AMR Open Data Initiative

AMR Surveillance in Pharma: a case-study for data sharing

Professor Barry Cookson

External Consultant to Project

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- Dept. of Microbiology, St Thomas’ Hospital
Background of “90 day Project”

Addressed some recommendations of the first Wellcome funded multi-disciplinary workshop (included Pharma Academia & Public Health invitees: 27th July 2017 (post the Davos Declaration):

1) **Review** the landscape of existing Pharma AMR programmes, their protocols, data standards and sets

2) **Develop a "portal" (register/platform) to access currently available AMR Surveillance data**

Important to emphasise that this is a **COLLABORATION between Pharma and others**
Overview of Questionnaire Content

- **General information** - including name, years active, countries, antimicrobials, microorganisms.

- **Methodology** - including accreditation, methodology for; surveillance, isolate collection, organism identification, breakpoints used,

- **Dataset** - including data storage methodology, management and how accessed.
<table>
<thead>
<tr>
<th>Companies</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achaogen, GSK, J&amp;J, Merck, Pfizer, Shionogi, Pfizer</td>
<td>Questionnaire about AMR surveillance activities received</td>
</tr>
<tr>
<td>Novartis, Roche, Sanofi</td>
<td>No current surveillance studies to be included</td>
</tr>
<tr>
<td>Allergan, The Medicines Company / Melinta Therapeutics</td>
<td>Engagement, but couldn't be included at this time</td>
</tr>
</tbody>
</table>
Structure of register

Companies can have different ways of referring to their activities: We had to choose a consistent framework.

Programmes can contain multiple studies (e.g. Pfizer has single global programme "ATLAS" containing all studies)
Open-Access Register
Structure:

Companies
Pharmaceutical companies develop and market multiple drugs, including antimicrobials. They also conduct surveillance of antimicrobial resistance (AMR). This register contains information on six companies who conduct AMR surveillance.

GSK
SOAR 114620 Programme
Years active: 2011-2014 Countries: 15 Antimicrobials: 22

SOAR 201818 Programme
Years active: 2014-2016 Countries: 8 Antimicrobials: 13

SOAR 201910 Programme
Years active: 2015-2017 Countries: 18 Antimicrobials: 17

Cefpodoxime
Cefpodoxime on the WHO website

Generic name: Cefpodoxime
Other names: Vorni, Cefpodox
Class of Agent: Third-generation cephalosporin
In development? No
Currently marketed? Yes

Programmes:
- ALERT
- SOAR 114620
- SOAR 201910

SOAR 114620 Programme
Conducted by: GSK
Date: 2011-2014
Countries: Thailand, India, South Korea, Singapore, Democratic Republic of Congo, Ivory Coast, Republic of Senegal, Kenya, China, Bahrain, Lebanon, Oman, UAE, Ukraine, Turkey

About the data
Isolates collection method: Primarily for routine clinical practice, then used for surveillance.
Organism identification: Local labs identify microorganisms based on their routinely used methodology. Isolates were not sent to a central lab for this programme.
Methodology and breakpoints: Gradient diffusion and disk diffusion according to CLSI guidelines.
Inclusion and exclusion criteria: See SOAR 114620 country-specific study protocols.
Are infections hospital or community acquired? Yes, Community-acquired is defined as <30 days hospitalization.
Can isolates be identified from the community? No.

Dataset
Disclaimer: These data are provided for illustration purposes only. The data are anonymised and data from China and India only are included at this time.

Data stored: As an Excel spreadsheet.
Data access method: Excel sheets (no email).
Who can access: GSK-Global, GSK-LOCs, third party and investigators.
Data curator: Third party.
Isolates per year: 3937
Total Isolates: 38,000
Format: Excel spreadsheet.
How is data from previous years added? No.
Anonymisation instructions: Download
Dataset file: Download
SOAR 114620 Programme  
Conducted by GSK  
Active: 2011-2014  
Studies: 15  
Regions: Thailand, India, South Korea, Singapore, Democratic Republic of Congo, Ivory Coast, Republic of Senegal, Kenya, China, Bahrain, Lebanon, Oman, UAE, Ukraine, Turkey

### About the data

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<td>Methodology and breakpoints:</td>
<td>See SOAR 114620 country-specific study protocols.</td>
</tr>
<tr>
<td>Inclusion and exclusion criteria:</td>
<td>Yes. Community-acquired is defined as &lt;48 hrs hospitalization.</td>
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What sort of data are collected?

Pharmaceutical activities:
- High-quality standardised data
- Large Antimicrobial panel
- Many countries
- Stored in spreadsheets or databases (integration a massive challenge)

AMR surveillance ‘pyramid’

Lab Based Surveillance (a WHO GLASS Category)

- People infected with AMR bacteria
- People who become ill
- People who seek healthcare
- Specimens obtained
- Lab tests for organisms
- Culture-confirmed
- Reported
What sort of data are collected?

