# Role of The Pharmaceutical Industry in Responsible Antibiotic Stewardship

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# The Problem

- Safe and effective antibiotics have saved billions of lives
- Globally available and accessible
- Stringent regulatory processes for their evaluation

# The Threat

*View from the Center of Disease Control*

"*Antimicrobial resistance is one of our most serious health threats. Resistant bacteria are now too common and need novel treatments*," Dr Tom Frieden, CDC

**Urgent Threats**

- Clostridium difficile
- **Carbapenem-resistant Enterobacteriaceae**
- Drug-resistant Neisseria gonorrhoeae

**Serious Threats**

- **Multidrug-resistant Acinetobacter baumannii**
- Drug-resistant Campylobacter
- **ESBL Enterobacteriaceae**
- Vancomycin-resistant Enterococcus
- **Multidrug-resistant Pseudomonas aeruginosa**
- Drug-resistant Non-typhoidal Salmonella
- Drug-resistant Salmonella Typhi
- Drug-resistant Shigella
- **Methicillin-resistant Staphylococcus aureus**
- Drug-resistant Streptococcus pneumoniae
- Drug-resistant tuberculosis

**Concerning Threats**

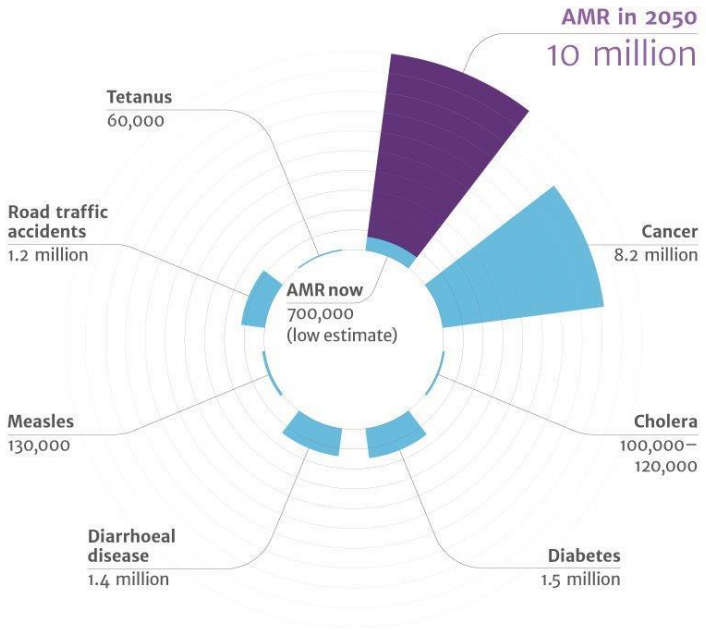
- Vancomycin-resistant Staphylococcus aureus (VRSA)
- Erythromycin-resistant Group A Streptococcus
- Clindamycin-resistant Group B Streptococcus

*CDC Antimicrobial Resistance – Biggest Threats (http://www.cdc.gov/drugresistance/biggest_threats.html) – last accessed June 2015*

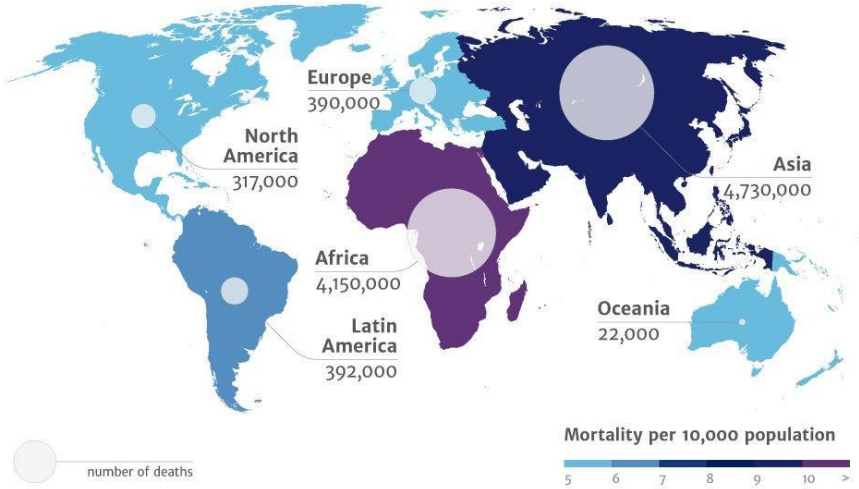
# Antimicrobial Resistance

*A current and potentially accelerating crisis*

## Deaths attributable to AMR every year compared to major causes of death




## Deaths attributable to AMR every year by 2050




*Review on Antimicrobial Resistance: Antimicrobial Resistance: Tackling a crisis for the health and wealth of nations (http://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations_1.pdf) Last accessed June 2015*

