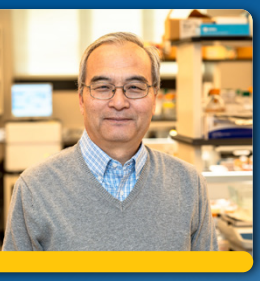
HEPATITIS B FOUNDATION | Baruch S. BLUMBERG INSTITUTE

2023 ANNUAL REPORT

ELEVATING THE VOICES OF HEPATITIS B



A YEAR OF SUCCESS: CHANGING LIVES LOCALLY AND GLOBALLY

As I write this, I am putting the finishing touches on the new Hepatitis B Foundation 2024-2028 strategic plan. As anyone who has ever done strategic planning knows, it can be an overwhelming and time-consuming exercise. But I have found the experience to be very worthwhile. It allowed us to assess our progress and impact, and think boldly about exciting new ways we can meet our mission.

As I look back on 2023, I am in awe of all that this small but mighty team has accomplished.

In 2023, we expanded our **#justB** and **#BtheVoice** storytelling programs, adding more than 30 new storytellers from Taiwan, the Philippines and the U.S. Their videos, posted at **www.hepbstories.org**, are elevating the voices of people living with hepatitis B. They describe struggles with anxiety, discrimination, stigma and accessing appropriate medical care. They also describe the beauty of lives full of love and support from family and friends. It is a privilege to work with hundreds of storytellers and advocates around the world. Together, we are giving a voice to the lived experiences of millions and inspiring people and government leaders around the world to take action.

One of the things I find most gratifying about our work at the Hepatitis B Foundation is that we strategically conduct diverse programs that align for significant impact. For example, in Delta State Nigeria, we developed a public health model to improve birth dose administration of hepatitis B vaccine towards preventing mother-to-child transmission. We also trained new storytellers and advocates, and provided capacity building to small community groups to conduct local education, screening and linkage to care. And we documented local discrimination through our **Discrimination Registry**. In 2023, we were able to combine the results of these programs for a historical win: In Delta State, Nigeria, because of the work we led, hepatitis B screening is now free for all pregnant people, and hepatitis B is now included in the anti-discrimination protection law. These changes will improve and save lives, and protect the next generation from hepatitis B infection. This experience allowed us to build a model that can now be used to make this kind of change happen across the globe – we just need the resources to do it!

In the U.S. in 2023, we expanded our programs to build capacity among our Hep B United partners nationwide.

Our new **Community Clinic Learning Collaborative** is helping clinic providers working in highly impacted U.S. communities improve their hepatitis B programming. And we hosted our 2023 **Hep B United Summit**, in person for the first time since the pandemic, for 100 partners! Through our **advocacy program**, we made 82 Legislative visits and sent 174 comments to Congress advocating for increased prioritization of hepatitis B research and programming.

We secured increased support for hepatitis B and liver cancer in the Congressional and President's FY24 budget.

Our efforts led to National African Immigrant HIV and Hepatitis Awareness Day in September becoming federally recognized by Congress! And we rounded out our year with the news that CVS Health, the largest pharmacy benefit manager in the U.S., was adding Vemlidy back onto their formulary, improving access to this medication for thousands of people. It is so gratifying when our advocacy efforts succeed!

There are many more programs to share, of which we are particularly proud. Last year, we launched the B Informed **Training Hub**, which is training thousands of individuals to become health educators. Our **Hepatitis B ECHO** program provided training for over 400 clinicians, to help them manage patients with hepatitis B and D. We launched new **train-the-trainer** and community health education materials in 10 languages. We expanded our program with the FDA to improve clinical trial access for people living with hepatitis B around the world. And we hosted the first-ever Emerging Scientists Workshop, where almost 100 early career scientists came together to discuss the most pressing scientific needs in hepatitis B, D and liver cancer.

We continue as the only nonprofit organization working to find a cure and improve the lives of those with hepatitis B and D.

When there is a need somewhere in the world, some challenge that needs to be addressed, we are the ones called upon. Whether it is helping one person find a resource to pay for their medication, or changing federal policy, we are there. That is our mission, and our passion. From all of us, we thank you for being in this together with us. Thank you for your generous support, your brave voices and your partnership.

All my best,

Chari Cohen, DrPH, MPH
President of the Hepatitis B Foundation

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Policy & Advocacy

EFFECTIVE WORK BY OUR POLICY AND ADVOCACY TEAM

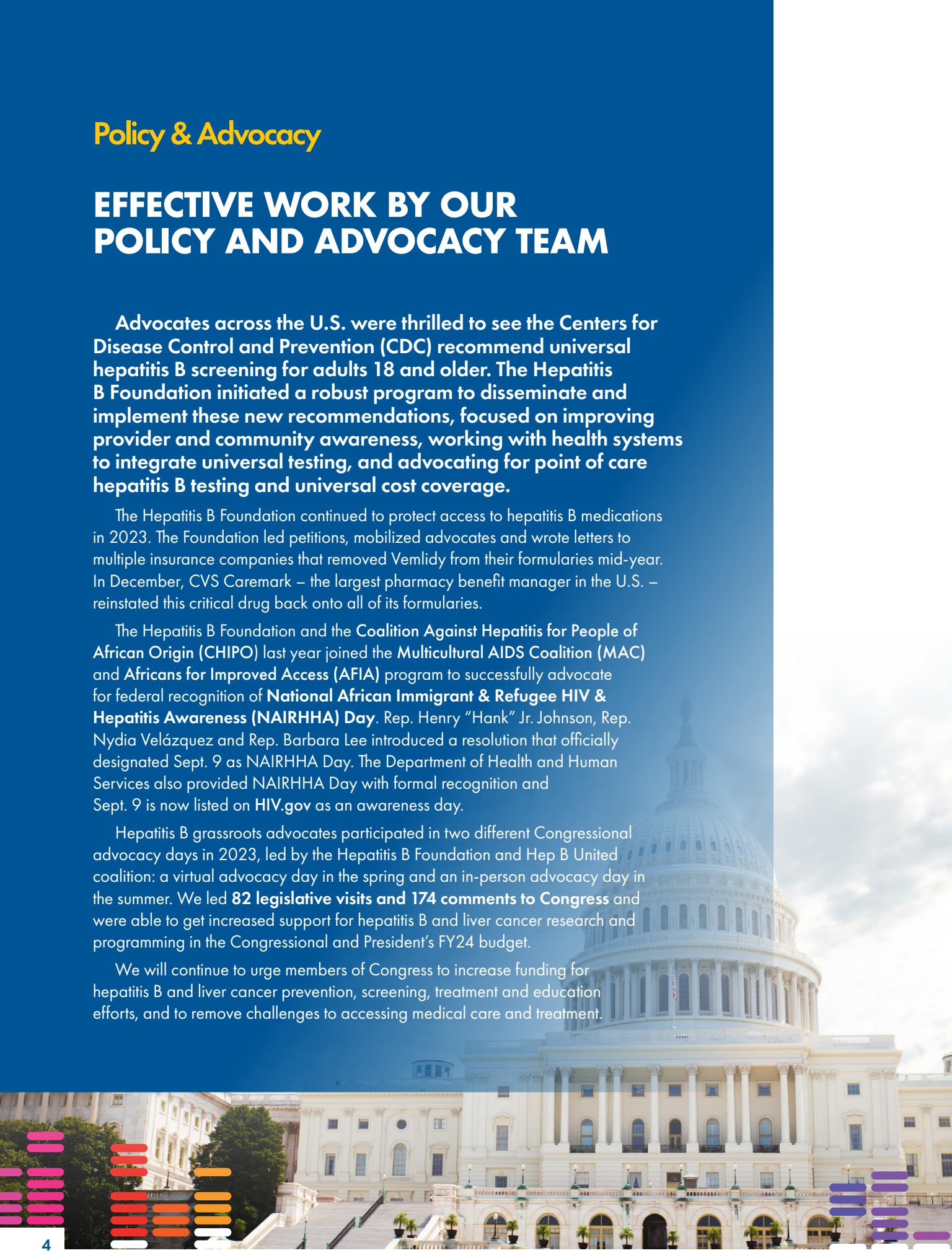
Advocates across the U.S. were thrilled to see the Centers for Disease Control and Prevention (CDC) recommend universal hepatitis B screening for adults 18 and older. The Hepatitis B Foundation initiated a robust program to disseminate and implement these new recommendations, focused on improving provider and community awareness, working with health systems to integrate universal testing, and advocating for point of care hepatitis B testing and universal cost coverage.

The Hepatitis B Foundation continued to protect access to hepatitis B medications in 2023. The Foundation led petitions, mobilized advocates and wrote letters to multiple insurance companies that removed Vemlidy from their formularies mid-year. In December, CVS Caremark – the largest pharmacy benefit manager in the U.S. – reinstated this critical drug back onto all of its formularies.

The Hepatitis B Foundation and the **Coalition Against Hepatitis for People of African Origin (CHIPO)** last year joined the **Multicultural AIDS Coalition (MAC)** and **Africans for Improved Access (AFIA)** program to successfully advocate for federal recognition of **National African Immigrant & Refugee HIV & Hepatitis Awareness (NAIRHHA) Day**. Rep. Henry "Hank" Jr. Johnson, Rep. Nydia Velázquez and Rep. Barbara Lee introduced a resolution that officially designated Sept. 9 as NAIRHHA Day. The Department of Health and Human Services also provided NAIRHHA Day with formal recognition and Sept. 9 is now listed on **HIV.gov** as an awareness day.

