental therapeutics and translational medicines. Dr. Shenk is Emeritus James Elkins Professor of Life Sciences in molecular biology at Princeton. He founded Evrys Bio, an on-site member company for the past 10 years at the Pennsylvania Biotechnology Center, which is managed by the Blumberg Institute.



**Liudi Tang, PhD**, who had been working at Evrys Bio with Dr. Shenk, joined our faculty as an assistant professor of experimental therapeutics and principal Investigator. Dr. Tang is a virologist with a particular focus on the hepatitis B virus. He received his doctorate in 2019 from Drexel University College of Medicine.



**Scott Willett, PhD**, who worked in the pharmaceutical industry for more than 30 years, now is the Blumberg Institute's Director of Academic Affairs and professor of experimental therapeutics and translational medicine. He has a PhD in pharmaceutical chemistry from the UC San Francisco.

**Qiong Zhao, PhD**, has joined the faculty as assistant professor in viral pathogenesis and biopharmaceutics programs. She received her doctorate from Peking Union Medical College and Chinese Academy of Medical Sciences, Beijing. Dr. Zhao is developing cccDNA-targeting therapeutics for the cure of chronic hepatitis B.

➔ Read noteworthy news about people who work at the Blumberg Institute at [www.blumberginstitute.org/news/blumberg-institute-faculty-news](http://www.blumberginstitute.org/news/blumberg-institute-faculty-news).



## A colleague's late husband honored by a new lab

**Steven W. Miller**, husband of Blumberg Institute employee, **Dianna Miller**, was widely respected and loved by his colleagues at Johnson & Johnson Consumer Inc.

Sadly, he died two years ago from liver cancer caused by metabolic associated fatty liver disease (MAFLD), a chronic illness for which symptoms don't emerge until the latter stages.

Steve's family, friends and former colleagues honored him last year with the dedication of a new laboratory at the **Blumberg Institute**, where scientists, led by **Dr. Aejaz Sayeed**, are working on tests to better diagnose MAFLD, liver cancer and related diseases.

The idea for raising funds to support research into MAFLD diagnosis occurred to Dianna Miller when she learned that a scientist working in that area is on the institute's faculty. She launched the fundraising effort, starting with some of Steve's closest colleagues, and more than \$80,000 has been contributed so far.



▲ **Dianna, Mandy and Matthew Miller**



◀ Lewis Roberts, MB, ChB, PhD, Mayo Clinic professor of medicine, (right, foreground) was one of attendees at the 2022 Princeton Workshop.

## Liver cancer prevention and diagnosis subject of April 2022 workshop

Since 1996, the Hepatitis B Foundation has been bringing together some of the world’s thought leaders in hepatitis B and related fields from academia, industry and government for highly focused roundtable discussions of new and innovative therapeutic strategies for the disease.

Named for the town where it was first held, the most recent Princeton Workshop took place on April 28, 2022. Meeting in the Foundation’s new Doylestown facility, 30 top scientists and physicians discussed “Liver Cancer Risk, Prevention and Early Detection: Challenges and Opportunities to Improve Outcomes.” The daylong meeting was chaired by [Chari Cohen, DrPH, MPH](#), president of the Hepatitis B Foundation, and [Brian McMahan, MD](#), scientific and medical director of the Alaska Native Tribal Health Consortium. Results of the meeting will be published and used to advocate for investment in strategies to improve early detection and prevention of liver cancer.

## Longtime Board Chair honored by his colleagues

The Hepatitis B Foundation's Board of Directors and leadership recognized [Joel D. Rosen, Esq.](#), last summer for his nearly two decades of service. A board member since 2003, Mr. Rosen was chair from 2009 until stepping down last June. A conference room in the new building that houses the Hepatitis B Foundation has been named in Mr. Rosen's honor. The building is on our Doylestown campus, which comprises four connected buildings on 10 acres. In addition to new labs, meeting rooms and a large event space, the new structure provides offices for many scientists and the Foundation’s leadership, the Pennsylvania Biotechnology Center and the Blumberg Institute. The PABC is an incubator that houses the Institute’s labs and nearly 50 small companies.



▲ Founding President Timothy M. Block, PhD (left), Mr. Rosen (center) and Louis P. Kassa, III, MPA, PABC president and CEO of the Hepatitis B Foundation, Blumberg Institute and PABC.



