

A System Solution Approach to Antimicrobial Resistance

1243

Projects

£1.3bn

Funding

(Kelly et Al., 2015)

There were 1243 research projects on antibacterial resistance undertaken across 19 countries from 2007-2013.

Across JPIAMR countries, the European Commission and related European Union agencies, the total funding spent on ABR during 2007-2013 was £1.3bn.

AMR is a complex, system issue of global concern. Myriad solutions are required across the whole system, developed by many different individuals from different organisations, fields and disciplines. The complexity of coordinating the multitude of activities within the UK (and beyond) to maximise the impact delivered, is mirrored by the complexity of the system itself.

Our hypothesis is that it is possible to create:

“A map of the space within which all known and as yet unknown ABR solutions exist.”

Case study

York Bringing the Gap Experience

Stimulating and supporting interdisciplinary ways of working

Example Projects:

- B: Microfluidic chemostat for single-cell profiling of membrane-associated processes in bacteria
- D: Computational methods for predictive bacteriotherapy design
- K: FINAL_LAPP: for implementing novel antimicrobial-therapy locally: low temperature atmospheric pressure plasma

What do we know?

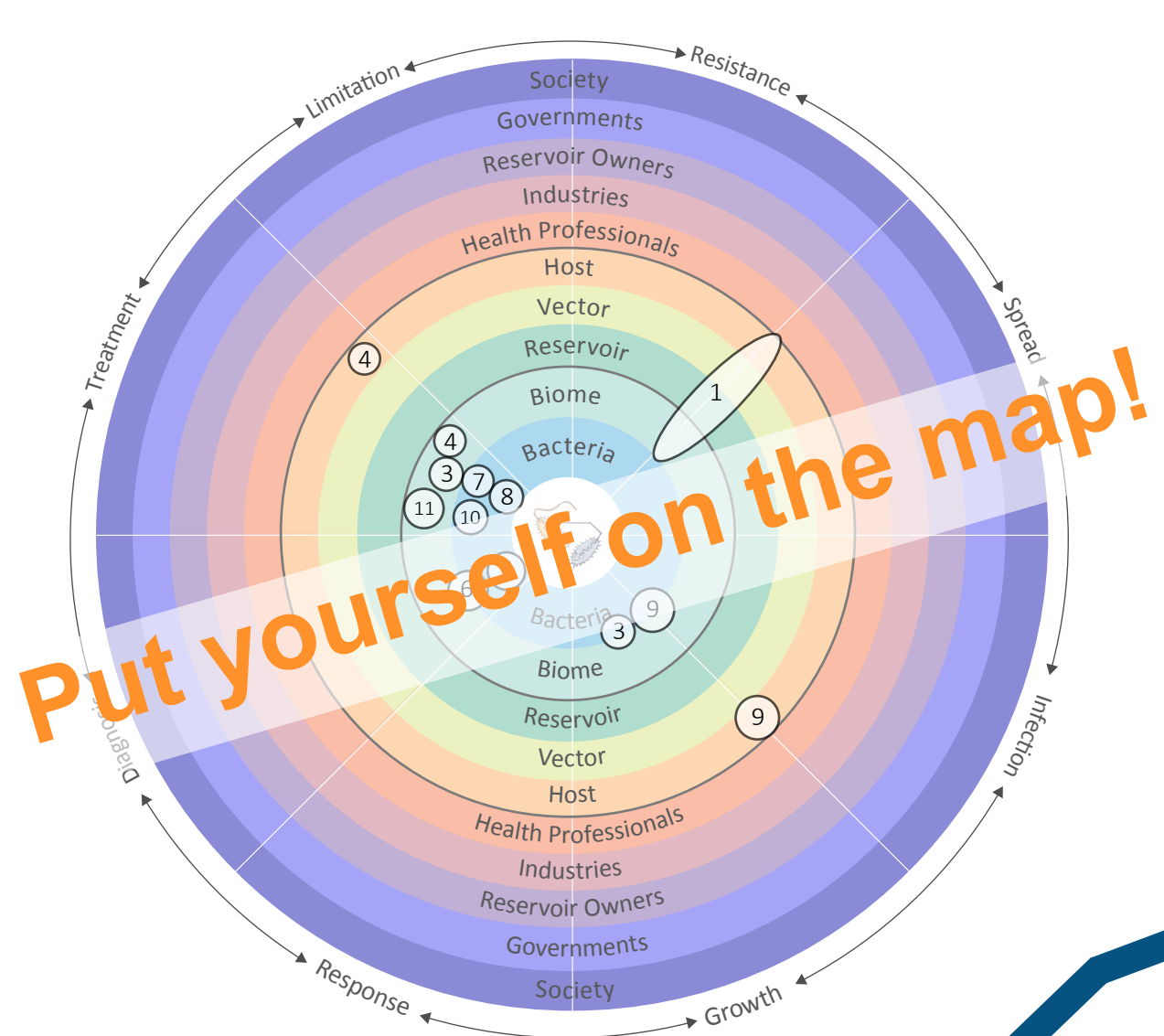
- » Where are the 'hot-spots' of activity?
- » Where might we maximise impact by a more 'joined up' approach?
- » Where are the 'under-explored' spaces?
- » Where are the new and different capabilities that might lead to creating new and better solutions?