Hepatitis B grassroots advocates participated in two different Congressional advocacy days in 2023, led by the Hepatitis B Foundation and Hep B United coalition: a virtual advocacy day in the spring and an in-person advocacy day in the summer. We led **82 legislative visits and 174 comments to Congress** and were able to get increased support for hepatitis B and liver cancer research and programming in the Congressional and President's FY24 budget.

We will continue to urge members of Congress to increase funding for hepatitis B and liver cancer prevention, screening, treatment and education efforts, and to remove challenges to accessing medical care and treatment.



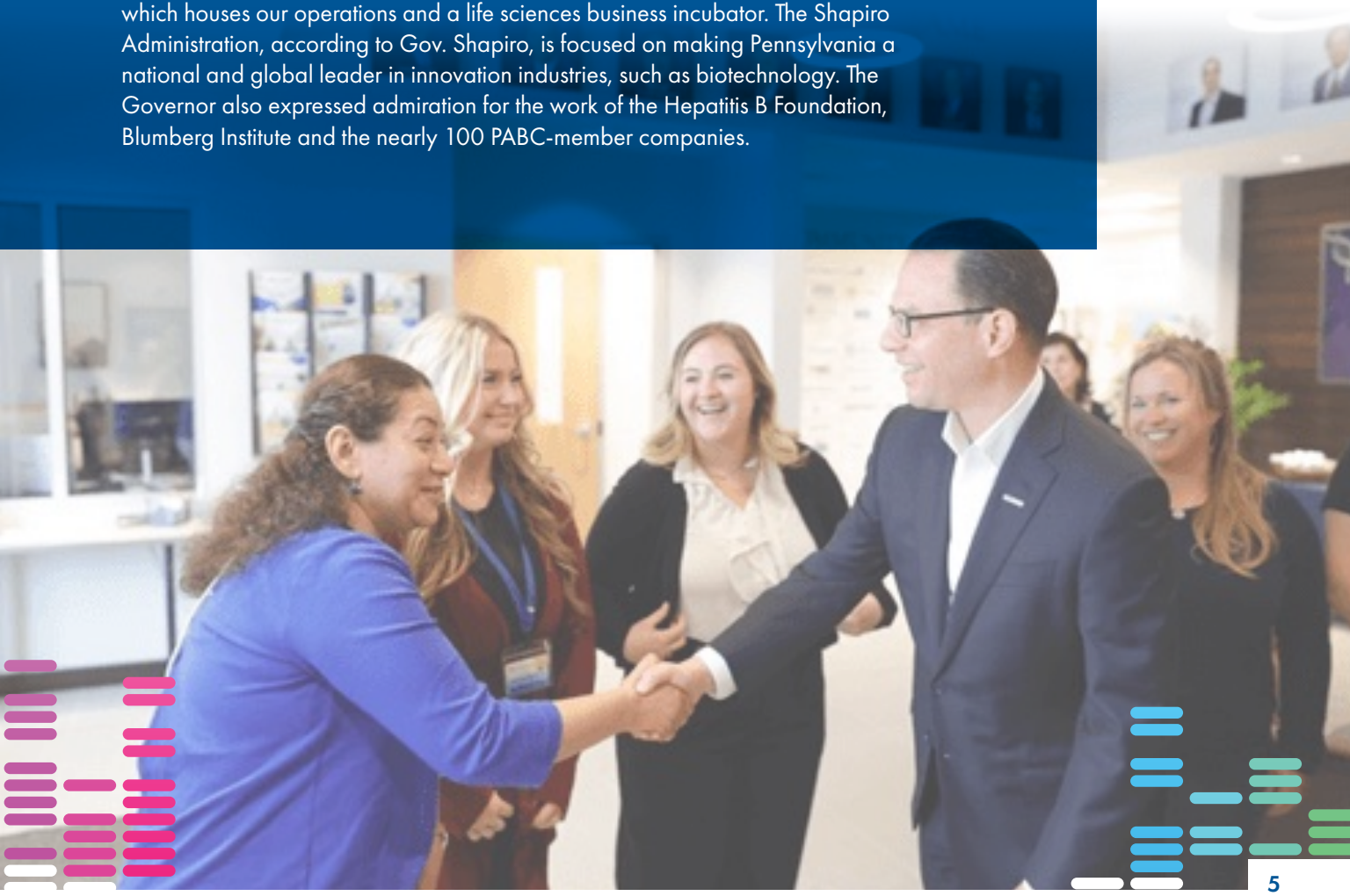
Policy & Advocacy

GOV. SHAPIRO VISITS OUR NEW HOME

Pennsylvania Gov. Josh Shapiro visited our campus in Doylestown on April 27, 2023, to speak with our leadership and staff, along with key CEOs and other professionals in the biotech industry.

Hepatitis B Foundation Co-founder and Board Chair Dr. Timothy Block (left) talking with Gov. Shapiro (2nd from left), Hepatitis B Foundation President Dr. Chari Cohen (right) and Blumberg Institute President Dr. Randall Hyer (center).

The Governor learned about the **Hepatitis B Foundation** and its research arm, the **Blumberg Institute**. He also toured the **Pennsylvania Biotechnology Center,** which houses our operations and a life sciences business incubator. The Shapiro Administration, according to Gov. Shapiro, is focused on making Pennsylvania a national and global leader in innovation industries, such as biotechnology. The Governor also expressed admiration for the work of the Hepatitis B Foundation, Blumberg Institute and the nearly 100 PABC-member companies.



2023 Gala

THE HEPATITIS B FOUNDATION'S ANNUAL GALA, A CELEBRATION OF SUCCESSES AND SPECIAL PEOPLE

Every spring, the Hepatitis B Foundation holds its annual Gala to celebrate some of the prior year's successes, honor a few select individuals who have made major contributions that support our mission and raise funds to support our work.

From left, Foundation Co-founder Joan Block, President Chari Cohen, Co-Founder Jan Witte, and friends Suzanne Crilley and Craig Garretson.

More than 240 of the Foundation's most loyal supporters attended the 2023 Gala, held March 10 in Warrington, Pa. Our two major awards were presented to **Stephan Urban, PhD**, and **Su Wang, MD, MPH, FACP**.

Chari Cohen and Community Leadership Award winner Dr. Su Wang.

Dr. Wang, who is a dedicated physician and advocate, received the Foundation's 2023 Community Commitment Award. She is the medical director of Viral Hepatitis Programs and the Center for Asian Health at Cooperman Barnabas Medical Center in Livingston, N.J. Dr. Wang is a practicing internist and also living with hepatitis B, having been diagnosed when she donated blood in college.

Tim Block and Blumberg Prize winner Dr. Stephan Urban.

Prof. Urban, a distinguished professor and globally recognized virologist at Heidelberg University Hospital in Germany, received the 2023 Baruch S. Blumberg Prize. He and his team developed bulevirtide (brand name Hepcludex), a new and effective first-in-class drug approved in Europe to treat hepatitis D, which is a serious coinfection that only exists in combination with hepatitis B.

www.hepbgala.org

Accolades

NOBEL PRIZE TO A BLUMBERG DISTINGUISHED SPEAKER

One of the Blumberg Institute's shining jewels is the Distinguished Speaker Seminars series, which brings to campus some of the world's top scientists working on hepatitis B and D, other liver diseases and associated research challenges.

Hildegund Ertl, MD, professor in the Vaccine & Immunotherapy Center at the Wistar Institute, spoke at the Blumberg Institute on July 6, 2023.

The 2023 list of presenters was stronger than ever, including **Hildegund Ertl, MD**, professor at the Wistar Institute; **Dr. Jun Wang**, associate professor at Rutgers University; **Dr. Patrick Kennedy** with Barts Health NHS Trust; and **Dr. John A. McCauley**, senior director in medicinal chemistry at Merck.

Dr. Drew Weissman, the Roberts Family Professor of Vaccine Research at the University of Pennsylvania, delivered the Distinguished Speaker Seminar at the Blumberg Institute on March 24, 2022.

Dr. Drew Weissman (right, with necktie) presenting on March 24, 2023, a the Blumberg Institute.

Less than seven months later, **Dr. Weissman** was awarded the 2023 Nobel Prize in Medicine or Physiology, along with **Katalin Karikó, PhD**, adjunct professor of neurosurgery at the University of Pennsylvania.

Randall N. Hyer, MD, PhD, MPH, president of the Blumberg Institute, said: "Congratulations, Dr. Karikó and Dr. Weissman. The Blumberg Institute salutes your pioneering, lifesaving contribution to humanity. We need more people like you!"

The Blumberg Distinguished Speaker Seminars are open to all and most are available via Zoom. **The schedule is posted on** www.blumberginstitute.org.

Outreach

#justB STORYTELLING CAMPAIGN, A VISUAL PLATFORM FOR PEOPLE LIVING WITH HEPATITIS B

The Hepatitis B Foundation partnered with StoryCenter to produce seven new #justB storytelling videos in 2023 featuring people impacted by hepatitis B and D.