## Toward translational research: Science at the Blumberg Institute

**Greetings. What a difference a year makes! The year 2022 represents the strongest ever with respect to the achievements and research grant awards for the Baruch S. Blumberg Institute.**

Prior to my joining the Blumberg, I was aware of the top-quality research being done by the world class scientists on our faculty. Since becoming president of the Blumberg Institute in July 2022, I have become even more impressed by the accomplishments that occur on this campus every single day. The energy and innovation are palpable as you walk down the halls of this unique and highly capable research institution.

**The Blumberg's core mission remains finding a cure for hepatitis B.** Aided by exceptional funding, Blumberg scientists have [discovered new drug candidates that specifically target the production of HBV subviral production and reduce the load of viral envelope protein \(HBV surface antigen, HBsAg\) to facilitate the activation of antiviral immune responses.](#) Our scientists have screened over 15,000 compounds and validated 17. One of these compounds shows inhibitory effects on HBV subviral production in at least four different hepatocyte-derived cell lines under several different conditions that not only inhibit the production of sub-viral particles, but also other proteins produced when the hepatitis B virus is actively replicating (HBV "e" antigen or HBeAg). Blumberg will continue developing this compound and its derivatives as potential antiviral agents for chronic hepatitis B.

Blumberg also is advancing gene therapy and completed the proof-of-concept study to demonstrate that feasibility to express a therapeutic protein by gene editing technology to "knock-in" a protein-coding gene into HBV cccDNA (viral genetic material that mostly lies dormant in chronically infected liver cells). This innovative therapeutic approach not only inactivates HBV cccDNA, the most stable HBV replication form and the resource of viral rebound after stop of antiviral drug treatment, but also allows for selective elimination of HBV infected liver cells.

I have made it a priority and strategic direction for the Blumberg to move into translational research. I ask, "What can the Blumberg do and do well that no other similar research institution can do?" In my opinion, it is [accelerating discoveries into medicines that change peoples' lives.](#)

Original research done by Blumberg scientists identified a highly active therapeutic for the fatal liver disease, yellow fever. Our scientists discovered the potential therapeutic for yellow fever while searching for broadly active antiviral drugs. The Blumberg further developed this molecule to where the National Institute for Allergies and Infectious Diseases (NIAID) has recognized the potential and awarded the Blumberg a [five-year \\$32 million contract](#) to develop this molecule to early clinical trials. Yellow fever kills thousands of people every year and there is no effective antiviral. Development of this molecule into an effective therapy would be a major contribution to reduce morbidity and mortality for thousands of people worldwide.

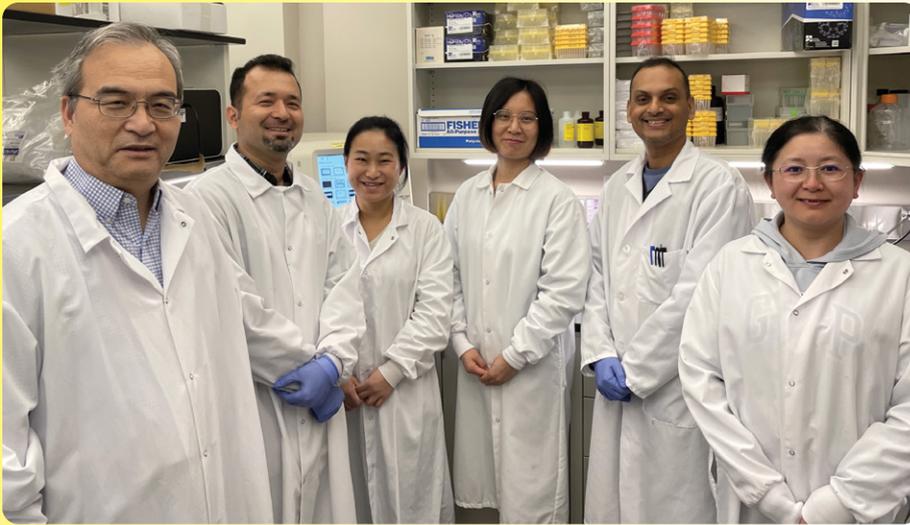
Translational medicine is further epitomized by the startup companies spun out from Blumberg into the Pennsylvania Biotechnology Center. These exciting and fast-moving companies include MERLIN BIOTECH, developing mRNA cancer therapeutics; HARLINGENE, developing new hepatitis A therapeutics; CIRNA, developing new non-invasive bloodborne diagnostic and prognostic indicators; PENTRAVALENT, developing a new five-valent therapeutic platform; and RIMSTING, developing new therapeutic based on novel STING therapeutics. All these startups have attracted investment from the State of Pennsylvania's Academic Entrepreneurs program and promise to translate Blumberg discoveries into useful medicines and diagnostics.