# What is Antimicrobial Stewardship?

- Refers to coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration.

- Seeks to achieve optimal clinical outcomes related to antimicrobial use, minimize toxicity and other adverse events, reduce the costs of health care for infections, and limit the selection for antimicrobial resistant strains.

- **Role of a pharmaceutical company**: to research, innovate and develop novel and effective therapies and to work with governments and regulatory agencies to ensure their appropriate use in the treatment and prevention of disease.

# Why is Antimicrobial Stewardship Important?

**The misuse of antibiotics has contributed to the growing problem of antibiotic resistance, which has become one of the most serious and growing threats to public health**

- 20-50% of all antibiotics prescribed in U.S. acute care hospitals are either unnecessary or inappropriate, breeding antibiotic resistance

- Patients unnecessarily exposed to antibiotics are placed at risk for serious adverse events with no clinical benefit.

Programmes/policies are needed globally to optimise antibiotic use in common settings such as hospitals

*CDC. Core Elements of Hospital Antibiotic Stewardship Programs. http://www.cdc.gov/getsmart/healthcare/implementation/core-elements.html. (Last reviewed July 2015).*

# CDC: Core elements of antibiotic stewardship

*In hospital settings*

**Leadership**
- Dedicating necessary human, financial and information technology resources

**Accountability**
- Appointing single leader responsible for program outcomes. Experience shows physician leader is effective

**Drug Expertise**
- Appointing a single pharmacist leader responsible for working to improve antibiotic use.

**Action**
- Implementing at least one action, such as evaluation of ongoing treatment need after set period of initial treatment (i.e. "antibiotic time out")