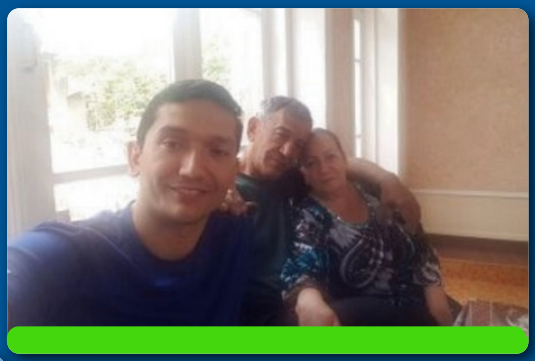
Julie and her husband adopted a daughter from Vietnam who was diagnosed with hepatitis B. After years of treatment, her daughter achieved a "functional cure." After her husband's death, Julie found support through the Hepatitis B Foundation, and shared her story of hope.

LM's brother Timothy became ill and died from hepatitis B. She now looks after Timothy's children and teaches them about the disease. **She is passionate about educating her community about hepatitis B.**

After graduating from college, **"PMF"** was accepted into a Master of Nursing program, but discovered he had hepatitis B during health checks. **When the nursing school threatened to revoke his acceptance, he wrote an essay defending his position, and he was ultimately admitted to the program.**

#justb video library www.hepbstories.org/justb

Rav was diagnosed with hepatitis B at an early age. After moving to Canada, he was diagnosed with liver cirrhosis and hepatitis D co-infection. He is now waiting for new treatment options. **Rav is passionate about educating communities and supporting efforts to find better treatments.**



An emergency room worker, **Rebekah** draws on her experiences supporting her father during his hospitalization for hepatitis B. Rebekah now cares for her patients in the same way her father cared for her. **She connects with and supports patients and their families through challenging times.**

Tahibatou and her brother planned to leave Togo for the United States, but her brother was diagnosed with hepatitis B, preventing them from emigrating together. **She is now educating African communities in the U.S. about hepatitis B.**

Zaya's blood test at a health fair in her community came back positive for hepatitis B and D due to the lack of proper vaccination in her hometown in Mongolia. **She aims to learn more about the viruses to help her family and fellow Mongolians and prevent future infections.**

Attending a #justB digital storytelling workshop is a unique and uplifting experience that brings together people directly affected by hepatitis B in a supportive, small group environment of 10 or less participants. That allows them to share openly about their experiences while learning to create short videos or "digital stories" in their own words.

THE #JUSTB CAMPAIGN OFFERS STORIES THAT HAVE BEEN TRANSLATED AND PUBLISHED IN 14 LANGUAGES: ENGLISH, MANDARIN, CANTONESE, VIETNAMESE, KOREAN, ARABIC, FRENCH, MANDINGO, TWI, YORUBA, TAGALOG, KHMER, MONGOLIAN, AND CHUUKESE.

Outreach

B HEPPY: OUR PODCAST KEEPS BUILDING A LOYAL AUDIENCE

As the podcast craze began to build three years ago, a creative and energetic member of the Hepatitis B Foundation public health team proposed we start a podcast. Now nearly 50 episodes later, *B Heppy* has built a loyal following.

The podcast is co-hosted by Anousha, Foundation public health program coordinator, and **Bright**, one of our most active **#justB** storytellers. Hundreds of people listen to most installments, which are available through our website and on Spotify Podcasts, Apple Podcasts, and Overcast. But the most popular is one of the first, featuring a conversation in August 2021 about **"Progress on the Hepatitis B Cure"** with **Dr. Tim Block**, co-founder and former longtime president of our Foundation.

Dr. Block explained that scientists believe they need to **"jump start a person's immune system"** to treat hepatitis B. **"It burrows inside cells unlike hepatitis C, which is only cytoplasm,"** Dr. Block said, making the hepatitis B virus a far more difficult challenge than hep C.

More than 1,500 people have listened to that insightful interview, which gives a realistic but hopeful assessment of work toward developing a cure for hepatitis B. A similar conversation, in July of 2023 with **Dr. John Tavis**, director of Saint Louis University's Institute for Drug and Biotherapeutic Innovation, provides an equally informative and recent picture of work toward a drug, or combination therapies, that have the potential to cure hepatitis B.

Another episode worth your time is, "The history of the Hepatitis B Foundation and Hep B 101." It features **co-founders Jan Witte and Joan Block** with **Chari Cohen**, president of the Foundation.

B Heppy is a podcast aimed to inform and help individuals living with hepatitis B through discussing various topics related to hepatitis B. You'll hear from other people who are living with hepatitis B, doctors, scientists, and public health professionals as we tackle new topics every episode. **Please give it a listen and send your ideas for future topics to info@hepb.org.**

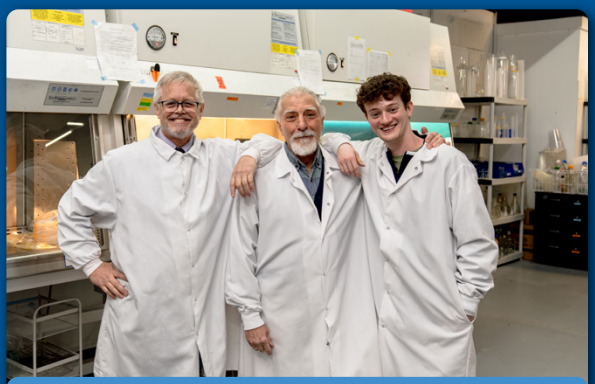
B Heppy library https://bheppy.buzzsprout.com

Outreach Stats

- **Consults:** 5,000
- **Website visits:** 3 million
- **Social media followers:** 81,400
- **Facebook reach:** 2.4M [17.3% increase]
- **YouTube views:** 62,200

EDUCATION PROGRAMS AT THE BLUMBERG INSTITUTE

A key element of the Barch S. Blumberg Institute's mission is to "advance research discoveries through traditional scholarship and education opportunities."



Scott Willett, PhD (left), Pat Romano, PhD (center), and Kevin Gerbrick (right)

Students in our teaching lab at work during the two-week summer High School Science Enrichment program

In partnership with the Hepatitis B Foundation, the Blumberg Institute conducts a 10-week college internship program each summer. Again in 2023, the program was highly competitive. After an intensive interview process, the Institute's team selected interns from the University of Pittsburgh, Rutgers' Honor College and Carnegie Mellon. Six other college interns worked on campus last summer at companies in the **Pennsylvania Biotechnology Center (PABC)** incubator.

The nine students work alongside faculty and company researchers in state-of-the art laboratories. Along with the hands-on experience gained, students also attend **Distinguished Speaker Seminars**, group lunches with guest speakers and participated in our intensive **Entrepreneur Bootcamp**, a "Shark-Tank" style event.

The Foundation and Institute also host a **High School Science Enrichment** program every year for rising seniors seeking to **gain experience in biotechnology, public health and biomedical research in hepatitis B and liver cancer**. During the two-week experience, area students work in our teaching lab guided by senior Blumberg scientists.

Also at the high school level, throughout the school year, 29 students from the Central Bucks School District take AP Chemistry onsite at the PABC. Aside from their classwork, and working in our teaching lab, students conduct research in Blumberg and PABC company labs. Now in year six, the program's students have won top honors at the Regeneron International Science and Engineering Fair, Delaware Valley Science Fair, Bucks County Science Research Competition and others.

Both high school programs receive major funding from the local **Fred Beans Automotive Group** through the Pennsylvania Educational Improvement Tax Credit (EITC) Program. Other companies contributing through EITC are **Univest**, **Softerware**, **Customers Bank**, **Mid Penn Bank**, **Waste Management** and **Weis Markets**.

Community Forum

MAKING A GREAT CONFERENCE BETTER: ENHANCEMENT TO THE INTERNATIONAL HBV MEETING

The Hepatitis B Foundation, coordinated the highly successful 2023 International HBV Meeting, held last September in Kobe, Japan, which is the only scientific conference dedicated to research into the hepatitis B virus (HBV).

Nearly **500 scientists** and other professionals from **28 countries** participated in person and online this year. Our team has coordinated the conference every year since 2005, except for 2020, when COVID-19 forced a cancellation.

Prior to the many research-focused presentations on the program, the event started with the **HBF and ICE-HBV Community Forum** led by **Chari A. Cohen, DrPH, MPH**, president of the Hepatitis B Foundation. The Forum, which was first held at the 2019 meeting in Melbourne, allows people living with hepatitis B and caregivers to share their challenges, concerns and triumphs with the scientists who are working on HBV.

Our team in Kobe (from left): Ying-Hsiu Su, PhD; Chari Cohen, DrPH, MPH; Randy Hyer, MD, PhD, MPH; Ju-Tao Guo, MD; Qiong Zhao, PhD; Luidi Tang, PhD.

Chari A. Cohen, DrPH, MPH, president of the Hepatitis B Foundation, opened the Emerging Scientists Symposium.

The 2023 meeting included the first-ever **Young Scientists Symposium**. The well-attended session allowed early stage researchers to become acquainted with each other and discuss key topics and priorities for those working in the field of hepatitis B and D.

Many globally prominent scientists have participated in the meeting over the years, including Nobel Laureates **Harold Varmus, PhD**, one of the meeting's co-founders, and **Harvey Alter, MD**, who is credited with discovering the hepatitis C virus, along with **Michael Houghton, PhD**, and **Charles Rice, PhD**. A key contributor at every International HBV Meeting has been **Timothy M. Block, PhD**, one of the top experts on the hepatitis B virus. He is co-founder and former president of the Hepatitis B Foundation and chair of its Board of Directors.