**It is my great honor to present the following brief look into the advancements made by the Blumberg team in 2022.**

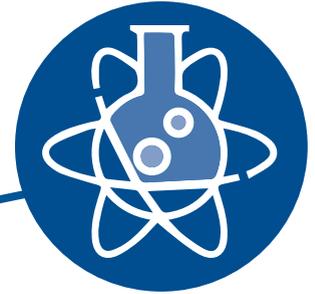
With thanks,

**Randall N. Hyer, MD, PhD, MPH** ▶

*President, Baruch S. Blumberg Institute*



Left to right:  
 Ju-Tao Guo, MD;  
 Biplav Shrestha, PhD;  
 Qiong Zhao, PhD;  
 Hui Liu, PhD;  
 Hemraj Rimal, PhD;  
 Liangxian Shen, MD



## The Blumberg Institute's research progress in 2021

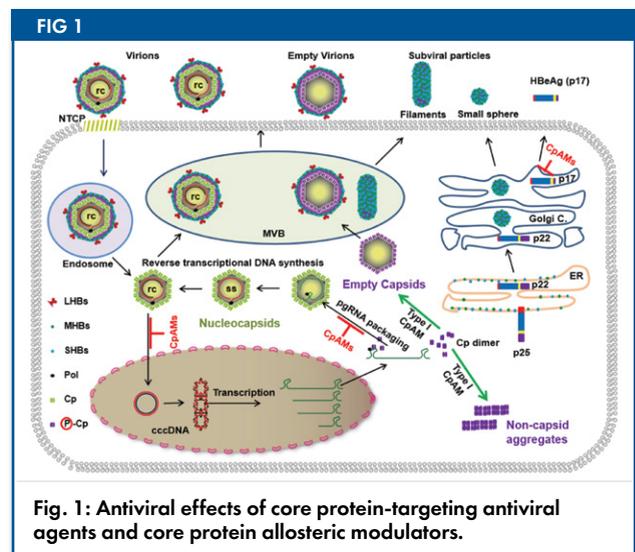
### Guo Lab highlights ▼

The focus of the Blumberg Institute's research into the hepatitis B virus (HBV) is the highly productive laboratory of **Ju-Tao Guo, MD**, senior vice president, chief scientific officer and W. Thomas London Distinguished Professor.

**Therapeutic reduction or elimination of subviral particles (SVPs)** is considered to be essential for the restoration of antiviral immune response against HBV and the functional cure of chronic hepatitis B. In 2022, Dr. Guo and his team continued work to uncover the mechanism of hepatitis B SVP biogenesis and discovery of small molecular compounds that inhibit SVP assembly and secretion. In collaboration with Dr. Jinhong Chang's laboratory, the scientists used high-throughput screening to discover several compounds that suppress the production of SVPs. Now, they are investigating the compounds' mode of action.

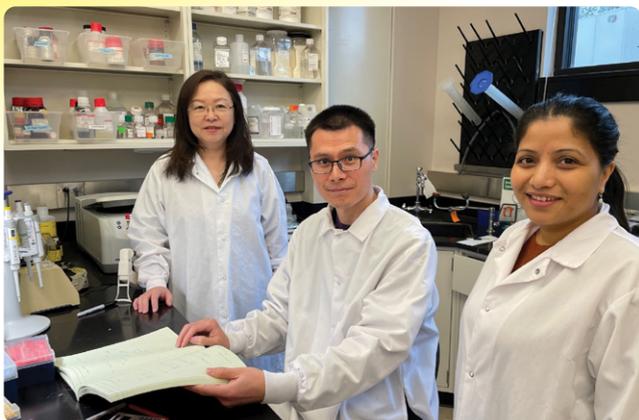
**HBV core (capsid) protein** participates in almost every step of HBV replication, and pharmacological targeting of the multifunctional core protein by core protein allosteric modulators (CpAMs) has been shown by the Guo lab and others to inhibit the assembly of nucleocapsids and viral genomic DNA replication. It also disrupts mature nucleocapsid disassembly and cccDNA synthesis and inhibits e antigen (HBeAg) secretion. In collaboration with Dr. Yanming Du's lab, Dr. Guo's team is searching for novel core protein-targeting compounds for efficient induction of core protein/capsids degradation and facilitate the recovery of host antiviral immunity for the cure of chronic hepatitis B (see Fig. 1).

