

The Antibiotic Pipeline

What Can we Expect?

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The antibiotic era

Small spectrum

Broad spectrum

Small spectrum

Small spectrum

Gram positive

Gram negative
Gram positive

Gram positive

Gram negative
targeted



1950-60s

1970-90s

2000s

2010s

Golden years of pills and profits

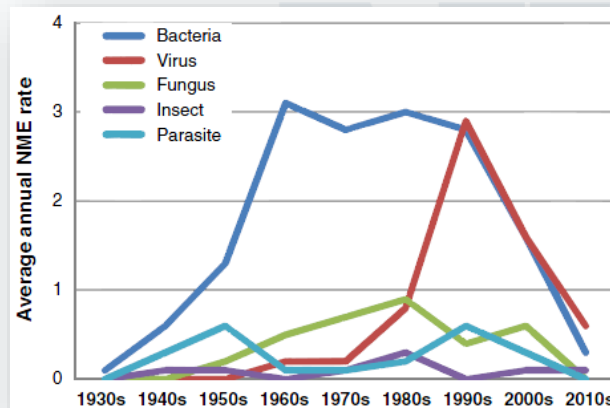
Fixing selected
resistance problems

Natural products

Medicinal chemistry,
Semisynthetic products

Target based

Natural products?
Alternative approaches?