FIRST POST-PANDEMIC HEP B UNITED SUMMIT EXCEEDED EXPECTATIONS

Hep B United, a national coalition established by the Hepatitis B Foundation and the Association of Asian Pacific Community Health Organizations (AAPCHO) to help eliminate hepatitis B in the U.S., hosted its 11th annual Summit in Washington, D.C., July 24-25.

Chari A. Cohen, DrPH, MPH, (left) with Rep. Henry "Hank" Johnson (center) and Jeffery Caballero, MPH, executive director of AAPCHO, on Capitol Hill during Hep B United's July 24-25 Summit.

Held in-person for the first time in four years due to COVID-19, the Summit brought together nearly 100 **community leaders, advocates, clinicians, federal partners and people living with hepatitis B** to discuss strategies and challenges towards eliminating hepatitis B in the U.S.

Participants discussed innovative local and national programs to prevent, diagnose and treat hepatitis B. Discussions focused on strategies to disseminate and implement the new universal adult hepatitis B testing and vaccination recommendations, while also ensuring that we continue to work towards addressing hepatitis B and liver cancer related health disparities among disproportionately impacted communities. Summit participants identified critical needs for improving the hepatitis B care cascade in the U.S. This includes the need for point-of-care testing for hepatitis B and hepatitis delta, increased access to vaccine, capacity building and support for disseminating and publishing community-based data, and enhanced training and support for patient navigators. The Summit also featured people living with hepatitis B, to discuss the role of storytelling in increasing public awareness and combatting stigma and discrimination.

Hepatitis B Foundation President **Chari A Cohen, DrPH, MPH**, said, **"This was an ideal way to commemorate World Hepatitis Day, and an opportunity to spotlight the needs of people living with hepatitis B, and generate action towards prioritization hepatitis B, hepatitis D and liver cancer as urgent health priorities."**

During the Summit, HBU hosted a Community Reception, and were honored to have opening remarks made by the **Honorable Hank Johnson**, from Georgia's Fourth Congressional District, co-chair of the Hepatitis Caucus, and supporter of Hep B United's vision of a **future free of hepatitis B**.

HBU also conferred **Leadership Legacy Awards** for outstanding contributions to communities impacted by hepatitis B to **Joan Block**, co-founder and past Executive Director of the Hepatitis B Foundation; **Cynthia Jorgensen**, former Lead for Education, Communication and Training at the CDC Division of Viral Hepatitis and primary architect of the multi-lingual **Know Hepatitis B** campaign; and **Jane Pan**, former Executive Director of HBI-DC.

COLDA 2023 | AHS 2023

AMPLIFYING THE VOICE OF HEPATITIS B IN AFRICA

The Hepatitis B Foundation extended its engagement in Africa during 2023 by leading sessions and bringing more than 10 people with lived experience to two major, influential conferences: the Conference on Liver Disease in Africa (COLDA), held in Dar es Salaam, Tanzania, in September and the African Hepatitis Summit in Abuja, Nigeria in October.

Deaconess Tobore Oborevwori (left) with Dr. Catherine Freeland.

This is one example of how we are ensuring that the voices of people with hepatitis B are heard around the world.

At the **COLDA** meeting, **Dr. Freeland**, the Foundation's associate director of public health research, presented the Hepatitis B Foundation's research on the impact of hepatitis B discrimination in Africa. The research addressed the significant impact of hepatitis B discrimination, highlighting the injustice of discrimination and the need for policy change across the continent to prevent discrimination and its consequences for those living with hepatitis B.

Dr. Freeland served on the organizing committee for the **African Hepatitis Summit (AHS)** and **Dr. Yasmin Ibrahim, MD, PhD, MBA**, Foundation public health program director, hosted a well-attended patient-focused session on **Addressing Hepatitis B Stigma** and **Discrimination in Africa**.

The Hepatitis B Foundation hosted several representatives with lived experience and representing the community from across the continent, who served as panelists and shared the importance of disseminating accurate information to reduce stigma in the community and prevent discrimination. Participants spoke about challenges accessing employment opportunities if they test positive for hepatitis B.

Rise Against Hepatitis Global Initiative leadership sharing educational resources on hepatitis B in their local communities in Nigeria.

After the AHS, Dr. Freeland joined with representatives of the **Hepatitis Advocacy Foundation**, the **Delta State Ministry of Health (SHM)**, **World Health Organization (WHO)** and the **Excellence Community Education and Welfare Scheme** to pay an advocacy visit to **Her Excellency, Deaconess Tobore Oborevwori**, the First Lady and wife of the Governor of Delta State. Their purpose was to advocate for improved resources for hepatitis B.

As a result, the advocacy team reported, **"with great pleasure we announce and commend Her Excellency and her husband, His Excellency Rt. Hon. (Elder) Sheriff F. O. Oborevwori, Executive Governor of Delta State, for their timely executive responses as the first step towards addressing hepatitis B and C in Delta State."**

Following the visit to the First Lady, His Excellency, the Governor of Delta State approved the inclusion of free Hepatitis B and C screening for all pregnant people in the state. Resources for this effort have been included under the Delta State Contributory Health Commission. This was an historical decision as the first Governor to do this. Additionally, the First Lady, Deaconess Tobore Oborevwori has put forth a recommendation for hepatitis B and C to be included within the existing HIV/AIDS anti-discrimination, prevention and protection law of 2022 for Delta State. These are commendable steps towards improving access to care and anti-discriminatory protections for the 6 million people in Delta State, and the Foundation was instrumental in making them happen.

Working with local partners in Nigeria including the **African Field Epidemiology Network** and the **U.S. Centers for Disease Control and Prevention (CDC)**, the Hepatitis B Foundation and Dr. Freeland have been engaged in a birth-dose program since 2021. The program aims to improve the number of babies that are given the hepatitis B vaccine within their first 24 hours of life by making the birth dose more accessible in healthcare facilities. The program also is educating healthcare workers and pregnant people in Nigeria on the importance of the hepatitis B birth dose and empowering them to request the vaccine for their baby after delivery.

Strategic development and advancement of the Blumberg Institute: science, innovation and education

In line with our core mission, finding a cure for hepatitis B, research at the Baruch S. Blumberg Institute focuses on addressing the key scientific questions in HBV pathogenesis and conquering the major barriers toward the functional cure of chronic hepatitis B. Particularly, our scientists investigate the formation and transcriptional regulation of HBV covalent closed circular DNA (cccDNA), the reservoir molecule of HBV infection in hepatocytes, and mechanism of HBV DNA integration and subviral particle biogenesis. Taking advantage of our understanding of HBV pathogenesis, our scientists are also discovering antiviral agents targeting viral nucleocapsid assembly and disassembly, subviral particle production as well as immune modulators for restoration of host antiviral immune responses to facilitate the cure of chronic hepatitis B. Gene editing technologies for direct inactivation of cccDNA and integrated HBV DNA and RNA-based therapeutics for targeted expression of therapeutic proteins in HBV infected hepatocytes are also under development. In addition to hepatitis B, our scientists also work on the discovery and development of antiviral agents against other viruses. With the support of a contract from the **National Institute for Allergies and Infectious Diseases (NIAID)**, an orally available antiviral agent against yellow fever virus, originally discovered at BSBI, is currently under preclinical to phase I clinical development. 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.

Blumberg scientists have begun a new avenue of investigation into a rare and aggressive liver cancer known as cholangiocarcinoma. Recent discoveries have found that a type of cancer-killing immune cell known as the natural killer (NK) cell correlates with survival in the most common cholangiocarcinoma subtype. Work at BSBI is focusing on why these special cells potentially impact cholangiocarcinoma patient outcomes and if they can be targeted via novel therapies.

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 **RIMMSTING**, developing a new therapeutic based on novel STING therapeutics. All these startups have attracted investments from the State of Pennsylvania's **Academic Innovation Zone** program and promise to translate Blumberg discoveries into useful medicines and diagnostics. Additional startup companies founded and developed by Blumberg Faculty include **ECOGENOME**, funded by seed rounds from qualified investors, developing tests to guide prostate cancer therapies, **LIGHTSEED**, funded by the NIH, developing protectants from chemotherapy-induced cardiac damage and death, and **STROMAGENESIS Pharmaceuticals**, developing a clinical stage therapeutic for cancer.

Blumberg is also bringing its experience and expertise with technology incubation in supporting partnerships with other institutions, including the Medical University of South Carolina, Philadelphia's Wistar Institute and Capital Health, a major hospital system in our region.

Blumberg remains dedicated to our thriving academic programs, which we conduct in partnership with the Hepatitis B Foundation. Through an ongoing collaboration with the Central Bucks School District, more than 30 high school students receive hands-on training by Blumberg scientists for the entire school year and they routinely excel in local, regional and national science fair competitions. Pennsylvania high school students also enjoy our two-week summer biotech camp where they gain valuable hands-on experience and an enlightening course of lectures and seminars. We also host 10-12 college interns each summer in our 10-week program from top universities around the country. These programs collectively have a very positive impact in our community and beyond.

As we look forward into 2024 and the years ahead, we are updating our strategic plan and planning implementation to best allow Blumberg to reach and exceed its potential. Our planning is based on **the four pillars of scientific research, innovation, education and development.** I look forward to seeing all pillars further advance in 2024.