**Covalently closed circular DNA (cccDNA)** is the most stable HBV replication intermediate and the source of viral replication rebound after secession of antiviral therapy. Dr. Qiong Zhao, an assistant professor in the Guo lab, established a pregenomic RNA launch HBV replication system for investigating the mechanism of cccDNA biosynthesis and transcriptional silencing/activation by host cellular and viral factors. In collaboration with GeneLancet Biosciences Inc., Dr. Zhao is currently developing a novel CRISPR/Cas technology for efficiently qelimination of cccDNA.



## Chang Lab highlights ▼

Blumberg Institute scientists, led by **Jinhong Chang, MD, PhD**, have discovered a new type of small molecule, direct-acting antiviral drug that has demonstrated effectiveness against yellow fever in a series of lab studies.



▲ Jinhong Chang, MD, PhD (left); Fuxuan Wang (center), PhD; and Sumangala Darsandhari, PhD

There is no cure or treatment for yellow fever, a mosquito-borne disease caused by a virus found mostly in Africa and South America. An estimated 1.7 million adults and children are infected annually, with up to 170,000 severe cases and 29,000 to 60,000 deaths every year, the WHO says.

Working with **Ju-Tao Guo, MD**, senior vice president, and Yanming Du, PhD, professor and director of medicinal chemistry, Dr. Chang, professor of molecular virology and antiviral research, discovered the potential therapeutic for yellow fever while searching for broadly active antiviral drugs.

Using high-throughput screening, Dr. Chang and Dr. Guo, with their teams, assessed more than 27,000 compounds before identifying one that showed some effect against dengue. Their further analysis showed that the compound was extremely effective against yellow fever with an unprecedented mode-of-action. Structure optimization subsequently was performed on the compound by Dr. Du's team to generate a promising lead candidate.

Dr. Chang says there is a pressing medical need for a yellow fever antiviral drug and an increasing potential for a global epidemic of yellow fever in non-endemic, unvaccinated countries due to international travel and widespread existence of mosquito carrying yellow fever worldwide.

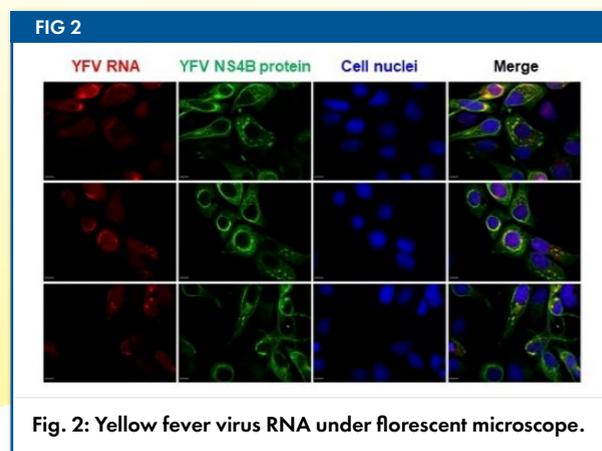


Fig. 2: Yellow fever virus RNA under florescent microscope.

## Pestell Lab highlights ▼

**Prof. Richard Pestell, MD, PhD, FACP, FRACP, MBA**, and his team continue making progress on several fronts with research into cancer onset and progression, biomarkers and therapies.

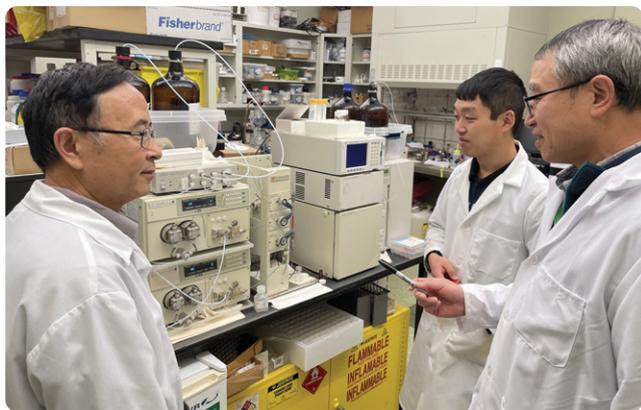
Dr. Pestell and his team published in *Breast Cancer Research*, *International Journal of Molecular Sciences*, *Frontiers in Cell and Developmental Biology*, *Lancet Public Health*, *Journal of Clinical Investigation* and other scholarly journals.