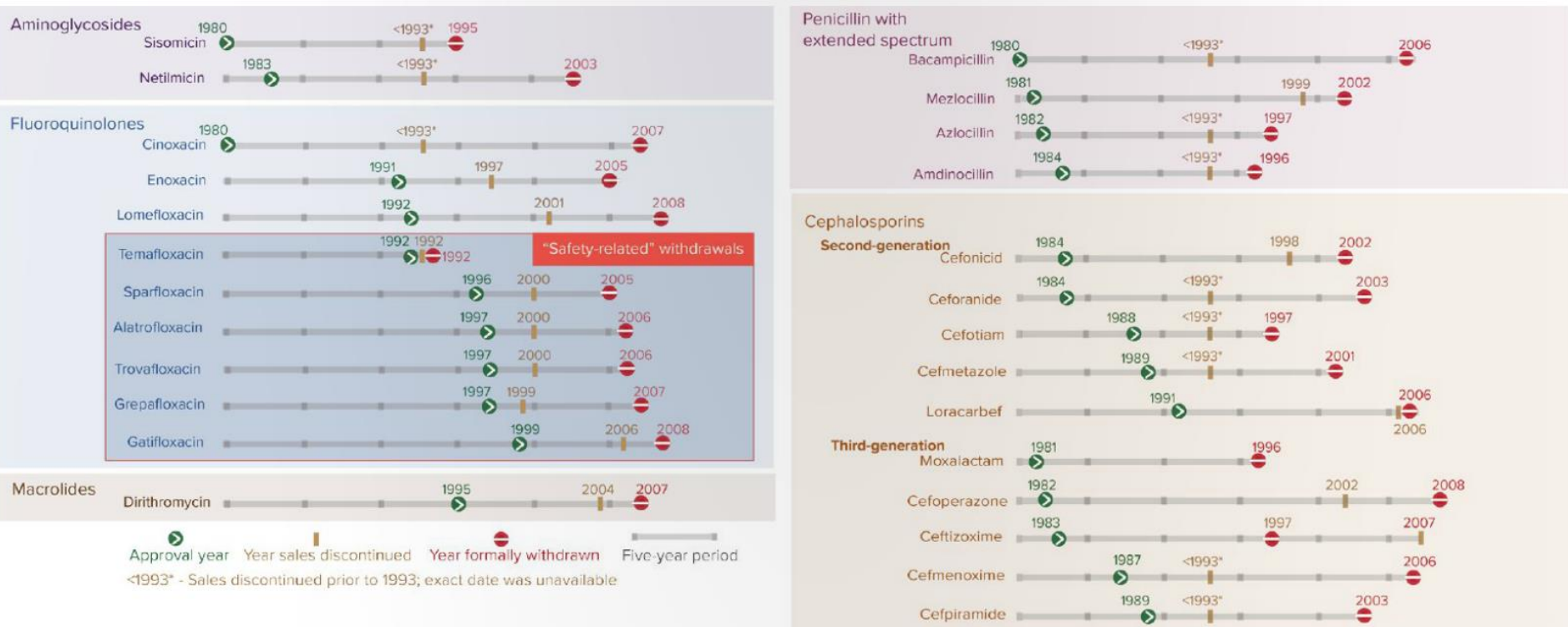
Novel antibiotics and derivatives



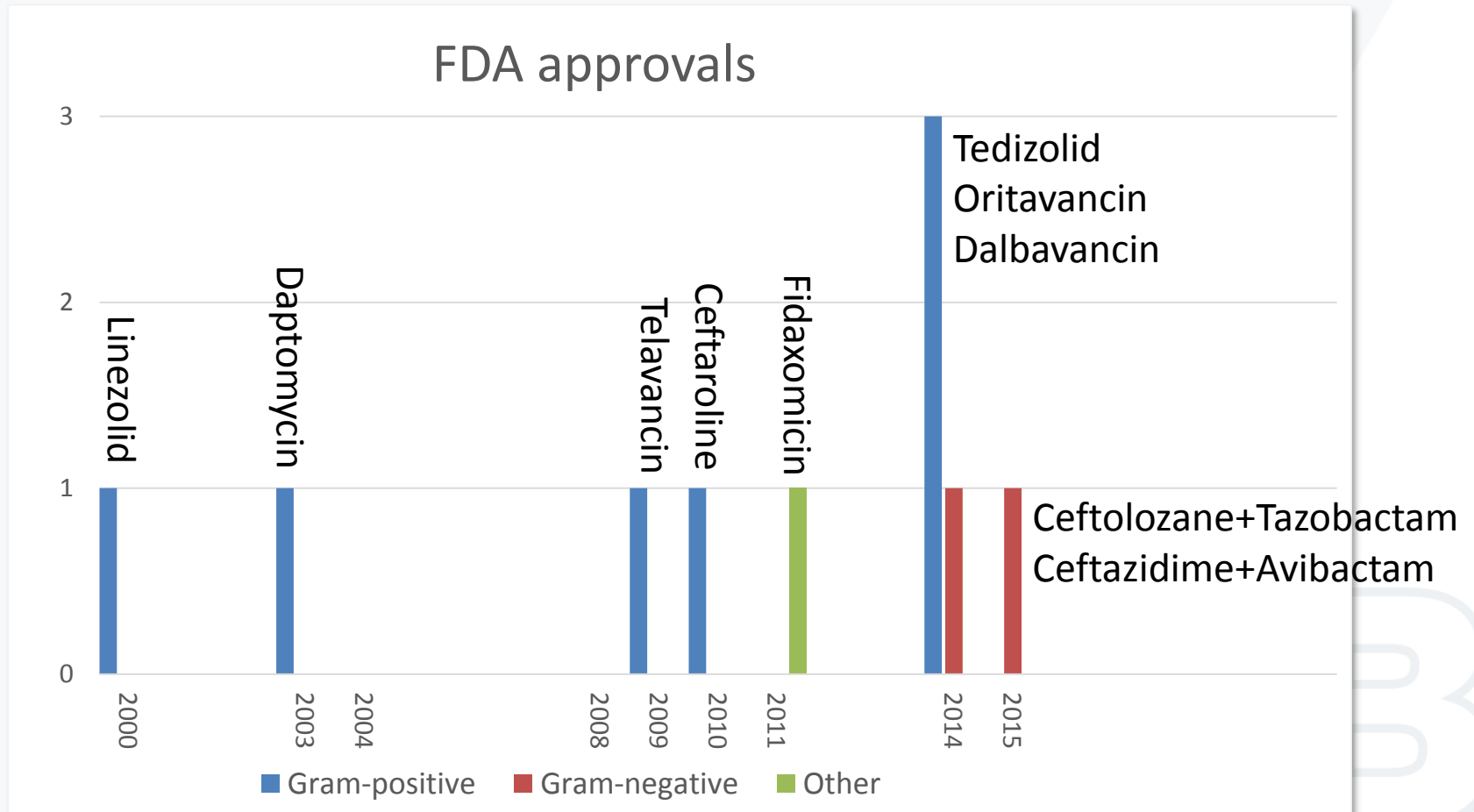
QUARTZ, Keith Collins

Antibiotics 1980-2009

New antibiotics approved by the FDA but subsequently withdrawn or discontinued, 1980-2009