**Tracking**
- Monitoring antibiotic prescribing and resistance patterns

**Reporting**
- Providing information on antibiotic use and resistance to staff

**Education**
- Educating clinicians about resistance and optimal prescribing

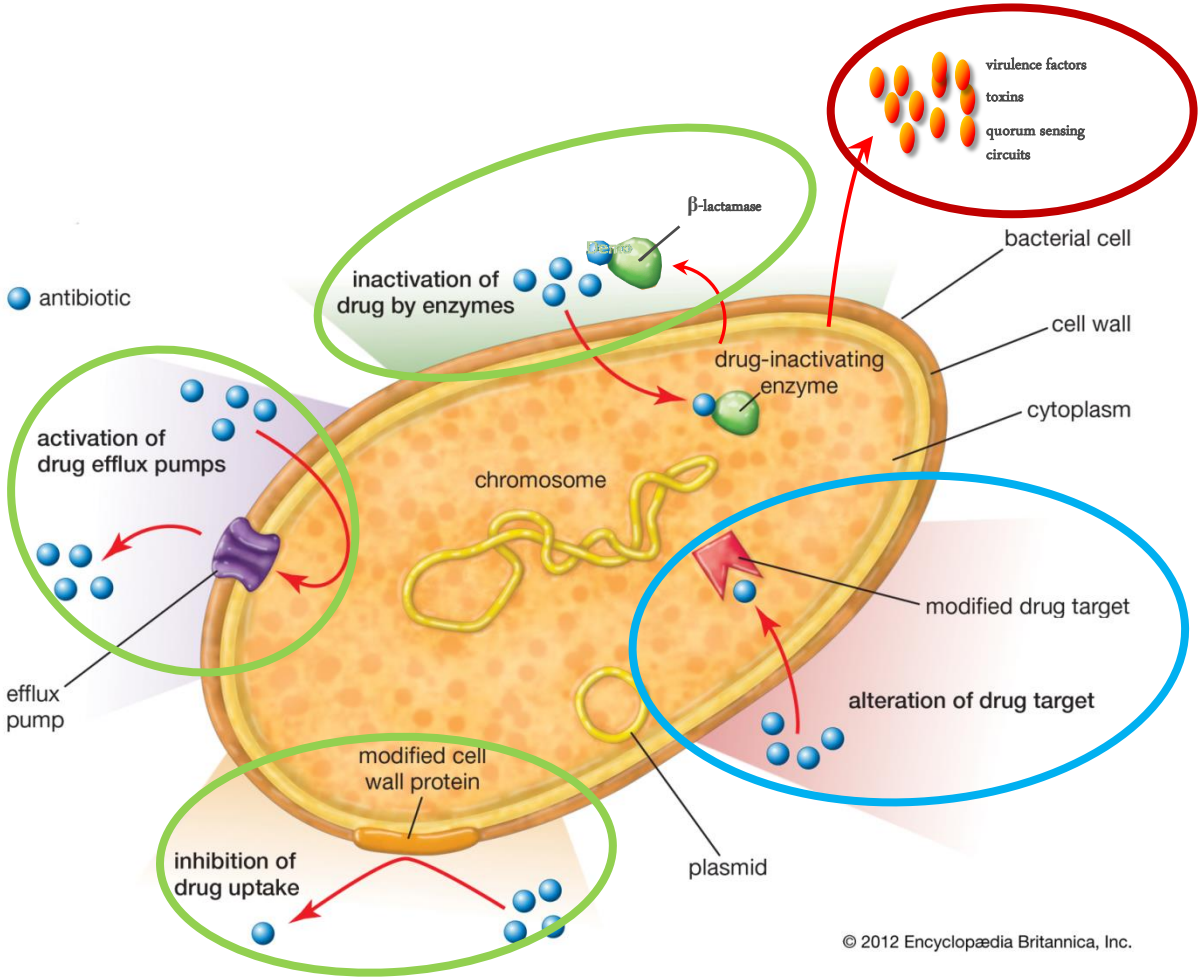
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# How can the Pharmaceutical Industry Support Antibiotic Stewardship?

- Drug development – develop broad spectrum and pathogen specific antibiotics to increase treatment options and address medical need
- Diagnostics – Innovate rapid/point of care testing to optimise patient diagnosis and treatment optimization
- Educate – support healthcare professionals in appropriate dosing, duration and route of administration of new treatments
- Support regulatory change – ensure innovation in antibiotic development is recognized and not focused on need to prescribe