The team received two major grants: a subcontract of sponsored research from Ecogenome into "Precision Theragnostics for Prostate Cancer" totaling \$1,240,360 and a federal grant to research into "Improving Outcomes in Cancer Treatment-Related Cardiotoxicity," which provides \$650,000 over two years.

Two biotechnology companies were formed out of the Pestell lab last year. EcoGenome Biotechnology completed seed round of funding with more than \$2 million. StromaGenesis completed asset acquisitions and initiated A round funding. Dr. Pestell received two major honors in 2022: he was elected to the Royal College of Physicians (London) and the Royal College of Physicians (Ireland). And the academic front, 50 medical students received training in the Pestell lab over the past 18 months.

## Du Lab highlights ▼

**Yanming Du, PhD**, professor and director of medicinal chemistry, engaged in a variety of research projects in 2022.



▲ Yusheng Wu, PhD (left), Zhengyuan Jiang, MS (center) and Yanming Du, PhD

**Hepatitis B is the focus of three projects.** One involves studying hepatoselective dihydroquinolizone for reduction of hepatitis B surface antigen reduction with improved safety. Another, working with Ju-Tao Guo, MD, involves novel capsid assembly modulators with de-assembling functions. And a lead compound the team is investigating showed a good pharmacokinetics profile with a single daily for oral that demonstrated in vivo efficacy in a hydrodynamic HBV mouse model (see Fig. 3). A third project, in collaboration with University of North Carolina scientists, is studying the use of proteolysis-targeting chimera (PROTAC) against both hepatitis B and hepatitis A.

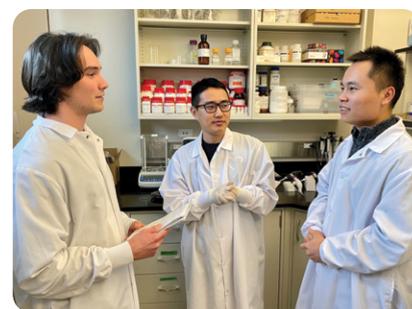
The team in Dr. Du's lab also discovered some liver-targeting compounds that are active against hepatitis A virus infection, for which there are no medicinal treatments. The researchers also invented a PROTAC that is the first active in HBV field with small molecules that clearly showed degradation of enzyme PAPD 5.

## Tang Lab highlights ▼

**Liudi Tang, PhD**, a postdoctoral researcher working at Evrys Bio with Dr. Thomas Shenk, joined the Blumberg Institute faculty last year as an assistant professor of experimental therapeutics and principal Investigator.

Dr. Tang, a virologist with a particular focus on the hepatitis B virus, earned his doctorate in 2019 from Drexel University College of Medicine.

After setting up his new lab last spring, Dr. Tang hired Andrew Snedeker as junior research fellow and Liren Sun as research associate. The team is conducting exploratory research on selective expression of neo-antigen in HBV-infected cells.



▲ Andrew Snedeker, Liren Sun and Liudi Tang, PhD

FIG 3

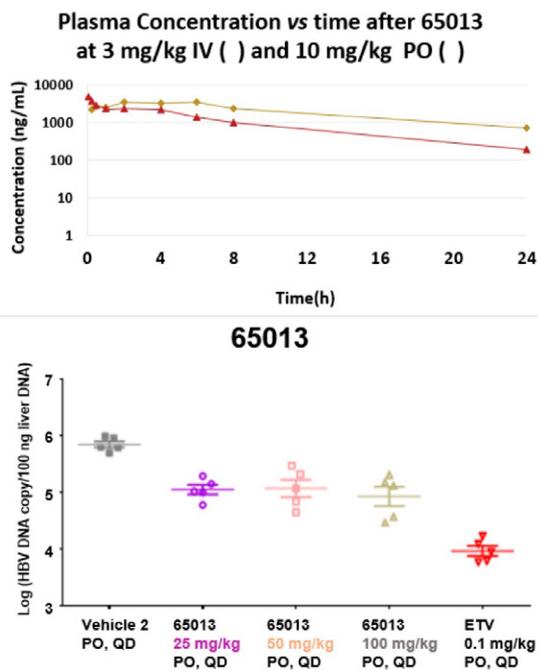


Fig. 3: The pharmacokinetic profile and efficacy in HBV virus DNA reduction of a lead compound that is useful for hepatitis B treatment.

