At BARDA We Seek Innovation in...

Science and in the way we do business

CARB-X
Xcelerating global antibacterial innovation
CARB-X: A Year of Progress

BARDA Industry Day 2016
“Dreaming of a Portfolio”

BARDA Industry Day 2017
“CARB-X is Powering Innovation”
CARB-X Portfolio

The CARB-X portfolio comprises 18 early stage R&D projects investigating 8 new classes of antibiotics, 5 non-traditional antibiotics, 10 new molecular targets and a rapid diagnostic to determine the type of drug-resistant bacteria that is causing an infection.

**Table of Projects**

<table>
<thead>
<tr>
<th>Company/Research Team</th>
<th>Project</th>
<th>New Class</th>
<th>Non-traditional</th>
<th>New Target</th>
<th>Project description</th>
<th>urgency/Priority</th>
<th>Bacteria Targeted</th>
<th>Stage of Early Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achaogen</td>
<td>AKAO-LpxC</td>
<td>✔</td>
<td>✔</td>
<td>LpxC Inhibitor</td>
<td>Pseudomonas aeruginosa</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<tr>
<td>Antabio</td>
<td>PEI</td>
<td>✔</td>
<td>✔</td>
<td>Pseudomonas Elastase inhibitor</td>
<td>Pseudomonas aeruginosa</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<tr>
<td>Bugworks Research</td>
<td>Gyrox</td>
<td>✔</td>
<td>✔</td>
<td>Gyrase-topoisomerase inhibitor</td>
<td>Gram-negative activity</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<tr>
<td>Cidara Therapeutics</td>
<td>CD201</td>
<td>✔</td>
<td>✔</td>
<td>Bifunctional immunotherapy</td>
<td>Acinetobacter + P. aeruginosa + Enterobacteriaceae</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<tr>
<td>ContraFect</td>
<td>Gram-negative lysins</td>
<td>✔</td>
<td>✔</td>
<td>Recombinant lysin protein</td>
<td>P. aeruginosa</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<tr>
<td>Debiopharm</td>
<td>Debio 1453</td>
<td>✔</td>
<td>✔</td>
<td>Narrow-spectrum inhibitors of Pabli</td>
<td>Neisseria Gonorrhoeae</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<tr>
<td>Eligochem Therapeutics</td>
<td>Helical AMP</td>
<td>✔</td>
<td>✔</td>
<td>Helical Antimicrobial Peptide</td>
<td>Gram-negative activity</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<td>Entasis Therapeutics</td>
<td>ETX000</td>
<td>✔</td>
<td>✔</td>
<td>Oral Gram-negative combination</td>
<td>Gram-negative activity</td>
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<td>✔</td>
<td>Phase 1</td>
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<td>Forge Therapeutics</td>
<td>FG-LpxC</td>
<td>✔</td>
<td>✔</td>
<td>LpxC Inhibitor</td>
<td>Gram-negative activity</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<td>Iterum</td>
<td>Sulopenem</td>
<td>✔</td>
<td>✔</td>
<td>Oral and IV penem</td>
<td>Gram-negative activity</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<tr>
<td>Microbix</td>
<td>T355 Inhibitor</td>
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<td>✔</td>
<td>Virulence modifier</td>
<td>Pseudomonas aeruginosa</td>
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<td>✔</td>
<td>Phase 1</td>
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<tr>
<td>Oppilotech</td>
<td>LPS</td>
<td>✔</td>
<td>✔</td>
<td>Targets synthesis of LPS</td>
<td>Gram-negative activity</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
</tr>
<tr>
<td>Reckx Pharma</td>
<td>NBT1</td>
<td>✔</td>
<td>✔</td>
<td>Dual-acting topoisomerase inhibitor</td>
<td>Acin. + P. aerug + Enterobacteriaceae</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
</tr>
<tr>
<td>Spero Therapeutics</td>
<td>SPR741</td>
<td>✔</td>
<td>✔</td>
<td>Potentiator</td>
<td>Gram-negative activity</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
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<tr>
<td>Tetraphase Pharm</td>
<td>TP-6076</td>
<td>✔</td>
<td>✔</td>
<td>Next-generation tetracycline</td>
<td>Acinetobacter + Enterobacteriaceae</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
</tr>
<tr>
<td>VenatorRx</td>
<td>VNRX-PBP</td>
<td>✔</td>
<td>✔</td>
<td>β-lactamase Resistant PBP Inhibitor</td>
<td>Entero-bacteria</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
</tr>
<tr>
<td>Visterra</td>
<td>VIS705</td>
<td>✔</td>
<td>✔</td>
<td>Antibody-drug conjugate</td>
<td>Pseudomonas aeruginosa</td>
<td>✔</td>
<td>✔</td>
<td>Phase 1</td>
</tr>
</tbody>
</table>