# Antibiotic Focus Areas

*Novel MoAs to revolutionize treatment*




Overcoming Resistance and Improving Existing Mechanism of Action

Exploring novel targets and new innovative chemistry

Implementing completely new approaches by targeting virulence and host factors

# Pathogen-Specific Antibiotics Will Need To Be A Cornerstone of Stewardship

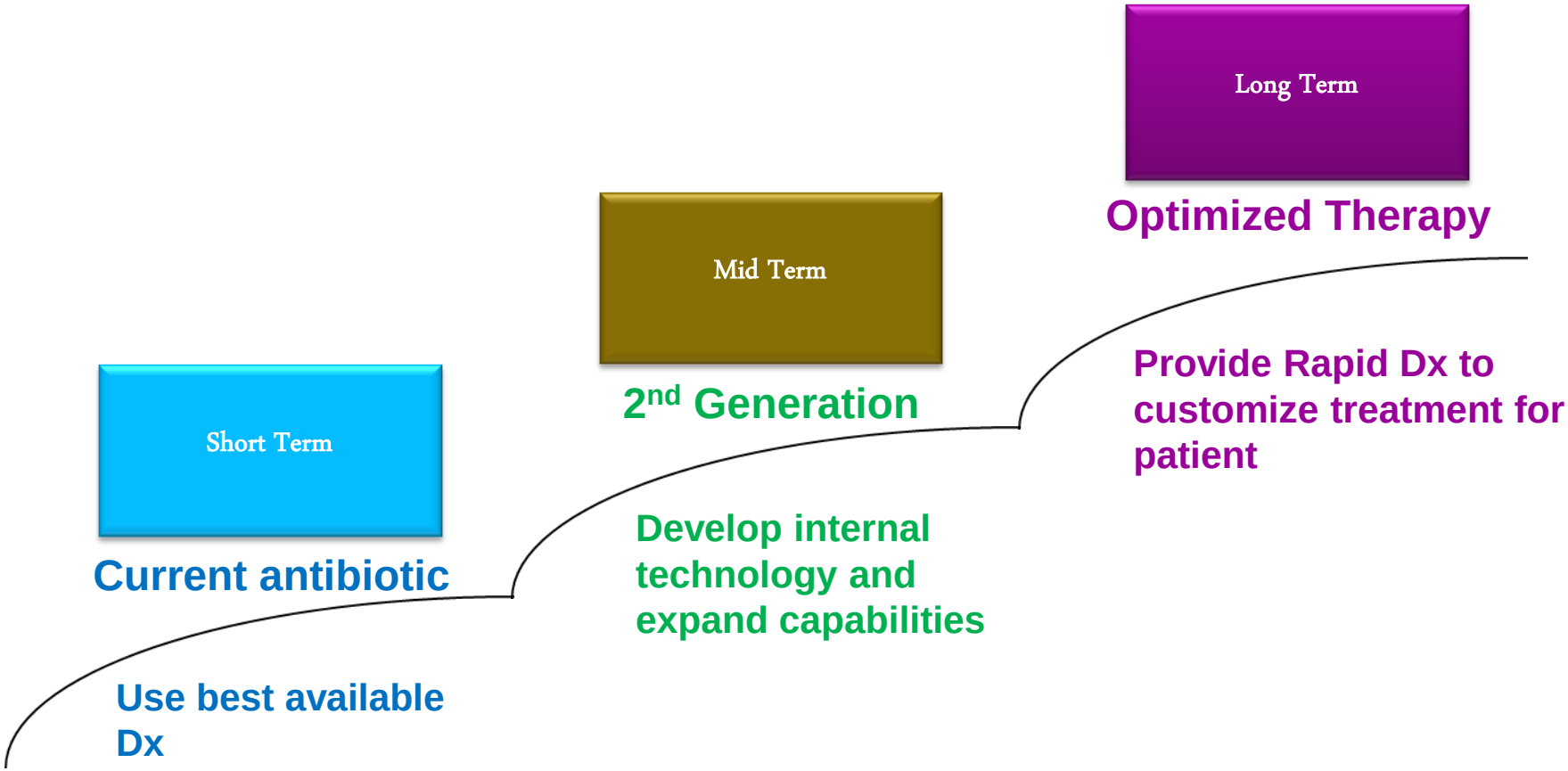
- Pathogen-specific antibiotics provides potential to target and tackle specific bacterial infections with the opportunity to combine novel diagnostics that promote personalized healthcare.
  - This innately advocates a more selective and responsible prescribing behaviour than with broad-spectrum antibiotics.

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# Rapid Testing will Change Treatment with Antibiotics

- Rapid diagnostics can support the development of novel, **paradigm-changing treatments** for patients with **severe infections** in order to address the emerging health care crisis caused by multidrug **resistant bacteria**
  - Make antibiotic clinical trials feasible
  - Optimize use of antibiotics to support stewardship
    - Reduce the induction of resistance
  - Facilitate patient access and improve treatment outcomes for serious infections

