



Baruch S. BLUMBERG™ INSTITUTE

Hepatitis B Foundation

The Baruch S. Blumberg Institute was established in 2004 as an independent nonprofit research organization by the Hepatitis B Foundation to nurture biotechnology, recruit and train scientists, and pursue cures for viral hepatitis and liver cancer.

The Blumberg Institute is headquartered at the Pennsylvania Biotechnology Center of Bucks County, a nonprofit research organization dedicated to the creation of a world-class biotechnology center; to the promotion of regional economic development and job creation; and to the education and training of researchers.

BSBI PARTNERS

- Hepatitis B Foundation
- PA Department of Health
- PA Biotechnology Center of Bucks County
- Drexel University College of Medicine
- Delaware Valley University
- Ben Franklin Technology Partners of Southeastern PA
- University of Pennsylvania
- The Commonwealth Medical College

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A BIO SILICON VALLEY...

ECONOMIC IMPACT OVER \$1.8 Billion!
Says a study by KLIOS, Inc.

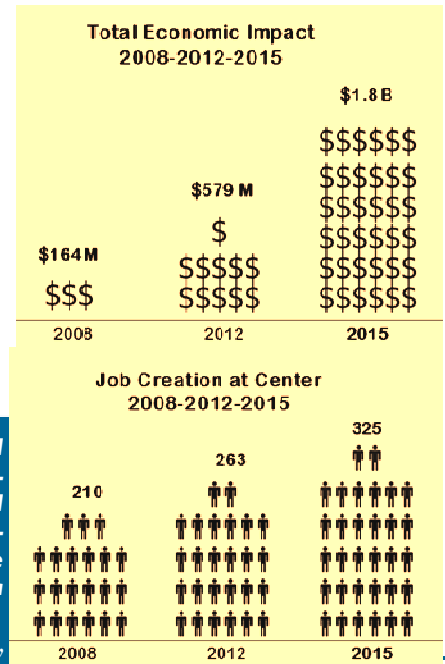
Since its creation in 2006, the Pennsylvania Biotechnology Center and the Blumberg Institute have been economic drivers that have increased jobs and revenue in Bucks County and the State of PA. The Economic Impact Study 2016 reports:

- 727 Jobs in Labor Impact for PA
- \$1.8 Billion in Economic Impact



"The Pennsylvania Biotechnology Center and Blumberg Institute have clearly exceeded all expectation in creating jobs, entrepreneurship and bringing hope to many people suffering from human disease. Given their track record, I can see this as just the beginning, and that Bucks County can become a major center for biotechnology entrepreneurship."

PA State Senator Chuck McIlhinney



THE MEASURE OF OUR SUCCESS

Novira Therapeutics acquired by Johnson & Johnson!

The acquisition enhances development of Novira's pipeline of novel HBV assets, including a Phase 2 clinical trial for NVR 3-778, a hepatitis B antiviral!



County Commissioner **Rob Loughery** (right) with **Dr. Mike Daley**, CEO of OrthogenRx (left) and **Jennifer Hartt**, Director of Investments, Life Sciences, Ben Franklin Technology Partners

OrthogenRx receives Pre-Market Approval (PMA) from the FDA for GeneVisc! The device is used for treatment of pain in osteoarthritis of the knee. It has been estimated that the product could eventually save the healthcare system over \$300M!

Arbutus Biopharma, formerly OnCore, raises \$150 million to support R&D efforts, and will have four HBV drugs in clinical trials in 2016. It has increased its research staff by 23 professionals, and is valued at \$170M, making it the biggest biotech company solely dedicated to HBV!!!

Synergy raises \$200 million and is successful in a Phase III clinical trial for Plecanatide for idiopathic constipation and is on its way to FDA approval! Synergy also had a successful Phase II clinical trial for its second drug, Dolcanatide for IBD—with all research performed at the Center.

PMV Pharma, with infectious disease and anti-cancer drugs, raises \$30M in funding; it is named "one of the 10 best startups of 2014", by Nature Biotechnology's bioentrepreneur published supplement.

"The Blumberg and Biotech Center continue to be a source of pride to this community, turning ideas and dreams into innovations and medicines, and, importantly, jobs!"