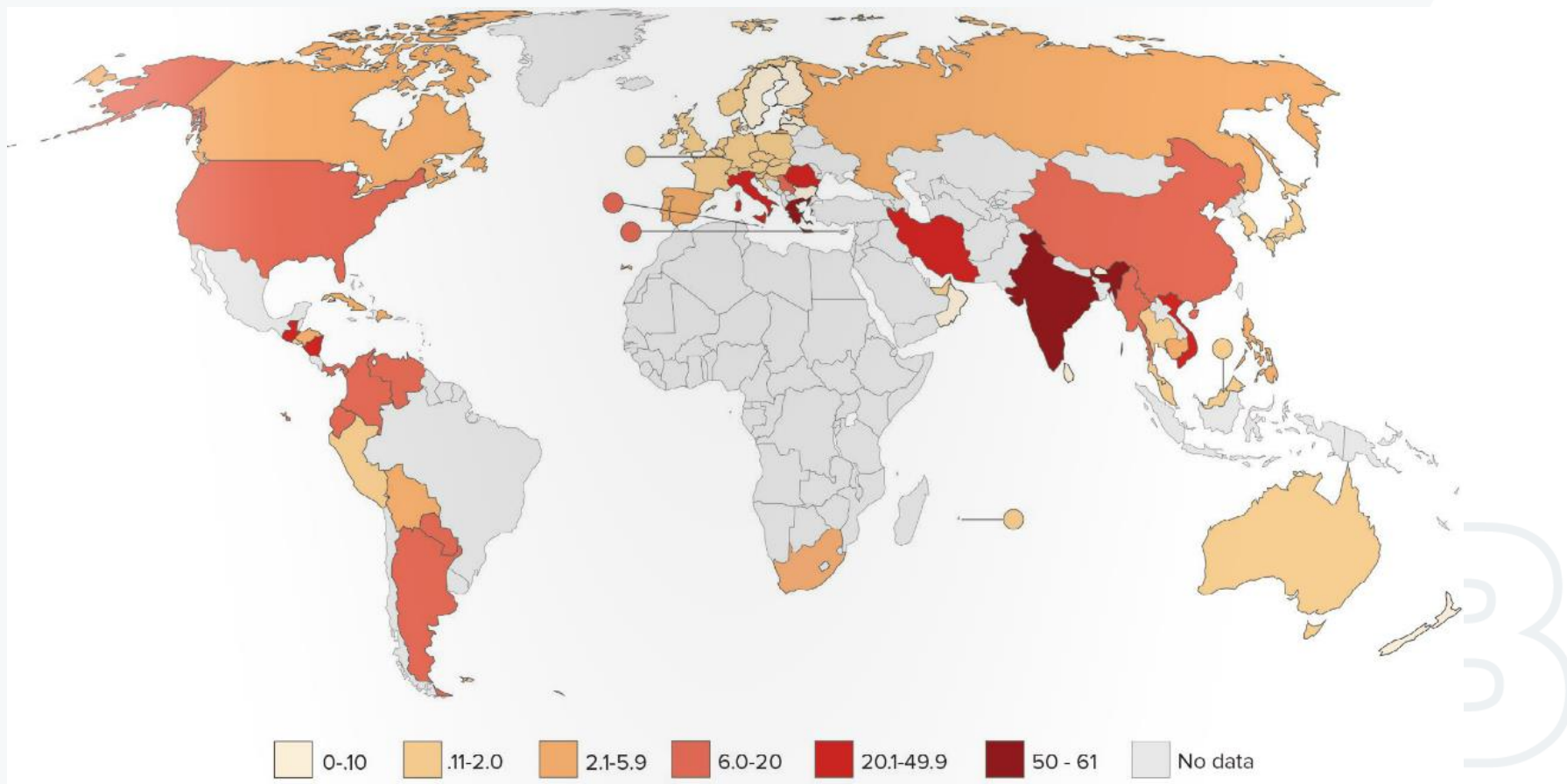


Recent approvals



Extensively resistant Gram-negatives

Percentage of carbapenem-resistant Klebsiella, 2011-2014

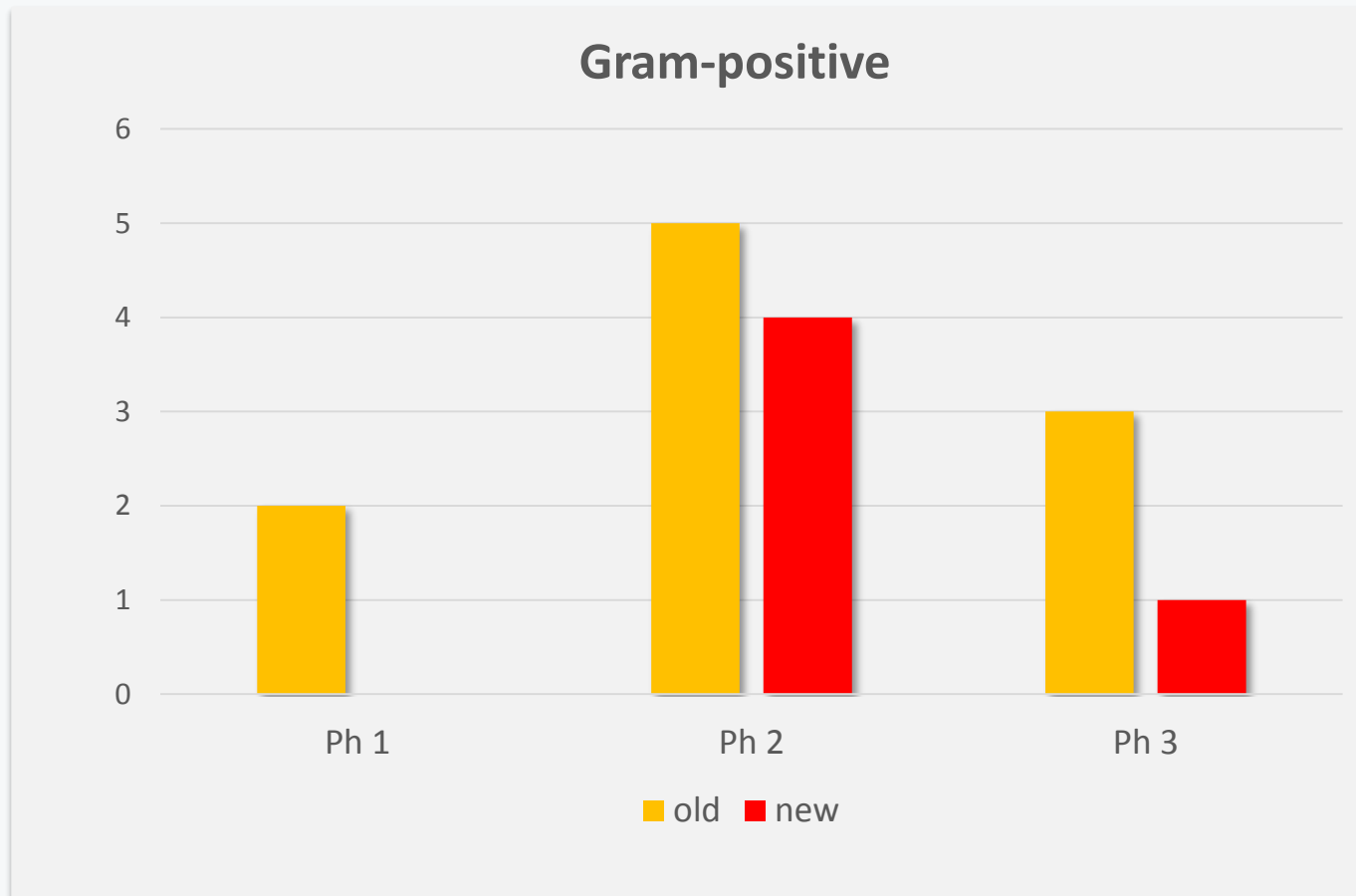


Medical need