It is my great honor to present the following brief look into the advancements made by the Blumberg Institute team in 2023.

With thanks,

Randall N. Hyer, MD, PhD, MPH
President, Baruch S. Blumberg Institute

THE BLUMBERG INSTITUTE'S RESEARCH PROGRESS *2023*

The Chang Lab

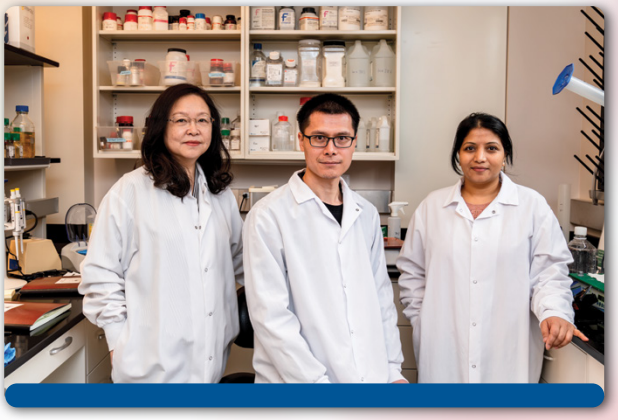
Blumberg Institute scientists, led by Jinhong Chang, MD, PhD, have discovered a new type of small molecule, direct-acting antiviral drug that has demonstrated effectiveness against yellow fever in a series of lab studies.

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 World Health Organization 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.

The mode of action studies, which are being funded by the National Institute of Allergy and Infectious Diseases (NIAID), revealed an ***unprecedented mechanism leading to potent antiviral efficacy***. The team successfully demonstrated potent therapeutic efficacy in the animal model of yellow fever during 2023 and made significant progress on chemical process and formulation development to prepare the project to the next level of preclinical development. **Fig. 1**

The contract for this research, which supports development of the drug candidate through Phase 1 clinical testing, was awarded through the NIAID's Antiviral Program for Pandemics (APP). The NIAID is part of the National Institutes of Health, Department of Health and Human Services. This contract (No. 75N93023C00003) has a total estimated cost of the base period (November 2022 to May 2024) of approximately $5.5 million with the potential to receive funding of up to $32 million, if all project milestones are met.



THE CHANG LAB STAFF *From left to right:* **Jinhong Chang, MD, PhD; Fuxuan Wang, PhD; and Sumangala Darsandhari, PhD**

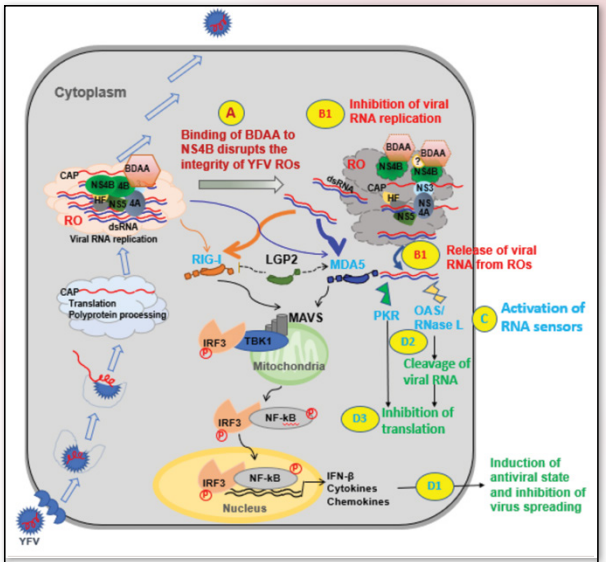
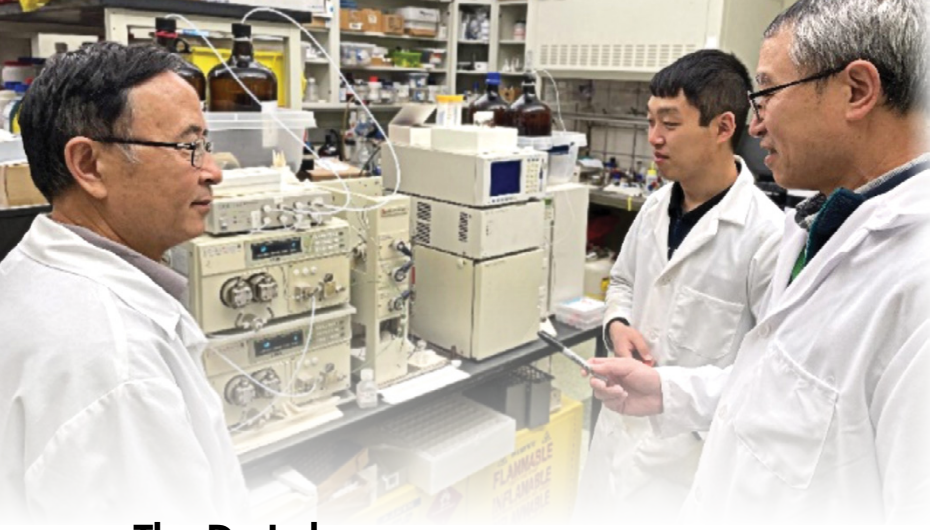


Fig. 1: The unprecedented mode of action leads to the potent antiviral efficacy of a yellow fever virus (YFV) drug candidate



THE DU LAB STAFF *Left to right:* **Yusheng Wu, PhD, Zhengyuan Jiang, MS, and Yanming Du, PhD**

The Du Lab

Yanming Du, PhD, professor and director of medicinal chemistry, engaged in a variety of research projects in 2023.

On the yellow fever therapeutic project, working with Jinhong Chang, PhD, MD, the internal management team and outside CROs, Dr. Du and his team have optimized the chemistry synthesis route and transferred that progress to a CRO for process chemistry development. In addition, stable crystal forms of both lead and backup compounds have been identified.

Hepatitis B is another focus of the group. One project involves studying ***hepatoselective dihydroquinolizinone for reduction of hepatitis B surface antigen with improved safety.*** Another, working with Ju-Tao Guo, MD, involves ***novel capsid assembly modulators with de-assembling functions***. 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***. **Fig. 2**

In cancer research, Dr. Du has continued working with scientists at the University of Texas at San Antonio on RAD52 inhibitors usage for treating triple negative breast cancer.

The Du Lab in 2023 obtained a two-year Small Business Technology Transfer grant from the National Institute of Allergy and Infectious Diseases for $600,000. The lab also won a R21 grant for $440,000 last year for anti-HBV research.

Dr. Du contributed to two patent publications in 2023. One is for ***Novel hepatoselective polyadenylating polymerases inhibitors and their method of use***, Assignees: Baruch S. Blumberg Institute; The University of North Carolina at Chapel Hill. It describes methods of treating and preventing disease due to infection with Hepatitis A Virus in a subject in need thereof, comprising administering any one of the hepatoselective inhibitors of PAPD 5 and 7. The invention further relates to a process for preparing the hepatoselective PAPD5 and PAPD7 inhibitors of the present invention.

The second is for ***Novel diazepines that target yellow fever virus non-structural 4B (NS4B) protein and their preparation***, Assignee: Baruch S. Blumberg Institute. Pharmaceutical compositions of the invention comprise diazepines derivatives having a disease-modifying action in the treatment of diseases associated with biol. effect that include disease state, and any disease type/class involving biological effect. The invention compounds were prepared by multistep procedure and evaluated for their antiviral activity.

The Du Lab hosted two interns last summer: Chamonix E. Bas, a student at the U.S. Naval Academy, and Emily Kurtz, a student at St. Mary's College of Maryland.

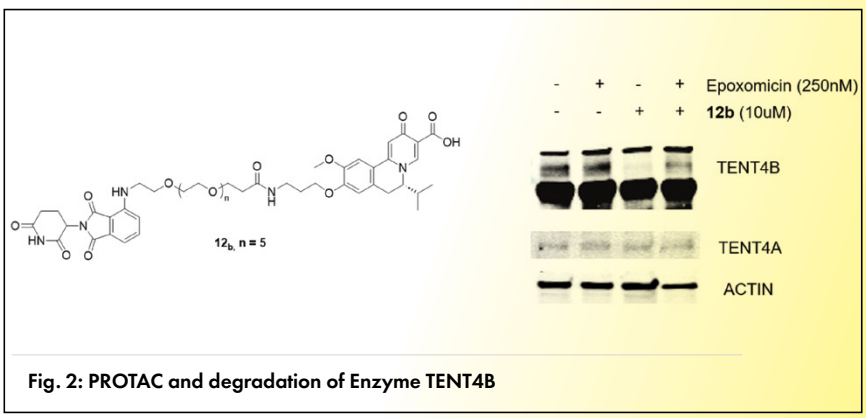


Fig. 2: PROTAC and degradation of Enzyme TENT4B

The Guo Lab

Ju-Tao Guo, MD, is the *W. Thomas London Distinguished Professor,* Senior Vice President and Chief Scientific Officer of Baruch S. Blumberg Institute.

The Guo laboratory's research is focused on investigating the biology of hepatitis B virus (HBV) and discovering antiviral and immune modulating drugs for the cure of chronic hepatitis B.

