A major global partnership aimed at fighting superbugs announced Thursday that it is investing up to $48 million in research projects, including potentially the first new classes of antibiotics in decades, to target the deadliest drug-resistant bacteria.

The investments announced by CARB-X include $24 million in immediate funding for 11 companies. The firms can receive up to $24 million in additional payments over three years if they meet specific milestones.

The projects represent a broad range of approaches. Three companies are working on new classes of antibiotics, a significant development because the last class that made it to market was in 1984. Four companies are developing nontraditional therapeutics to boost the human immune response and disable pathogens’ ability to grow. Yet another company is pursuing a diagnostic imaging tool to identify the type of bacteria causing a lung infection within 60 seconds.

All the projects are in early stages of research, when risk of failure is high, officials said. CARB-X, which stands for Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator, was launched in July to stimulate such critical early-stage work. Its goal is to jump-start drug development with money and access to expertise, supporting companies with promising antibiotic candidates so they can attract enough private or public investment to advance development and eventually win regulatory approval.

Funding comes from the Biomedical Advanced Research and Development Authority, or BARDA, part of the Department of Health and Human Services, and the Wellcome Trust, a London-based global biomedical research charity. CARB-X aims to invest $450 million over five years with the goal of speeding up preclinical discovery and development of at least 20 antibacterial products and moving at least two of them into human trials. The partnership, which also includes academic, industry and other nongovernmental organizations, was created as part of the U.S. and British governments’ calls for global efforts to tackle antibiotic resistance.

The projects announced Thursday were selected out of 168 applications that flooded in within the first four days that proposals were accepted. “These projects hold exciting potential in the fight against the deadliest antibiotic-resistant
bacteria,” said Kevin Outterson, executive director of CARB-X and a law professor at Boston University, where the partnership is headquartered.

Everything about developing new antibiotics is difficult, he said. On the science side, that means finding a drug that only kills the bad bacteria, leaving good bacteria and the rest of human cells untouched. The economics for antibiotics also turn market incentives "upside down" because, unlike most new products that companies rush to sell, the best antibiotics need to kept on the shelf — to be used for "last-ditch cases," he said.

And because resistance will always develop, antibiotics are "the only drug class where we have to start all over every time we succeed," Outterson said.

But interest has been strong. Additional funds are likely to be awarded later this year, and another 200 applications have already been received for the next cycle.

All the potential medicines under development in this first phase target Gram-negative bacteria, among the most dangerous types of superbugs because they are increasingly resistant to most available antibiotics. They include CRE, or carbapenem-resistant Enterobacteriaceae, which U.S. health officials have dubbed “nightmare bacteria.”

These pathogens, which cause pneumonia, bloodstream infections, and wound or surgical site infections, have been identified by the Centers for Disease Control and Prevention and the World Health Organization as the greatest threat to human health. They have built-in defenses that include a double membrane barrier and a mechanism that expels drugs, such as antibiotics, from the cell.

Drug-resistant infections kill an estimated 700,000 people a year globally. The more antibiotics are used, the less effective they become as bacteria develop resistance to them. Scientists, doctors and other public health officials have increasingly warned that if antibiotic resistance continued at its current rate, routine infections eventually would be life-threatening ones. Common modern surgeries, such as knee replacements, could again become precarious.

Last month, the World Health Organization announced its first list of drug-resistant “priority pathogens” to guide and promote research and development of new drugs. Of the 40 antibiotics in clinical development in the United States, fewer than half have the potential to treat the pathogens identified by the WHO, said Allan Coukell, senior director of health programs at the Pew Charitable Trust’s antibiotic-resistance project.

Experts said they are excited by the research CARB-X is funding.

“It’s hitting the right targets for potential drug development,” said Kathy Talkington, director of Pew’s antibiotic-resistance project. “It’s covering a diverse portfolio of products. It addresses the need for novelty.”

Eight companies are based in the United States and three in the United Kingdom. The projects also will receive business and drug development support from the National Institute of Allergy and Infectious Diseases, part of the National Institutes of
Health, and other partners.

Companies that are developing potentially new classes of antibiotics include San Diego-based Forge Therapeutics, which was awarded $4 million over 15 months to spur development of a small molecule product to target an enzyme found only in Gram-negative bacteria and essential for its growth.

Visterra Inc. of Cambridge, Mass., was awarded $3 million over 12 months to develop an antibody with a potent antimicrobial compound engineered to kill all strains of the deadly Pseudomonas bacteria, including multidrug-resistant strains, the company said.

And Proteus IRC, based in Edinburgh, Scotland, is receiving $640,000 over 21 months to develop its technology to rapidly visualize bacteria in the deepest part of the human lungs.

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