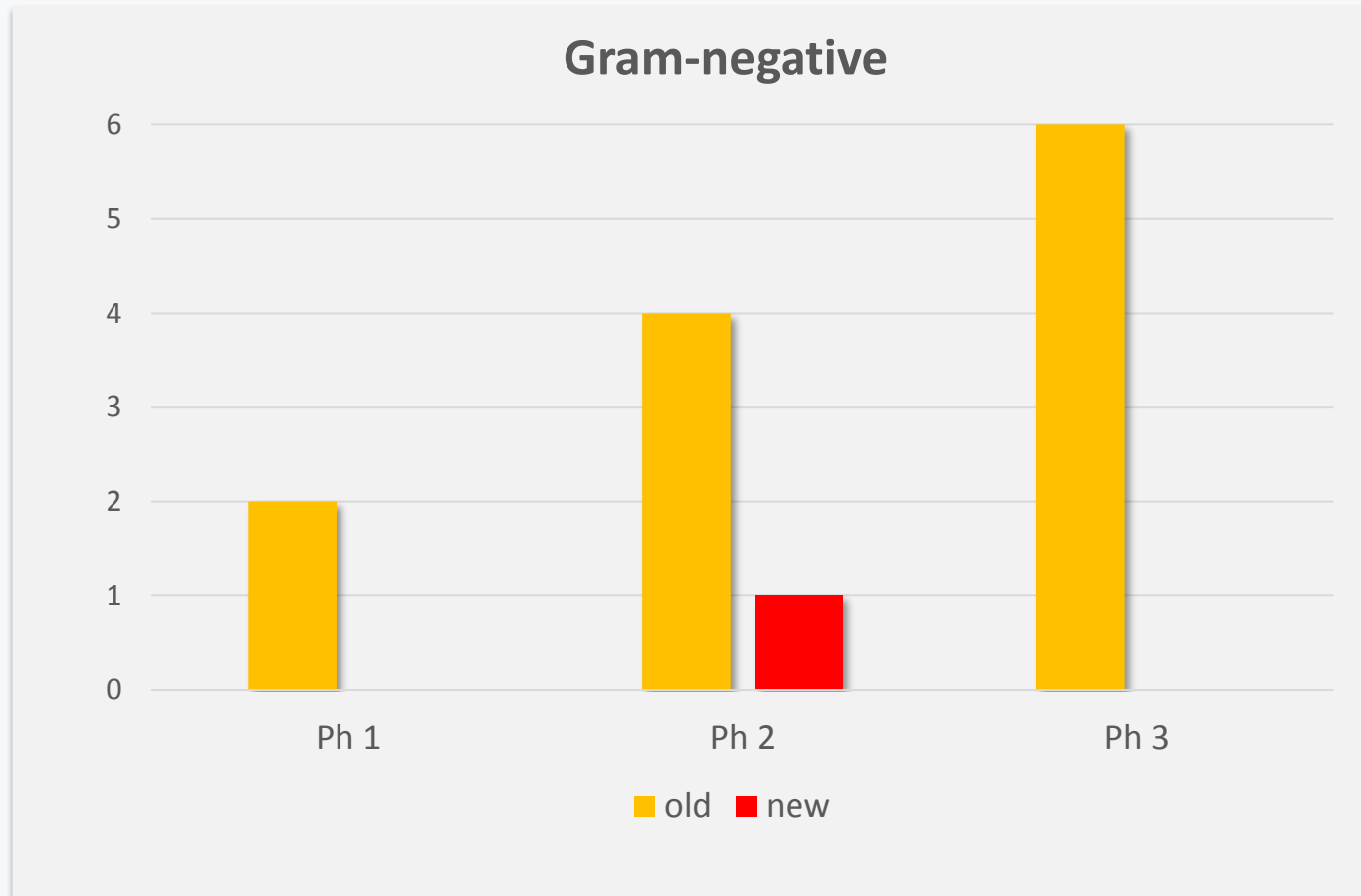
Major public health needs to address bacterial resistance

- Extensively drug-resistant Gram-negative bacteria
 - Klebsiella, E. coli, Pseudomonas, Acinetobacter
 - Critically ill patients
- Carbapenem-sparing treatment, i.v., oral
 - Klebsiella, E. coli, other Enterobacteriaceae
 - Urinary tract infections due to multi-drug resistant bacteria
 - Infections due to ESBL producers
- Specific indications
 - E.g. oral antibiotic against gonorrhoea