Investigating the mechanism of HBV DNA integration and inhibition by antiviral drugs

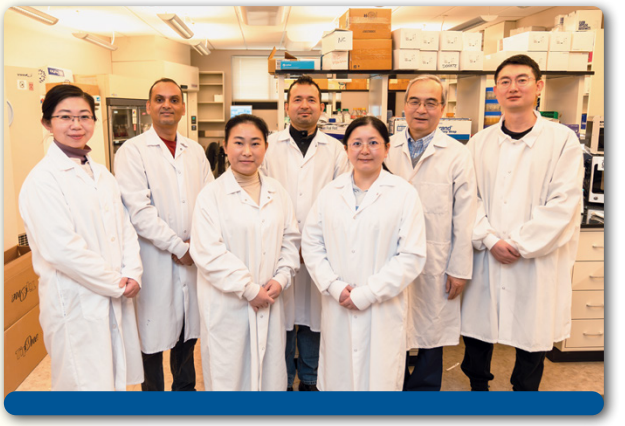
Although not required for viral replication, HBV DNA integration occasionally occurs. It not only contributes to development of liver cancer, but also supports HBV surface antigen (HBsAg) expression, particularly in HBeAg-negative patients. Qiong Zhao, PhD; Yan Yan, PhD; and Bo Chen, PhD, have established cell-based assays to investigate the mechanism of HBV DNA integration and identify antivirals with the most efficient inhibition of HBV DNA integration for development as therapeutic agents for hepatitis B.

Investigating the mechanism of HBV nucleocapsid assembly/disassembly and discovering new chemotypes of capsid assembly modulators

HBV genomic DNA is replicated in nucleocapsids via reverse transcription of viral pregenomic RNA. The assembly and disassembly of nucleocapsids are regulated by many cellular proteins and the targets of capsid assembly modulators (CAMs) in preclinical and clinical development. Taking a chemogenetic approach, Hui Liu, PhD, elegantly demonstrated that HBV core protein is a wild-type dominant target for CAMs. This finding shed new light on the mechanism of CAM-resistant HBV emergence during antiviral therapy. Dr. Liu is also investigating the role of cellular protein kinases in regulation of HBV nucleocapsid assembly and disassembly. In collaboration with the Blumberg's Du and Chang laboratories, Liangxian Shen, MD, and Hemraj Rimal, PhD, discovered new chemotypes of CAMs and developed cell-based and biophysical assays to investigate the mode of action of novel CAMs.

Uncovering the molecular mechanism of HBV subviral particle biogenesis and discovery of its inhibitors

Subviral particles (SVPs) are the most abundant viral product produced by HBV infected hepatocytes and predominant form of HBsAg. Elimination of HBsAg is essential for the functional cure of hepatitis B. Biplav Shrestha, PhD, obtained evidence supporting the hypothesis that functional ERAD pathway is required for SVP biogenesis. In collaboration with the Chang laboratory, Dr. Shrestha also has identified a small molecular compound that preferentially inhibits HBV SVP production.



THE GUO LAB STAFF *From left to right:*
Yan Yan, PhD; Hemraj Rimal, PhD; Qiong Zhao, PhD; Biplav Shrestha, PhD; Liangxian Shen, PhD; Ju-Tao Guo, MD and Bo Chen, PhD

Development of a novel gene-editing technology for inactivation/elimination of cccDNA and integrated HBV DNA for the cure of chronic hepatitis B

In collaboration with Minghong Zhong, PhD, at GeneLancet Biosciences, Qiong Zhao, PhD, is developing a ligation-guide RNA (LgRNA)-based CRISPR/Cas9 gene editing technology for the cure of chronic hepatitis B. Dr. Zhao has demonstrated that LgRNAs are superior to conventional single guide RNA (sgRNA) in gene editing efficiency and amendable for large scale chemical synthesis and modification.

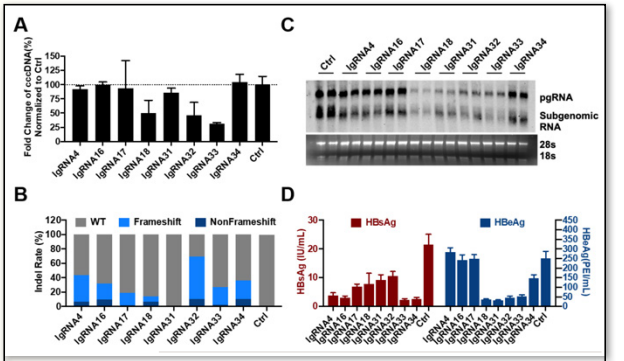


Fig. 3: LgRNA-targeted CRISPR editing of HBV cccDNA disrupts HBV replication via multiple distinct mechanisms

A set of LgRNA with superior editing efficiency to both cccDNA and integrated HBV DNA have been identified for further development. **Fig. 3** shows LgRNA can efficiently reduce the amounts of cccDNA as well as HBV RNA and secreted viral antigens.

The Su Lab

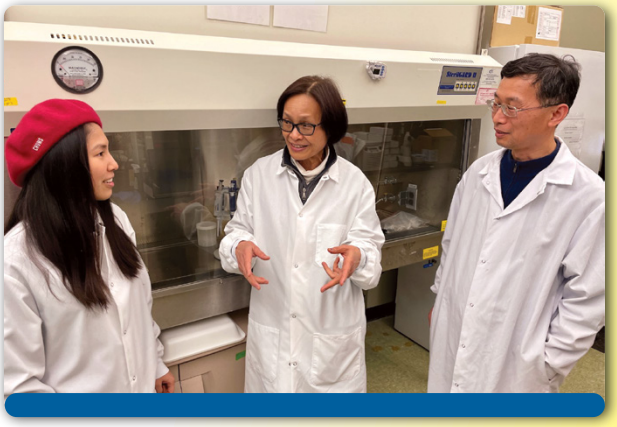
The lab run by Prof. Ying-Hsiu Su, PhD, focused on three major research projects during 2023.

One project involves ***studying the impact of pre-analytic procurement and processing variables on the detection of HCC DNA in urine (1U01CA275648-01), funded by a five-year UO1 award, which began in February 2023, for biospecimen science***. This work is to understand urine biospecimen science in order to develop an evidence-based robust urine collection and processing procedure for HCC urine liquid biopsy.

A second project ***aims to determine if detection of HBV-host DNA junction in urine can be a biomarker to assess the efficacy of anti-HBV treatment***, in collaboration with Dr. Daryl Lau of Harvard Medical School, Dr. Hie-Won Hann at Thomas Jefferson University and Dr. Ting-Tsung Chang of the National Cheng-Kung University. This study was awarded as the best of 2022 American Association for the Study of Liver Disease oral presentation and the Presidential Poster Award in 2022 American College of Gastroenterology's annual meeting. The findings are used as preliminary evidence to support a multiple federal grant submission submitted in 2022 and was awarded for R56 one-year bridge fund for resubmission.

Dr. Su's third project entails ***research to establish a program for precision medicine to explore development of the possibility that HBV-host cellular DNA junctions (HBV-JS) as a biomarker for disease detection (continuation)***. Specifically, this study will use HBV-targeted next generation sequencing (NGS) assay and ChimericSeq bioinformatic pipeline to detect HBV-JS DNA in blood and urine of patients with HBV-related HCC and patients with chronic HBV infection related other liver diseases as hepatitis and cirrhosis (non-HCC).

Using patient specimens from Thomas Jefferson University Hospital and Johns Hopkin University, the team determined if the HBV-JS can be used as a marker of minimum residual disease (MRD) and tumor recurrence after treatment in HBV-hepatocellular carcinoma (HCC) patients in a pilot study. Urinary HBV-JSs were identified by an HBV-targeted NGS assay. Quantitative junction-specific PCR assays were developed to investigate dynamic changes of the most abundant urinary HBV-JS. Abundant urinary HBV-JSs were identified in two cases of tumor recurrence. As seen in the image below, HBV-JS DNA biomarkers levels in serial urine samples from HBV–HCC patients with HCC recurrence (cases 1 and 2) and an HBV-cirrhotic patient under HCC surveillance (case 3). Both HBV–HCC patients were being monitored for HCC recurrence by MRI and serum AFP. The urine samples were collected prospectively from two HBV–HCC patients (when available) after curative treatment and at follow-up visits and from one cirrhotic patient at an HCC surveillance visit.



THE SU LAB STAFF *From left to right:*
Cinnee Liu, BS, MS, research associate, bioinformatics; Ying-Hsiu Su, PhD, professor and principal investigator; and Chundong Zhang, PhD, visiting scholar

Samples were retrospectively measured for HBV-JS DNA biomarkers. HBV-JS DNA along with serum AFP (ng/mL), were plotted at office visits until the last available visit in which an MRI was performed. The "POS" represents detection of HCC recurrence by MRI. HCC: hepatocellular carcinoma; AFP: alpha-fetoprotein. This study has been published and the results are preliminary data for the pending federal grant submissions in collaboration with scientists at Johns Hopkins and the University of Pennsylvania.

During the past year, Dr. Su and her team completed submission of four manuscripts and received two NIH grants with Dr. Su as principal investigator. The teams also established a workflow to effectively identify and estimate integrated HBV DNA in liver biopsy tissue sample and for HBV genetic liquid biopsy.