# Diagnostics Will Evolve Over the Next Decade

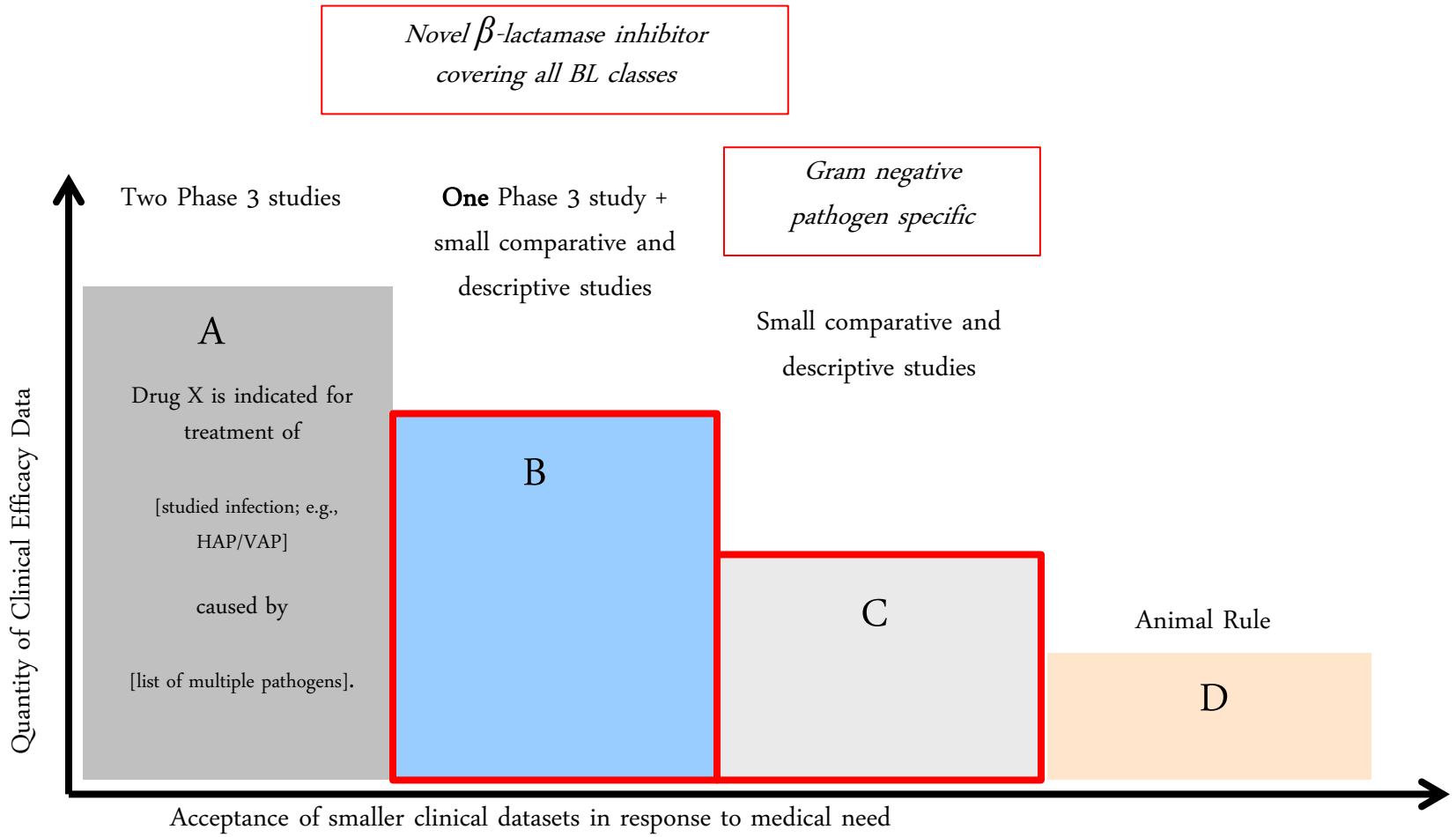


# Rapid Diagnostics in the Short and Mid Term

| | Unyvero | LIAT |
|---|---|---|
| Fast (< 1 h) | - | + |
| PoC (Near patient setting, small foot print, easy to use, CLIA waiver) | +/- | + |
| Multiplex (multiple bacteria >20) | +/- | + |
| Culture free / minimal culture | + | + |
| Sample type independent | - | - |
| “Cheap" | - | + |
| Very High NPV and PPV | +/- | + |
| Resistance | +/- | + |
| Susceptibility | - | - |

# Leverage Novel Development Strategies

*Shorter timelines with potential for higher success*




Rex et. al. Lancet Infect Dis 2013. 13(3):269-75

# Summary

- Antibiotics critical for modern medicine
- Need paradigm shift by ALL stakeholders
- Critical role of pharmaceutical industry in:
  - Ensuring a sustainable pipeline – deep R&D
  - Developing more targeted therapies
  - Developing rapid diagnostic tools
  - Educating and participating in new guidelines for rationalised use

*Doing now what patients need next*