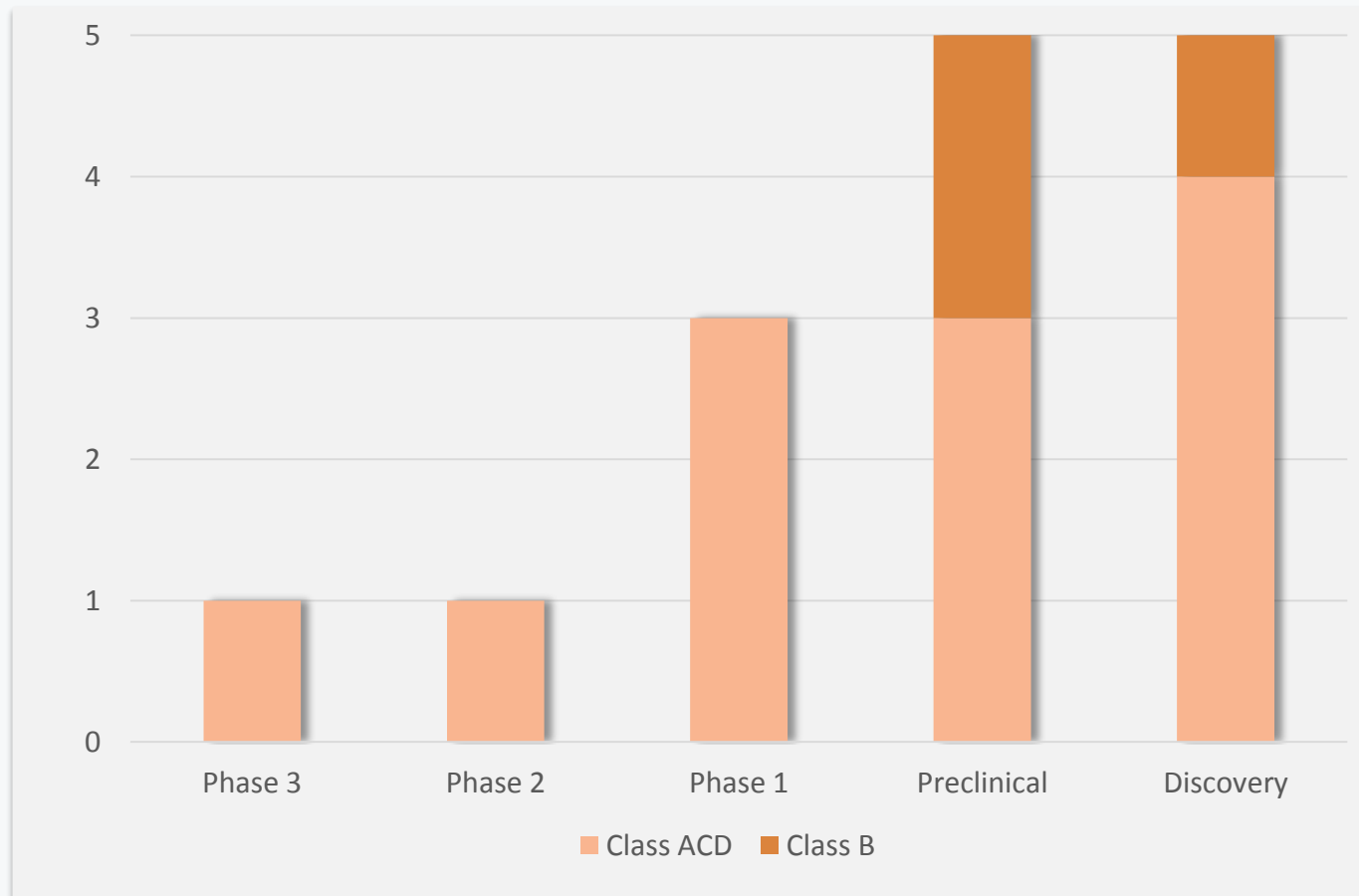
What to expect?