In cancer, Dr. Du is working with scientists at the University of Texas at San Antonio on RAD52 inhibitors usage for treating triple negative breast cancer. And the Du lab team is contributing to the Blumberg Institute's research on yellow fever.

**The lab obtained a Small Business Technology Transfer grant** last year from the National Institute of Allergy and Infectious Diseases for \$300,000 and Dr. Du collaborated on three patent applications. And three college students, including one from the U.S. Naval Academy, worked as interns in the Du lab last summer.

# Thank You to Our Donors



The Hepatitis B Foundation's valuable research and programs are made possible by the commitment of our donors. We are grateful to every individual and organization that has generously supported our mission to find a cure and improve the quality of life for those affected by hepatitis B.

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# Run 4 Hep B: Five runners raise funds for us at the TCS New York City Marathon

We were thrilled to be selected this year as an Official Charity Partner of the TCS New York City Marathon.

As such, the Hepatitis B Foundation was given five entries for the 2022 marathon to be used exclusively for fundraising purposes. For charity runners, a minimum fundraising amount of \$3,000 was required for each "RUN 4 HEP B" team member to be raised through individual fundraising efforts.

The Foundation's own Catherine Freeland, MPH, PhD(c), our associate director of public health research, was the first to sign on. She quickly was joined by Aaron Rak, Stephen Hirschmann, Axel Tismer and Aaron Pelz.

The "Run 4 Hep B" team ran in the N.Y.C. marathon, the largest in the world, which features a 26.2-mile course through all five boroughs: Manhattan, Brooklyn, Staten Island, Queens and the Bronx. Along with the amazing accomplishment of finishing the race, the runners raised \$20,000 for the Hepatitis B Foundation.

With great success in 2022, we plan to grow our team into the future, and will be looking for more runners in 2023!

➔ To learn more about the runners, please visit [www.hepb.org/nyc-marathon](http://www.hepb.org/nyc-marathon).



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*Thank you*

**TO OUR MANY IN-KIND DONORS WHO ARE TOO NUMEROUS TO MENTION.**

*We apologize in advance for any errors or omissions in our Donor List despite our best efforts to be as accurate as possible. Please email [editor@hepb.org](mailto:editor@hepb.org) or call (215) 489-4900 so that we can print corrections in our next newsletter. Thank you for understanding.*

# What's Next?

Supporters like you are the driving force behind all the success of the Hepatitis B Foundation and Baruch S. Blumberg Institute. With everything you just read about, you may be thinking, “What’s next? What can I do in 2023?”

## Stay in Touch

- Join our mailing list by clicking “Subscribe” on our homepage at [www.hepb.org](http://www.hepb.org).
- Register to be informed of upcoming events at [events@hepb.org](mailto:events@hepb.org).
- Check out the Hepatitis B Foundation’s annual gala at [www.hepbgala.org](http://www.hepbgala.org).

## Volunteer

Would you like to be more involved?

- For individual, peer-to-peer and corporate fundraising opportunities, email [Jean.Holmes@hepb.org](mailto:Jean.Holmes@hepb.org).
- For advocacy opportunities, email [info@hepb.org](mailto:info@hepb.org).

## Ways to Give

- One time gift: [www.hepb.org/donate](http://www.hepb.org/donate)
- “Set it and forget it” with the Champions club! Monthly giving ensures that we always have resources to support people living with hepatitis B and D and liver cancer: [www.hepb.org/champions](http://www.hepb.org/champions)
- Do you have a Donor Advised Fund (DAF)? The Hepatitis B Foundation and Baruch S. Blumberg Institute are able to receive funds from DAFs. Learn more at [www.hepb.org/donate/what-is-a-donor-advised-fund](http://www.hepb.org/donate/what-is-a-donor-advised-fund).
- Giving appreciated stock is one of the smartest ways to give: [www.hepb.org/givestock](http://www.hepb.org/givestock)
- Planned giving is a way to give to give much more than you thought you could: [www.hepb.org/donate/planned-giving](http://www.hepb.org/donate/planned-giving)
- Matching gifts: ask your employer if they will match your donation. Many employers will double or even triple your giving!
- Are you a runner? Join #TeamHepB by emailing [TeamHepB@HepB.org](mailto:TeamHepB@HepB.org)
- Donate your car by calling 855-500-RIDE (7433).