- People who become ill
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- Culture-confirmed
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Programmes vary in:
- Infection sites
- Microorganisms and
- Antimicrobials tested

Issues can relate to:
- Ability to identify Hospital- versus Community- Acquired infections as inconsistently recorded or defined
- Denominator data: usually % susceptible organisms BUT many variations: e.g. limiting % per site or organism numbers

Resonates with SUSPIRE study: CMI, 2018;24:105-9
Surveillance targets vary considerably between companies: in aggregate......

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<th>Microorganisms</th>
<th>Antimicrobials</th>
<th>Infection sites</th>
</tr>
</thead>
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<tr>
<td>Acinetobacter baumannii</td>
<td>Amikacin</td>
<td>Blood stream</td>
</tr>
<tr>
<td>Burkholderia cepacia</td>
<td>Amoxicillin/clavulanate</td>
<td>Intra-abdominal</td>
</tr>
<tr>
<td>Citrobacter spp.</td>
<td>Ampicillin/sulbactam</td>
<td>Skin</td>
</tr>
<tr>
<td>Enterobacter spp.</td>
<td>Azithromycin</td>
<td>Soft tissue</td>
</tr>
<tr>
<td>Enterococcus spp.</td>
<td>Aztreonam/avibactam</td>
<td>Respiratory tract</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>Bedaquiline</td>
<td>Urinary tract</td>
</tr>
<tr>
<td>Haemophilus influenzae</td>
<td>Biapenem</td>
<td></td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>Capreomycin</td>
<td></td>
</tr>
<tr>
<td>Moraxella catarrhalis</td>
<td>Cefaclor/Cefazolin/Cefcapene</td>
<td></td>
</tr>
<tr>
<td>Mycobacterium tuberculosis</td>
<td>Cefdinir/Cefditoren/Cefepime</td>
<td></td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>Cefiderocol etc.</td>
<td></td>
</tr>
<tr>
<td>Streptococcus pneumoniae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serratia spp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staphylococcus spp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stenotrophomonas maltophilia</td>
<td></td>
<td></td>
</tr>
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N.B. not comprehensive list
and not all equally represented
What is the scale of the data?

Programmes in register have data on isolates from a total of 93 countries and 85 antimicrobials.

Sub Saharan Africa Poor
Datasets: format, management, access

Format
Databases (7/12) - managed by specialised companies e.g. Micron, JMI, IHMA (via SLDN), LGC.

Spreadsheets (5/12) - managed internally

Access

- Online password-protected to centre participants
- Some datasets are public to some extent:
  - ATLAS (Pfizer) - [www.atlas-surveillance.com](http://www.atlas-surveillance.com) (updated every 6-9 months)
  - SMART (Merck) - [www.globalsmartsite.com](http://www.globalsmartsite.com)
  - SOAR (GSK) - raw data are now available

Scientific Publications - often include tabulated MIC distributions
Example of use

MICs for cefuroxime against *Streptococcus pneumoniae* from China

- Downloaded anonymized data from register for all isolates from India and China ~2011-2014
- Subsetted to *S. pneumoniae* and cefuroxime in China
- Generated distribution
- Plotted

N.B. this distribution was published as Table 4 in the associated GSK SOAR publication:
Hu et al. (2016) *JAC*
doi: 10.1093/jac/dkw065

Here Liam Shaw generated it from the raw data
Second Workshop March 2018: Four Key Actions

• Develop a public–private partnership between industry, public health organisations and other AMR initiatives for a more informative, coherent and openly accessible AMR data landscape

• Enable open innovation and catalyse data sharing within the AMR community by encouraging reuse of shared industry AMR data with case studies (Wellcome to launch a Data Reuse prize ~Jan. 2019)

• Facilitate development of common methodological and metadata standards and data governance frameworks so enabling the scientific and public health communities to utilise and compare data use with existing in-country datasets

• Online portal launch managed and governed by an independent party
Collaboration Personnel (and Acknowledgements)

Steering group
David Beardmore (ODI), Chair
Pauline L’Henaff (ODI), Project Manager
Seamus O’Brien (Pfizer now GARDP)
Didem Torumkuney (GSK)
Andrew Freeman (GSK)
Seamus O’Brien (Pfizer now GARDP)
Najib Rehman (Pfizer now Kokoro & Farma Trust)
Barry Cookson (Consultant: UCL)
Liam Shaw (Scientist: UCL)
Nandini Shetty (PHE)
Allison Holt (Longitude 174)
Wellcome: Francesca Chiara,
Joanna Wiecek, Ghada Zoubiane
& Tim Jinks

10 Company Nominated
Lead Collaborators
Achaogen: Tiffany Keepers
Allergan: Ian Critchley
GSK: Didem Torumkuney
J&J: Karen Grosser
Merck: Mary Motyl,
Silas Holland
Novartis: Susana Goncalves
Pfizer: Michael Dowzicky
Roche: Claudia Zampaloni
Sanofi: Christine Luxemburger
Shionogi: Yoshiri Yamano,
Gareth Morgan

Thank you for your attention