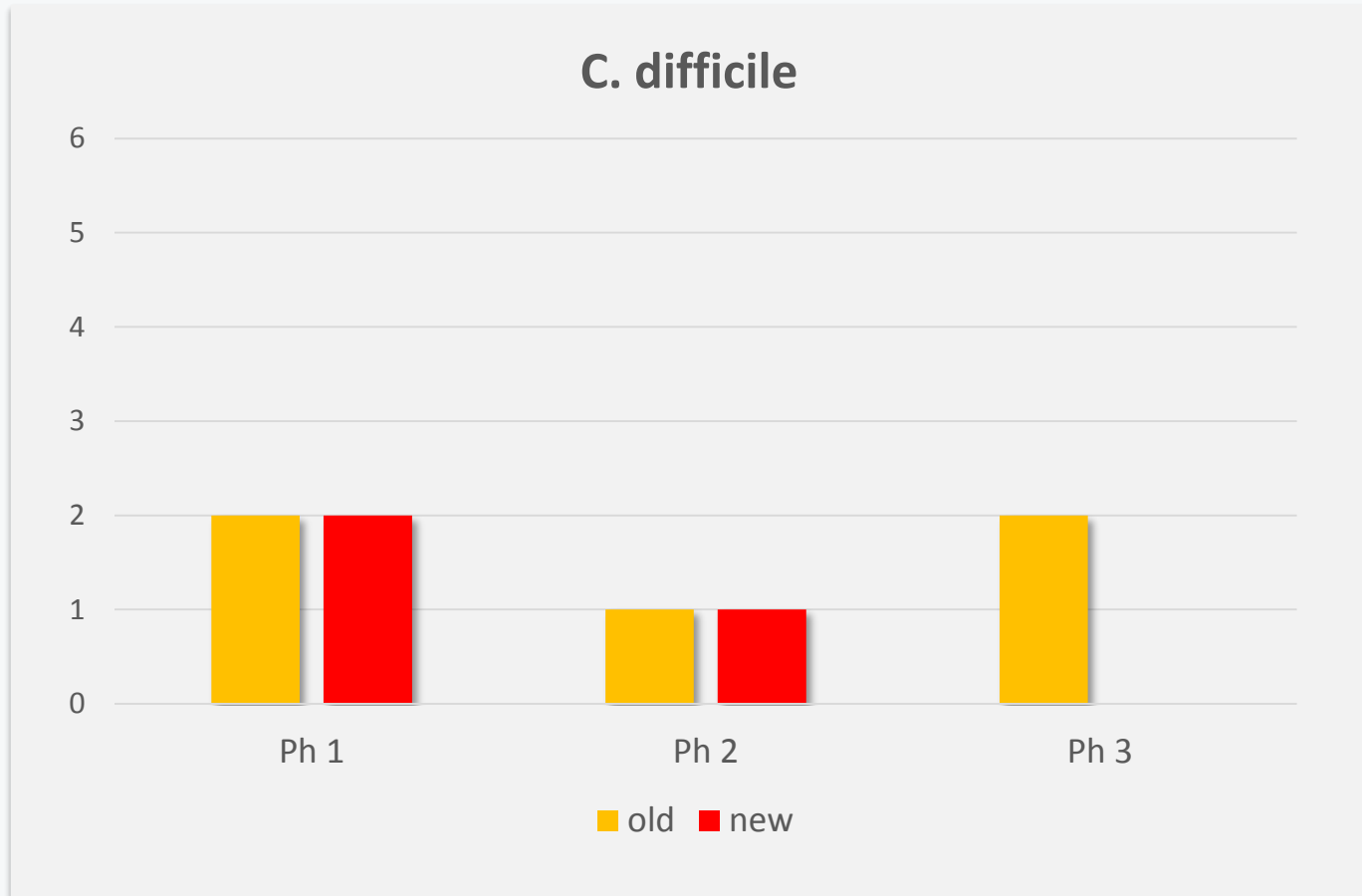
What to expect?



β -Lactamase Inhibitors



What to expect?



Antibacterial R&D pipelines

- New classes against MDR Gram-negative bacteria intended for systemic use (mostly research)
- New classes against MDR Gram-positive bacteria intended for systemic use; Mycobacterium tuberculosis
- Old class: Improving well-known classes or repurposing approved drugs, combinations
- C. difficile: different approaches