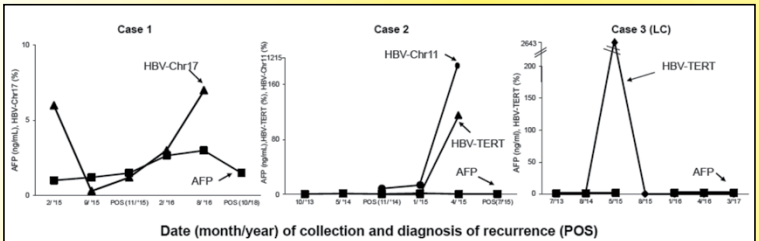


Fig. 4: HBV-targeted /HCC surveillance

The Sayeed Lab

The lab run by Aejaz Sayeed, PhD, focused on development of a liquid biopsy platform to facilitate early cancer detection using novel mRNA-based circulating biomarkers.

Mutations in circulating mRNA as a cancer biomarker

The team has demonstrated the value of circulating messenger RNA as a biomarker analyte with a potential in surveillance, early detection, prognosis and personalized medicine in cancer. The group demonstrated the detection of cancer specific mutations in circulating mRNA (ctmutRNA) that can be used to identify high risk patients with better diagnostic precision and published their work in *Frontiers in Oncology*. The lab is currently validating the detection of these biomarkers using additional clinical samples.

Confirmation of ctmutRNA in validation cohorts

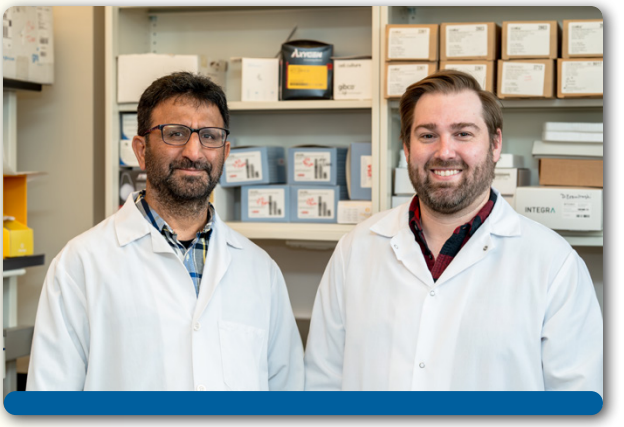
The observations of cancer specific variant mRNA need to be validated in additional patients. The lab has completed a study of investigating 100 clinical samples comprised of early-stage HCC, late-stage HCC and non-cancer liver cirrhosis patients using targeted RNAseq. Total RNA seq analysis of a new cohort of 100 samples is being carried out to compare profiles of early-stage and late-stage HCC patients.

Deeper characterization of mRNA variants in HCC

Collaborating with Mayo Clinic and Yale University scientists, the lab is comparing DNA and RNA from matching tumors and normal (cirrhotic) adjacent tissues from hepatocellular carcinoma patients. The lab has identified some common mutations in DNA and RNA. But, surprisingly, a plethora of mutations in RNA with no counterpart in DNA were observed, suggesting the development of somatic mutations in a post transcriptional manner. Dr. Sayeed and his team are validating a range of editing and splicing variants. Some early findings were presented as a poster in the AASLD's annual Liver Meeting in November 2023 in Boston.

Method and assay development

The biotechnology company CIRNA, associated with the Sayeed lab, is developing robust methods for RNA isolation from circulating vesicles in plasma followed by developing assays to detect mutated mRNA. The lab is developing assays for sensitive detection of a set of cancer associated circulating mRNA mutations. The lab submitted an SBIR/STTR and an R21 application to NCI in 2023. Both applications secured high scores and the lab is resubmitting the applications in 2024.



THE SAYEED LAB STAFF *From left to right:* **Aejaz Sayeed, PhD, and Daniel Zezulinski**

Circulating mutant mRNA biomarkers in LR3/LR4 indeterminate liver nodules

Sometimes the imaging results of liver pathology are not clear. In an interesting study in collaboration with University of Pennsylvania physicians, serially collected linear longitudinal plasma samples from LIRAD 3/4 patients who were clinically followed up until the HCC diagnosis, are being investigated by total RNAseq to dissect patterns associated with very early-stage HCC patients. This can potentially identify very early HC specific biomarkers.

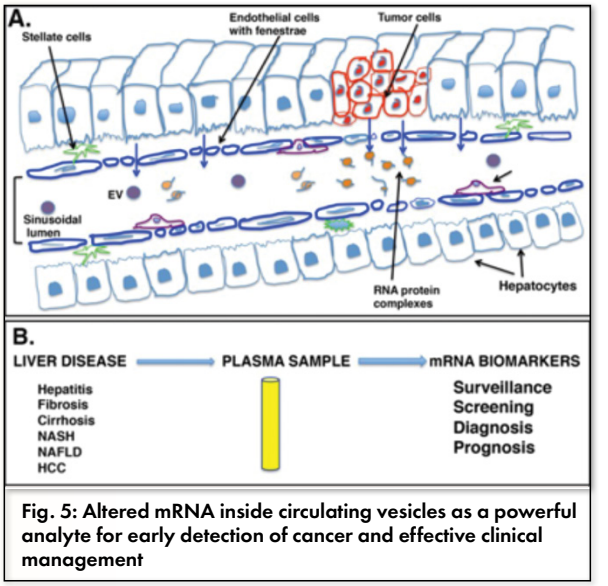


Fig. 5: Altered mRNA inside circulating vesicles as a powerful analyte for early detection of cancer and effective clinical management

Dr. Sayeed was appointed to the National Cancer Institute Special Emphasis Panel study section for Clinical and Translational Cancer Research at NIH as a scientific reviewer in ZCA1SRB-F(J2)S (2023). He also participated in the meeting: ZCASRB-8(M1)S in February 2024 for the same study section at NCI.

The Tang Lab

Liudi Tang, PhD, assistant professor of experimental therapeutics, is a virologist with a focus on the hepatitis B virus.

Novel RNA editing approach to selectively target HBV-infected hepatocytes

Through an emerging RNA editing technology called RNA sensing using ADAR (RADARS), Dr. Tang and colleagues have successfully designed RNA molecules (HBV-RADARS) that sense HBV viral transcripts and thus specifically target HBV-infected hepatocytes. This approach has potential to deliver a payload protein only to HBV-infected cells, therefore could be engineered to express a therapeutic payload as HBV antiviral treatment, or a fluorescent reporter payload for the labeling and tracking of HBV infected cells.

HBV X protein (HBx) regulation of extrachromosomal DNA transcription

HBV encodes a small regulatory protein HBx known to promote transcription of extrachromosomal DNA, ie, cccDNA. We designed an mCherry-Luciferase dual reporter plasmid, and for the first time showed that HBx, in the context of HBV infection, can robustly elevate mCherry and luciferase expressed from the extrachromosomal plasmid DNA. More work is being conducted to further investigate the mechanisms of HBx. Meanwhile, the dual reporter plasmid that responses to HBx can serve as a HBx-targeting drug screening tool.

Dr. Tang gave a presentation at SEED therapeutics on, "A proteomics approach to identify E3 ligases that interact with HBx for the discovery of molecular glue compounds targeting HBx for degradation," on March 30, 2023. He also participated in the 2023 HBV International Meeting in Kobe, Japan. Also last year, Dr. Tang supervised Cassidy Ermigiotti, a summer intern from University of Pittsburgh, who took on the project of characterizing microtubule and its associated motor proteins in hepatitis B virus (HBV) infectious entry.

The Zhao Lab

Qiong Zhao, PhD, assistant professor, is focused on understanding the mechanism and significance of double stranded linear DNA (dslDNA), a minor product of HBV DNA replication, in viral replication and pathogenesis.

Determining the molecular pathways of dslDNA-derived cccDNA synthesis

HBV covalently closed circular DNA (cccDNA) exists in the nucleus of infected hepatocytes as a minichromosome to support viral RNA transcription and is the reservoir for persistent HBV infection. HBV genome replication produces predominantly relaxed circular DNA (rcDNA) and dslDNA as a minor species. Prior studies by others and us suggest that although both rcDNA and dslDNA can be converted into cccDNA via distinct DNA repair mechanisms, only rcDNA is accurately converted into authentic cccDNA, whereas dslDNA is circularized into cccDNA by the error-prone non-homologous end joining (NHEJ) DNA repair pathway. Due to the insertion and/or deletion at the junction region, dslDNA-derived cccDNA cannot transcribe functional pregenomic RNA (pgRNA) to support viral replication.

Dr. Zhao reports that, taking advantage of pgRNA launch HBV replication system recently developed in her lab, the team can now investigate the molecular pathway of cccDNA synthesis from dslDNA with distinct structure features simply by transfection of cells with carefully engineered pgRNA. Using this experimental system, we have now demonstrated that dslDNA with extended 5' terminal HBV sequence are converted predominantly into authentic cccDNA, suggesting more comprehensive/accurate DNA repair mechanisms, but not the error-prone NHEJ pathway, involve in cccDNA formation from the engineered dslDNA. Further studies are under way to investigate the mechanism of DNA repair pathway selection in cccDNA biosynthesis.