**Novelty**

- ✔: Novelty characterization of new class and new target are established by CARB-X following the Pew Trusts pipeline analysis model. Pew defines a novel chemical class as a group of antibiotics that share a new common core molecular structure. Non-traditional products include lysins and monoclonal antibodies.
- ◼: Urgent and priority drug-resistant bacteria are determined by the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO).

**Coming Soon:**

>10 projects now in late stage review

**Cycle 3 Announcement**

For more info, visit www.CARB-X.org

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**Powered by CARB-X**

9 new classes of antibiotics

9 Non Traditional Approaches

11 New Targets

$57.5M Base/ $72.15M Options
CARB-X is just one part of our expanding Antibacterial Portfolio

Investing $192 million in FY 2017 through Novel Public Private Partnerships to support a Portfolio of Antibacterial Products to repopulate the Antibacterial Pipeline and enhance MCM effectiveness

Total number of products supported

34

CARB-X

Updated November 6, 2017
Why is BARDA supporting Antibacterial Product Development?

- Because the rate of drug development has not kept pace with the growth of antibacterial resistance
- 2M infections per year caused by Antimicrobial Resistant (AMR) pathogens
- 23,000 deaths annually in US
- Estimated economic burden of $20-35B annually
- Must meet the requirements in the National Strategy and National Action Plan for Combating Antibiotic-Resistant Bacteria (CARB)
- To enhance biodefense preparedness: Antibacterial resistant infections will complicate the USG response to a CBRN attack, an influenza pandemic, emerging infectious disease outbreak or any other public health emergency
Many survivors of CBRN and pandemic events will die in the second wave of infections unless BARDA and CARB-X bring new antibacterial products to the market.

Products mentioned are under development and supported by BARDA. The illustration provides examples of how products could be used if pursued for specific indications and if regulatory approval is obtained.
CARB-X accelerates R&D to combat the rising threat of serious drug-resistant bacterial infections.

**Urgent public health need**
Antibiotic resistance kills an estimated 700,000 people each year world-wide. No new classes for drug-resistant Gram-negative bacteria have been approved in decades.

**New global partnership model**
CARB-X represents a new novel public-private partnership model to accelerate the development of life-saving antibiotics, vaccines, devices and rapid diagnostics.

**Turning science into products**
Non-dilutive funding and Accelerators with drug development and business support services to help companies with promising products to become life-saving antibiotics, vaccines and rapid diagnostics to treat serious drug-resistant bacterial infections.

**CARB-X’s first year results**
Program operational 2 years ahead of schedule: 18 companies in 6 countries; 8 are pursuing new classes against Gram-negative bacteria; 10 new molecular targets; 5 non-traditional products; one rapid POC diagnostic.
BARDA is Accelerating Public Private Partnerships to Higher Levels

$455M FUNDING
Wellcome Trust, BARDA and NIAID provide funding and pre-clinical services

EXPERT SUPPORT
Partners provide scientific and business expertise to accelerate the research projects

BEST SCIENCE
SAB reviews applications and recommends to JOC projects for funding

GOVERNANCE
JOC provides oversight, develops strategy and makes investment decisions

BOSTON UNIVERSITY ADMINISTRATION
Hosted by a leading research university, with world-class research administrative support

368 applications from scientists around the world reviewed in 2016-17. SAB reviews applications and recommends to JOC projects for funding.

CARB-X
CARB-X ensures the integrity of the application and review process and works closely with partners, funded companies and global networks to support and accelerate antibacterial innovation.

18 projects in 6 countries awarded $41.6M in 2016-17 with an additional $52.6M more in milestone based options.
The “X” model is another example of how BARDA is innovating both in Science and in the way we do Business.

Innovation in antibacterial product development is needed. CARB-X is operational and Xcelerating antibacterial products to the clinic.

CARB-X is just one part of BARDA’s Portfolio.

CARB-X is growing to address domestic national security preparedness and global health security.

Coming Soon:
- New Accelerators,
- New Powered by CARB-X Awards
- New Funders
- New Funding Announcements
In 2018 will your company be...?