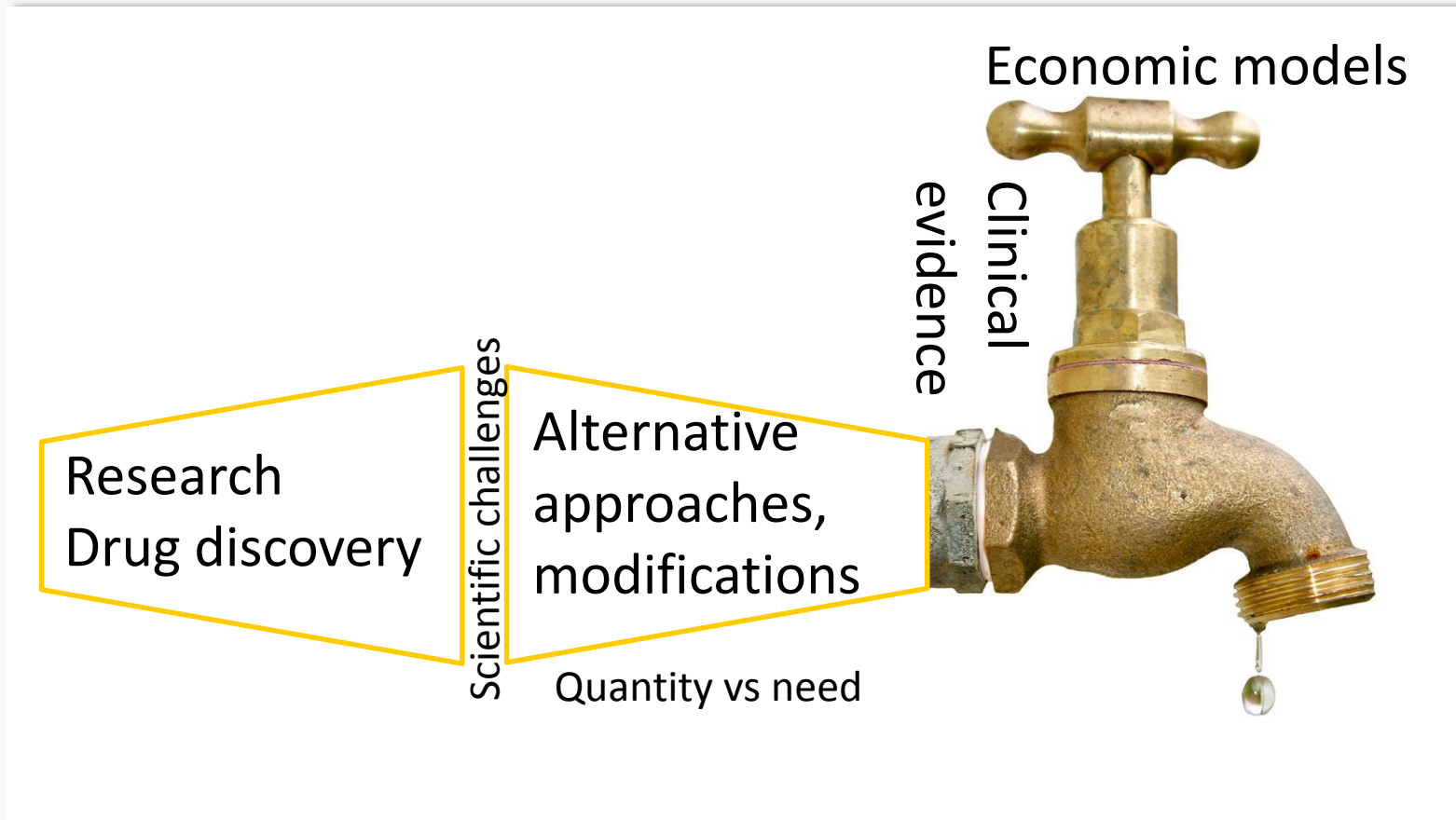
Antibacterial R&D pipelines

- Potentiators (mostly beta-lactamase inhibitors, resistance modifying) and adjunctive therapies
- Topical drugs incl. inhalation, mostly skin/wound formulations, OTC
- Vaccines, antibodies against MDR bacteria
- Immunsystem or microbiome modifying strategies
- Phage cocktails, modified phages or phage products
- Discovery or screening platforms

Where is innovation coming from?

- **Basic research:** Universities
- **Drug discovery**
 - SMEs
 - Publicly funded research institutes (Institute Pasteur, Fraunhofer, Deutsches Zentrum für Infektionsforschung,...)
 - Public-Private-Partnerships (Bioaster, IMI Lead factory,...)
 - Big Pharma
 - Small scale teams: GSK, Novartis, Merck, Genentech
 - Discovery partnerships: Roche, Sanofi-Aventis

Current antibacterial pipelines



Pipelines are insufficient

Discrepancy between antibiotic R&D pipelines and public health needs



Scientific challenges



Economic model

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