PA State Representative Marguerite Quinn



ECONOMIC STIMULATION & JOB CREATION THE R-I-T-E WAY!
RESEARCH - INNOVATION - TRAINING - ENTREPRENEURSHIP

BLUMBERG RESEARCH HIGHLIGHTS “LIVING SCIENCE”

Detecting Cancer Early:

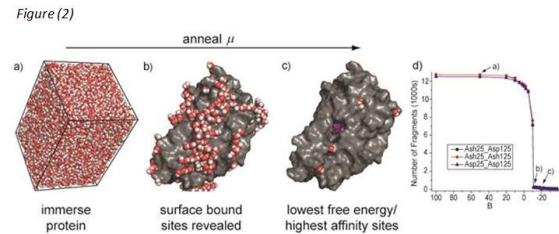
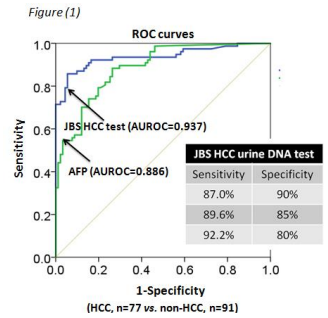
DNA biomarkers detect liver cancer more effectively than current methods. A “blinded” study, conducted with Thomas Jefferson University Hospital, suggested DNA markers from Dr. Ying-Hsiu Su’s lab at the Blumberg Institute were superior to Alpha Feto Protein in detecting liver cancer in people. Indeed, the urine-based assay detected at least 90% of liver cancer at early stages, as shown in Figure 1. (*Jain et al, 2015*)

Discovering New Therapeutics:

Defending yourself. Our new HBV drug that works by activating an infected liver cell’s own defenses has been shown to be effective in animals! (*Guo, F, et al, 2015; Chang and Guo Labs*)

cccDNA inhibitors move to the next step. Inhibiting HBV cccDNA is thought to be important, if not necessary, to achieving a cure. We are among the first, if not only, to identify a small molecule inhibitor of cccDNA formation. These compounds have now been made to be highly active and are licensed to Arbutus Biopharma.

Treating HBV, naturally. We have now screened thousands of plant and fungal extracts for natural product drugs that inhibit HBV cccDNA and envelope proteins, as shown in Figure 2. Two new leads have been found! (*Kulp and Zhou Labs*)



The Best and Brightest in the nation come to visit. The Blumberg Institute hosted more than 25 world-famous scientists from Harvard, Princeton, the NIH, the University Witwatersrand in South Africa, and of course, the great Philadelphia schools, to give seminars.



Being well read! Our scholarly publication (*Block et al, 2015*) was the “most downloaded” paper from *Antiviral Research* for four months in a row! We also have more than 44 publications in prestigious scholarly journals!

TO THE PUBLIC’S HEALTH

50 Years!! This year marks the 50th anniversary of the scientific paper that first identified the “Australia antigen,” which was shown to be the hepatitis B virus by HBF co-founder and Nobel Laureate, Baruch S. Blumberg.

HBF created and leads the 75-member Hep B United Philadelphia Coalition, which has screened almost 2,500 high-risk residents in the city since 2008.

HBF was invited to talk about hepatitis B at the Philadelphia City Council Meeting, which is a first for the Council. (see photo)

HBF helped draft the World Health Organization’s (WHO) first management guidelines for hepatitis B, which were published in May 2015.

Joan Block, HBF Executive Director, was a speaker at the 1st World Hepatitis Summit in Glasgow, Scotland, which was sponsored by WHO and the World Hepatitis Alliance.



ACCOLADES

Dr. Michael Sofia, Arbutus’ Chief Scientific Officer and Blumberg Professor, was named *Economist’s 2015 Innovation Award Winner in the Bioscience Category*.



Dr. Cynthia Maryanoff, a Distinguished Professor at the Blumberg Institute, was honored with the *2015 Perkin Medal*, one of the chemical industry’s most prestigious awards. It is bestowed annually by the Society of the Chemical Industry.



Drs. Patrick Lam and Michael Sofia, Professors at the Blumberg Institute, were named **Heroes of Chemistry** by the American Chemical Society. Dr. Lam won for his Bristol-Myers Squibb discovery of **Eliquis®**, and Dr. Sofia for the invention of **Solvaldi®** at Pharmasset, Inc.

Congratulations to Drs. Lalo Flores and Klaus Klumpp for having their paper accepted in the *Proceedings of the National Academy of Sciences*.



TRAINING TOMORROW’S SCIENTIFIC LEADERS



Gerald Liu, Emily Cheng, and Kelly Jiang, captured 2nd Place honors at the Siemens Competition in Math, Science and Technology. The students were mentored by Blumberg Professor Dr. Ying-Hsiu Su. (2015)

DRUG INVENTORS WALL OF FAME



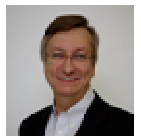
Hank Breslin, M.S.
Eluxadoline (Viberzi®)



Bruce Dorsey, Ph.D.
Indinavir sulfate (Crixivan™)



Patrick Y. Lam, Ph.D.
Apixaban (Eliquis®)



Stacy W. Remiszewski, Ph.D.
Panobinostat (Farydak®)



Bruce E. Maryanoff, Ph.D.
Topiramate (Topamax®)



Michael J. Sofia, Ph.D.
Sofosbuvir (Solvaldi®)