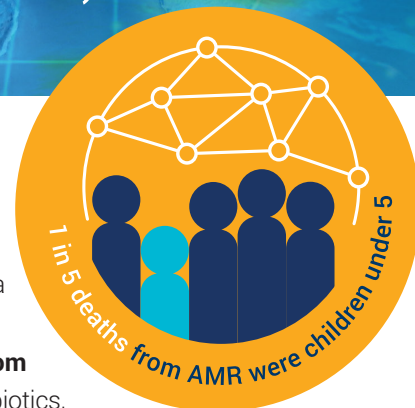


CARB-X Supports the Development of Products that Address Antimicrobial Resistance in Low- and Middle-Income Countries (LMICs)

The Impact of Antimicrobial Resistance on LMICs

Antimicrobial-resistant (AMR) bacterial infections kill more people annually than HIV/AIDS or malaria. While it is estimated that 1.27 million people died in 2019 due to AMR infections, the burden is most acute in Low- and Middle-Income Countries (LMICs). Sub-Saharan Africa has the highest death rate, where an estimated 255,000 people died in 2019. **One in five deaths attributed to AMR were in children under 5, and 99.65% of those children were from LMICs.** While people of LMICs face the greatest AMR burden, their access to life-saving antibiotics, vaccines and diagnostics is often limited.



A Comprehensive Approach

As shown by the Covid-19 pandemic, infection spreads beyond borders. **Resistance that starts in one nation will travel and impact the global population.** CARB-X supports vaccines, diagnostics, antibiotics, and other non-traditional products to help identify, treat, and prevent infections, curb resistance and save lives throughout the world.

CARB-X Portfolio Examples

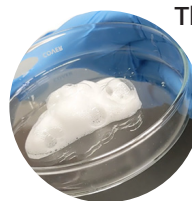
Preventative: **Lumen Bioscience** is

targeting *Campylobacter jejuni* and enterotoxigenic *Escherichia coli* (ETEC) to prevent life-threatening diarrheal diseases which kill 800,000 children per year—more than malaria, measles and AIDS combined.

Lumen uses a spirulina-based platform, derived from food algae. The low-cost oral product could be easily shipped and stored without cold chain distribution.



Diagnostic: **SpeedX** is developing its rapid diagnostic technology, *InSignia™*, with **QuantuMDx** as a portable, battery-operated device that could be used in resource-limited settings. It aims to detect chlamydia and gonorrhea, two common sexually transmitted diseases, and provide definitive results in under 1 hour. Rapid test results could enable patients to be diagnosed and treated with effective antibiotics in the same appointment to help improve patient outcomes and curb resistance.



Therapeutic: **Amicrobe** is engineering its **Amicidin-β synthetic proteins** in two formulations: a solution to treat orthopedic and trauma-related infections, and a foam designed to treat infections during emergency surgeries, like cesarean deliveries. These represent more than 50% of surgical procedures in sub-Saharan Africa, where up to 20% of mothers develop infections.

Select CARB-X Products are Engineered for:



Affordability



Speed



Oral use



Shelf life



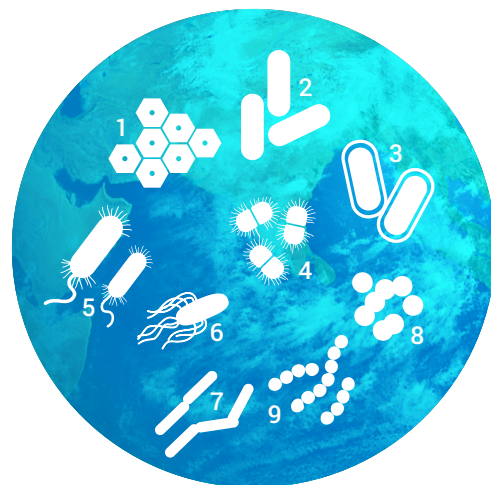
Easy transport

Addressing Antimicrobial Resistance in Low- and Middle-Income Countries

Portfolio Acceleration Tools

Targeted data are essential to create products that function globally. That is why CARB-X launched **Portfolio Acceleration Tools (PATs)** to address common challenges faced by product developers. One PAT focused on evaluating resistance risks, and prepared a panel of 3,000 bacterial isolates of WHO priority pathogens. 32.5% of these isolates came from LMICs. Select CARB-X product developers tested their therapeutics' activity against the bacterial isolates. The panel, results and genomic data were shared with all CARB-X product developers—including those engineering preventatives and diagnostics. The goal was to help developers optimize their products and evaluate their effectiveness in regions where resistance genes may differ.

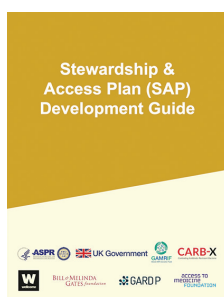
1. *A. baumannii*
2. *E. coli*
3. *K. pneumoniae*
4. *N. gonorrhoeae*
5. *P. aeruginosa*
6. *Salmonella sp*
7. *Shigella sp*
8. *S. aureus*
9. *S. pneumoniae*



Supporting Product Innovation in India

CARB-X has supported **Bugworks Research**, **GangaGen Biotech**, and **Module Innovations**. Based in Bangalore, Bugworks and GangaGen are developing novel first-in-class antibacterial products that target bacteria prevalent in LMICs. Based in Pune, Module is developing an affordable, rapid diagnostic to detect resistant UTIs, help guide effective treatments, and slow resistance.

Stewardship & Access Plan



When antibiotics are misused and infections are not treated quickly with effective antibiotics, people die at higher rates, and resistance spreads. CARB-X and its partners created a **Stewardship and Access Plan (SAP) Development Guide** to help product developers identify solutions to ensure their new products

are accessible in LMICs, and used appropriately to increase the lifespan of new drugs. The Plan must be developed during Phase 3 clinical trials, or the equivalent for diagnostics.

Targeting the World's Deadliest Bacteria

CARB-X products are designed to benefit everyone. They target the world's most deadly resistant bacteria identified by the CDC and WHO, including the nine bacteria above that cause the highest death rates in LMICs.

Partnering with Global Experts

CARB-X

Global
Accelerator
Network



CARB-X partners with subject matter experts and a **Global Accelerator Network (GAN)** that provide scientific, technical, regulatory, and business support to product developers around the world. Based in Bangalore, **C-CAMP** promotes CARB-X's mission, innovation and entrepreneurship, and encourages product developers in India to apply for CARB-X support. **FIND** encourages developers to build diagnostics that meet the needs of LMICs. Acceleration partners, like the **Clinton Health Access Initiative (CHAI)** and the **International Vaccines Institute (IVI)**, advise product developers about in-country manufacturing, regulatory and clinical considerations.



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Combating Antibiotic-Resistant Bacteria

CARB-X is funded in part with federal funds from the Department of Health and Human Services; Administration for Strategic Preparedness and Response; Biomedical Advanced Research and Development Authority; under Agreement number: 75A50122C00028. CARB-X is also funded by awards from Wellcome (WT224842), Germany's Federal Ministry of Education and Research (BMBF), the UK Global Antimicrobial Resistance Innovation Fund (GAMRIF) funded by the UK Government Department of Health and Social Care (DHSC), and the Bill & Melinda Gates Foundation. The content of this fact sheet is solely the responsibility of the authors and does not necessarily represent the official views of any CARB-X funders.