Thank you for your consideration!

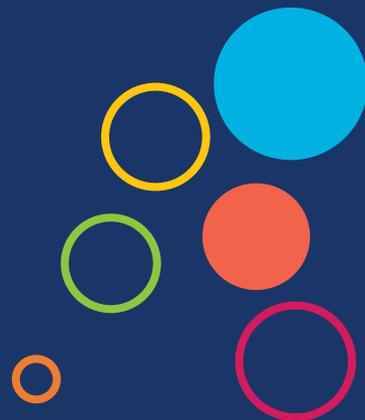
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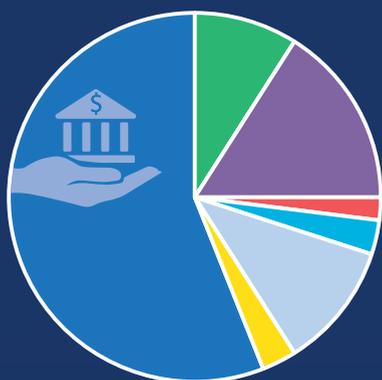
# Year in Review

## Financial Information\*

COMBINED HEPATITIS B FOUNDATION  
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FOR THE FISCAL YEAR ENDED JUNE 30, 2022

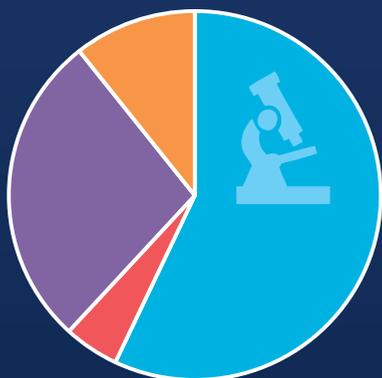


### Source of Funds



<b>56%</b>	<b>Grants</b>	<b>\$5,424,627</b>
<b>9%</b>	Charitable contributions <sup>***</sup>	822,375
<b>16%</b>	Management fees	1,503,511
<b>2%</b>	Special events	176,098
<b>3%</b>	Research Meeting	327,749
<b>11%</b>	Other Revenue	1,061,827
<b>3%</b>	Investment income <sup>**</sup>	293,496
<b>Total Revenue</b>		<b>\$9,609,843</b>

### Use of Funds



<b>57%</b>	<b>Research</b>	<b>\$ 5,776,365</b>
<b>5%</b>	Outreach and Education	487,117
<b>28%</b>	Support Services	2,784,878
<b>10%</b>	Rent and Depreciation	1,080,459
<b>Total Expenses</b>		<b>\$10,128,819</b>

\* The financial information presented above does not include the activity from Hepatitis B Foundation's ownership of the net assets of the Pennsylvania Biotechnology Center. At June 30, 2022, this interest was valued at, based on the equity method of accounting, approximately **\$10,145,356** per the audited Statement of Financial Position of the Hepatitis B Foundation.

\*\* The financial information presented above excludes unrealized investment related activities.

\*\*\* Excludes in-kind donations

\*\*\*\* **Baruch S. Blumberg Institute** is the research institute established by the Hepatitis B Foundation in 2004.

The financial information in this report was prepared by management and presented in condensed form from the financial statements of the Hepatitis B Foundation and the Baruch S. Blumberg Institute audited by EisnerAmper, LLP for the year ended June 30, 2022. A copy of each financial statement is available upon request.

The Hepatitis B Foundation (HBF) was established in 1991 and remains the nation's only nonprofit organization solely dedicated to finding a cure for hepatitis B and improving the quality of life for those affected worldwide through research, education and patient advocacy. The HBF established the **Baruch S. Bloomberg Institute** in 2003 as an independent, nonprofit research institute to fulfill its research mission. It was named to honor our co-founder Dr. Baruch S. Bloomberg, who was awarded the Nobel Prize for his discovery of the hepatitis B virus.

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 3805 Old Easton Road  
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