Investigating the mechanism and biological consequences of HBV DNA integration

In addition to being converted into cccDNA, dslDNA are the predominant precursors of viral DNA integration into cellular chromosomes, which promotes liver cancer oncogenesis and is responsible for the massive production of HBsAg in chronic HBV carries. The pgRNA launch HBV replication system allows to generate dslDNA with distinct terminal sequences for detailed genetic studies of HBV integration in cultured cells. A set of comprehensive assays are under development to map genome-wide HBV integration sites, transcription activity of integrated HBV DNA and the impacts of integrated FNA on cellular transcriptome.

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OFFICIAL CHARITY PARTNER TCS NEW YORK CITY MARATHON

We're extremely grateful to the six hearty runners who completed the 2023 TCS New York City Marathon raising funds for the Hepatitis B Foundation's Storytellers program and their supporters. Our runners brought in more than $26,000, which far exceeds our goal.

We extend our heartfelt thanks to the **#Run4HepB team: Aaron Rak**, **Frank Zeng**, **Kelsey Robb**, **Lou Kassa**, **Joseph Gedeon** and **Megan Romanovich**.

This is the second year we've had a team in the NYC Marathon and once again one of our own ran and completed the grueling run. Lou Kassa, CEO of the Hepatitis B Foundation, Blumberg Institute and Pennsylvania Biotechnology Center, accomplished that feet (pun intended), and it was his very first marathon. Last year, **Catherine Freeland**, the Foundation's associate director for public health research, ran and finished the NYC Marathon.

We have been approved for a team again in 2024, so if you're up for it, or know a marathoner who'd like to be on our team, please contact **Maura Delaney**, events manager, at run4hepb@hepb.org.

↗ To learn more about the runners, please visit www.hepb.org/nyc-marathon.

LEGACY SOCIETY (Planned Gifts)
Timothy and Joan Block
Richard and Flo Celender
Craig and Janet Esterly
Richard Grillo
Nicole Janssens
Bruce and Cynthia Maryanoff ■
Jean Miller
Richard Moyer
C. Theodore Tucker
Paul* and Janine Witte

EMPLOYEE GIVING PROGRAMS
Benevity Community Impact Fund
CHC: Creating Healthier Communites
IBM Employee Services Center
United Way Calif Capital Region

MATCHING GIFTS
The Blackbaud Giving Fund ●
Bright Funds
Citizens Charitable Foundation
Johnson & Johnson Family Companies Matching Gift Program ●
The Merck Foundation ■

OTHER GIVING PROGRAMS
Amazon Smile Foundation
Giving Lively Foundation LLC
Pledgeling Foundation

SPONSORSHIPS
Arbutus
Antengene Biotech LLC ●
Bank of America
Brandywine Realty Trust
Clemens Construction
Cooperman Barnabas Medical Center
Curtin & Heefner LLP
Demusz Brothers, Inc
EisnerAmper
Fox Chase Cancer Center
Fox Chase Therapeutic Discovery Inc. ■
Fox Rothschild LLP ●
Fujifilm Healthcare Americas Corporation
Geisinger Commonwealth School of Medicine
Gilead Sciences, Inc.
Granite Insurance Group LLC
GTS Scientific
High Swartz LLP
KeyBank
Penn Color, Inc.
Penn Community Bank
Subito Motus Consulting LLC
Tunnell Consulting ●
Univest Financial ●
VBI Vaccines
VIR Biotechnology
Wojdak Government Relations
Worth & Company, Inc.
ZRG Partners

DONOR ADVISED FUNDS
The Hepatitis B Foundation and Baruch S. Blumberg Institute accept grants from Donor Advised Funds, and have received distributions from the following organizations in 2023:
Bank of America Charitable Foundation
Fidelity Charitable Brokerage Services ●
Merrill Lynch Wealth Management ■
Schwab Charitable
Vanguard Charitable

GRANTS
Asian & Pacific Islander American Health Forum
Clinical Care Options, LLC
Gilead Sciences, Inc.
Antios Therapeutics
Plasma Services Group
IQVIA
GSK
VBI Vaccines

FEDERAL, STATE, CITY GRANTS
National Institutes of Health
Pennsylvania Department of Health
U.S. Centers for Disease Control and Prevention
U.S. Department of Defense ■
U.S. Food and Drug Administration

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 or call (215) 489-4900 so that we can print corrections in our next newsletter. Thank you for understanding.

GETTING A GOOD RETURN ON YOUR INVESTMENTS

Dear Friends,

Thank you for your 2023 investment in the Hepatitis B Foundation.

At year-end, there is always a deluge of financial data available on the rate of return of the S&P 500 and all types of funds. Analysts and institutions promote low risk and higher risk investment vehicles that can potentially generate a high yield for you from factors including interest rates and dividends. Within your portfolio, how did your 2023 investment in the Hepatitis B Foundation perform? Let's check.

The portion invested locally enabled us to provide free screenings for hepatitis B for individuals at the location run by a partner organization, a harm-reduction site in Philadelphia. In one week, roughly 60 people walked away with important knowledge about their health without absorbing a financial burden that would have prevented some from participating. Your investment gave one group of people peace of mind and another group vital information for health planning.

Through your generosity on a national level, **Chari Cohen, DrPH, MPH**, president of the Foundation, advocated with other team members on Capitol Hill for federal funding to support research on hepatitis B. In Washington, D.C., and beyond, national news coverage of the markets is a continuous cycle. When USA Today needed information, they reached out to the Foundation based on our expertise. In the subsequent article, Dr. Cohen informed readers that acute hepatitis B infections declined by 82% in the U.S. between 1991, when the vaccine was first recommended for infants, over the following decade. She said, "This is evidence that vaccinating babies prevents hepatitis B infection and is necessary if we are to eliminate a disease that causes 820,000 deaths each year worldwide."

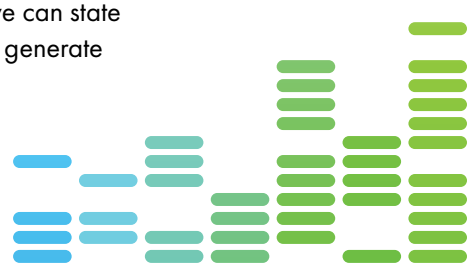
The international component of your funds was truly invested around the globe. It brought scientists together in Kobe, Japan, for the annual International HBV Meeting, which is focused on our mission – finding a cure for hepatitis B. In Africa, **Catherine Freeland, PhD, MPH**, the Foundation's associate director of public health research, visited with the First Lady of the Delta State, after which His Excellency the Governor, approved the inclusion of free Hepatitis B and C screening for all pregnant women in the state. Your gift doubled in value – with unborn babies benefiting from the dividend.

Your investment also had a worldwide educational impact, as the Foundation and partners launched a cost-free training website, the "B Informed Training Hub," for people who want to learn more about hepatitis B and hepatitis D.

So, the outlook for your 2024 returns from investing in the Foundation is solid. All analysts view this investment class of advocacy, education, prevention and research as a Buy and Hold. While financial advisors say that past performance is no guarantee of future results, we can state with total confidence that your continued investment in the Hepatitis B Foundation will generate positive returns. Thank you again!

With sincere gratitude,

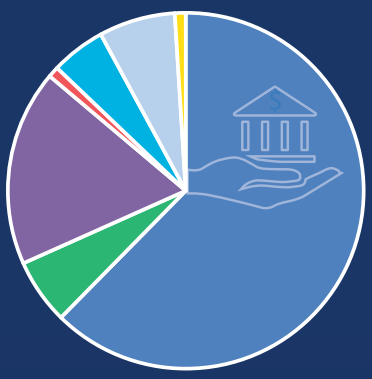
Joe Erckert and Alaina Schukraft
Your development team



FINANCIAL INFORMATION*

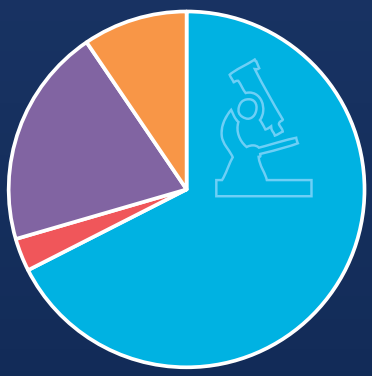
COMBINED **HEPATITIS B FOUNDATION**
& **BARUCH S. BLUMBERG INSTITUTE**[1]****
FOR THE FISCAL YEAR ENDED JUNE 30, 2023

Source of Funds



63%	Grants	$9,517,168
6%	Charitable contributions***	964,700
18%	Management fees	2, 752,730
<1%	Special events	133,143
5%	Research Meeting	705,893
7%	Other Revenue	1,008,792
<1%	Investment income**	81,707
Total Revenue		**$15,164,133**

Use of Funds



67.5%	Research	$ 10,491,416
3%	Outreach and Education	522,574
20%	Support Services	3,059,140
9.5%	Rent and Depreciation	1,471,247
Total Expenses		**$ 15,544,378**

* 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, 2023, this interest was valued at, based on the equity method of accounting, approximately **$14,203,438** 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 reseach 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, 2023. 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. BLUMBERG 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. BLUMBERG, WHO WAS AWARDED THE NOBEL PRIZE FOR HIS DISCOVERY OF THE HEPATITIS B VIRUS.

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IN MEMORIAM
Baruch S. Blumberg, MD, DPhil, Nobel Laureate
W. Thomas London, MD
William S. Mason, PhD
Bud Tennant, DVM
Edith Mitchell, MD
Paul Witte, Co-founder

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