THE BRINK

May 22, 2018

BU-BASED CARB-X ANTIMICROBIAL PARTNERSHIP GETS ANOTHER $50 MILLION PLUS

Sarah Rimer[*]

In a sign of the growing recognition of the threat of antibiotic resistance, the Bill & Melinda Gates Foundation and the U.K. government are joining CARB-X (Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator),[1] a BU-based public-private partnership launched two years ago by the US Department of Health and Human Services ("HHS") to give financial, scientific, and business support to small companies focusing on drug-resistant bacteria. The Gates Foundation is committing up to $25 million over three years to support scientific research to develop new vaccines, preventatives, and other antimicrobial products, particularly for health needs in low- and middle-income countries. The UK government, through its Global Antimicrobial Resistance Innovation Fund ("GAMRIF"), is contributing up to $27 million, for similar work. CARB-X, which is overseen by Kevin Outterson, the N. Neal Pike Scholar in Health and Disability Law and an expert on pharmaceutical markets, is the world's leading public-private partnership dedicated to the early development of innovative antibiotics, vaccines, and other products to fight the global threat of superbugs.

The commitments bring to more than $500 million the total funding available to CARB-X for the development of products to protect people from superbug bacterial infections. CARB-X's existing funding partners include the Biomedical Advanced Research and Development Authority ("BARDA"), part of the U.S. Department of Health & Human Services, which has committed $250

[*] Sara Rimer spent twenty-six years as a reporter at *The New York Times*, where she wrote about education, the death penalty, immigration, and aging in America, and was the New England bureau chief. The *Times* nominated her for the Pulitzer Prize. Her coverage of the death penalty was cited by the Supreme Court in its landmark 2002 ruling outlawing the execution of developmentally disabled individuals. She began her career as a reporter at the *Miami Herald* and also worked at the *Washington Post*. She graduated from the University of Michigan with a B.A. in American Studies.

This Article was originally published in the Boston University publication *The Brink*. Sara Rimer, *BU-Based CARB-X Antimicrobial Partnership Gets Another $50 Million Plus*, THE BRINK (May 22, 2018), https://www.bu.edu/articles/2018/carb-x-gets-another-50-million-plus [https://perma.cc/MFJ9-TVBD].

[1] CARB-X, https://carb-x.org/ [https://perma.cc/56BW-S6AZ] (last visited Dec. 2, 2019).

million over five years; the Wellcome Trust, a U.K.-based global charitable organization, which has committed up to $155.5 million over five years; and the National Institute of Allergy and Infectious Diseases ("NIAID"), part of the U.S. National Institutes of Health ("NIH"), which has committed $50 million in preclinical services over five years.

"We are in a race against superbugs, and it will take leadership, vision, and sustained effort to keep ahead," says CARB-X executive director Outterson. "We are deeply grateful for this new partnership with the UK government and Bill & Melinda Gates Foundation, building upon the leadership from the U.S. government [BARDA and NIAID] and the Wellcome Trust."

"The threat of antimicrobial resistance underscores the importance of prevention—which we believe is key to saving lives," says Sue Desmond-Hellmann, CEO of the Gates Foundation. The Gates funding "will advance the development of vaccines, and novel biologics, including monoclonal antibodies, to avert drug-resistant diseases and protect the lives of children and infants, especially in low- and middle-income countries."

"Superbugs are already killing hundreds of thousands of people around the world," says England's chief medical officer, Sally Davies. "By working together [with the Gates Foundation and CARB-X's other partners], we will represent a formidable force against this intensifying threat."

"We're honored to have these two powerhouse organizations join us in this fight to accelerate global antibacterial innovation," says BARDA director Rick Bright.

Tim Jinks, head of Wellcome's Drug-Resistant Infections Priority Programme, called the funding from the Gates Foundation and the U.K. government "a significant boost" and said he hoped other countries and partners would follow. "Without wider investment and collaboration, we will struggle to deliver the new treatments needed globally to protect and save lives and stop superbugs undermining modern medicine."

Drug-resistant infections cause about 700,000 deaths worldwide each year, according to the World Health Organization ("WHO"),[2] with an estimated 23,000 of those deaths in the U.S.[3] If antibiotic resistance continues at its current rate, these numbers are expected to rise significantly within a generation.