- Bacteria**
Single micro-organism
- Biome**
Community of symbiotic and pathogenic micro-organisms (including the bacteria)
- Reservoir**
Distinct area (e.g. container) where the Biome lives (e.g. animals, rivers)

- Vector**
Means by which the bacteria is transferred from the reservoir to the host (e.g. cannula, aerosol)
- Host**
Individual who is infected by the bacteria
- Health Professionals**
Health care professional at the "front line" (e.g. NHS, Veterinarians)
- Industries**
Pharma, diagnostics and device discoverers, manufacturers and distributors, chemical companies, FMCG, etc.

What's next?

- » Collection of examples of projects funded from a variety of sources.
- » Stress testing and aligning the prototype model with MRC and other funders.
- » Explore ways to e-enable and extend access to the model



What are the Opportunities?

- » Identification of 'hotspots' of activity around which more resource could be focussed
- » Collaboration between 'clusters' of researchers Inclusion of experts who have not traditionally been associated with AMR
- » Exploration of 'white spaces' which are currently under researched
- » Stimulation of ideas in white spaces where less 'traditional' AMR capabilities are not routinely applied
- » Identification of gaps in capabilities that, if filled, could create a springboard for new approaches
- » More informed portfolio management for funders of research

Which Capabilities are used & built?

- Growing body of knowledge, assets & resources brought to bear on the solution
- Enabling technologies (fundamental & applied)**
Science and technology expertise that is brought to and developed in the domain
- Sensing & Measurement**
Sensing systems and approaches to gather data
- Multi-Scale Modelling**
In-silico modelling of systems from micro to macro scale
- Failure & Root Cause Analysis**
Systematically understanding failures and their causes
- Policy, Guidelines & Standards**
Defined frameworks for operating within the system

Which Actions are involved?

- Resistance**
Emergence of microbes with resistant strains
- Spread**
Proliferation of microbes with resistant strains
- Infection**
Invasion of host by microbes with resistant strains
- Growth**
Multiplication of microbe population in the host
- Response**
Triggering and action of the host's immune system
- Diagnosis**
Identification of the infection-causing agent in the host
- Treatment**
Therapy administered to the host to counteract or mitigate the infection
- Limitation**
Prevention and mitigation of the emergence of resistant strains
- Human Factors**
Research into understanding human behaviour and performance
- Data Analysis & Surveillance**
Interpreting, understanding and making predictions from data
- Testing, Trialling & Evaluating**
Processes and platforms to evaluate solutions from lab to field
- Health Economics & Modelling**
Understanding financial impacts of changes in the system
- Collaborative & Creative Ways of Working**
Defined ways in which problem and solution finders and owners in the system work together to create value
- Knowledge Repository**
A common place to store and share system knowledge related to solving the problem