Researchers say it takes at least a decade and many millions of dollars to develop a new antibiotic or vaccine, and the success rate for bringing an early preclinical compound to market is less than one percent. In fact, there have been

---

[2] INTERAGENCY COORDINATION GRP. ON ANTIMICROBIAL RESISTANCE, NO TIME TO WAIT: SECURING THE FUTURE FROM DRUG-RESISTANT INFECTIONS—REPORT TO THE SECRETARY GENERAL OF THE UNITED NATIONS 5 (2019), https://www.who.int/antimicrobial-resistance/interagency-coordination-group/IACG_final_report_EN.pdf?ua=1 [https://perma.cc/U86W-MXDU].

[3] CTRS. FOR DISEASE CONTROL & PREVENTION, U.S. DEP'T OF HEALTH & HUMAN SERVS., ANTIBIOTIC RESISTANCE THREATS IN THE UNITED STATES 2019, at 3 (2019), https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf [https://perma.cc/7RH2-4YAV].

no approved classes of antibiotics for the most dangerous types of bacteria—Gram-negatives—since 1962. Largely because of a lack of financial incentives, the pharmaceutical industry has all but gotten out of the business of developing new antibiotics and antimicrobials. Small biotech and pharmaceutical companies have difficulty attracting private investors for the early phase of development of new antibiotics.

CARB-X funding—along with the partnership's scientific and business expertise—is intended to help companies get projects through the first phase of clinical testing, when they have a much better chance of attracting additional private or public funding for further clinical development. The partnership selects promising early research to support through a competitive review process overseen by a group of leading scientists who make up the partnership's scientific advisory board. Outterson, who does not have a seat on the board, and who works with a shoestring staff crammed into offices on the 12th floor of the Boston University Law Tower, says 94 percent of CARB-X's funding goes directly to research and development. "We're trying to be entrepreneurial and lean and nimble," he says.

The CARB-X awards are grants, which are distributed to companies as the work progresses and certain research and development milestones are met. The companies are obligated to commit to responsible stewardship so that if their products should succeed in reaching patients, they do not contribute to the rise of antibiotic resistance. What we get, says Outterson, is the possibility that one or more of the companies CARB-X funds will develop a product that will treat or prevent drug-resistant infections and save lives.

"Receiving additional funding for CARB-X, particularly of this magnitude and from these funders, is an indication of the importance of the type of work that CARB-X is undertaking," says Gloria Waters, the University's vice president and associate provost for research. "It is also a very strong endorsement of the unique funding model—and public-private partnership—that Kevin and his team have put together."

The partnership, which focuses on companies targeting the most serious bacteria infections, has five products in clinical development and 33 in preclinical development in the U.S. and six other countries. Outterson says they represent nine new classes of antibiotics, six novel diagnostic devices, one vaccine, and more than a dozen nontraditional products, including microbiome approaches.

"CARB-X has become a significant source of funding for antibiotic development," says Allan Coukell, senior director of health programs at the Pew Charitable Trusts, which studies efforts to combat antibiotic resistance, including the pipeline for new antibiotics. And, he adds, by offering companies scientific expertise around testing protocols, CARB-X "helps them to make good decisions in the early development phase."

With support from CARB-X, Entasis Therapeutics—a small company based in Waltham, Mass.—has one antimicrobial product in the first phase of clinical testing, and another project, for a new class of antibiotic aimed at Gram-negative bacteria, in the discovery phase. "Innovation is a long haul," says Manos Perros,

president and CEO of Entasis. "When you have a small company, it's in those earliest stages, when the return is farther away and the risk is higher, that the need for support is greatest."

"CARB-X focuses on what matters, which is making sure they put as much money as they can into the science and clinical development of the companies they're funding," says Perros. "They want us to be successful. There is engagement with the science, with the strategy, with the way in which we are solving problems that inevitably arise in R&D."

More than 400 companies in the U.S. and other countries have so far submitted projects to CARB-X for funding. In its latest round of awards, in April 2018, CARB-X gave up to $2.4 million over about 11 months to Achaogen, a biopharmaceutical company in San Francisco, California, for the development of a novel antibiotic to treat Gram-negative infections.

"They're very well organized and highly respected," says Kenneth Hillan, Achaogen's president of research and development. "They can bring things together in a way that the individual organizations involved couldn't do on their own. A lot of it is Kevin's leadership. Very few people would have the tenacity to bring these organizations together and navigate between all the partners."