Antimicrobial Resistance

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Presentation at a Foundation for Science and Technology debate

4th June 2014

Annual report of the CMO, Vol 2, 2011
It is not difficult to make microbes resistant to penicillin in the laboratory, and the same has occasionally happened in the body.

Alexander Fleming, 1945
Nobel Prize Acceptance Speech

<table>
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<th>History of antibiotic resistance</th>
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<td>Time from first clinical use of an antibiotic to first clinical resistance</td>
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Based on earlier slide developed by Professor Laura Piddock, on data from Clatworthy et al., Nature Chemical Biology 3, 541 -548 (2007)
Antimicrobial Resistance: A Global Threat

Europe:
Resistance doubles death rate from an infection.

25,000 deaths a year due to AMR.

= €1.5 billion added to hospital, treatment and societal costs.

Image from slides produced by McKinsey & Company, based on earlier image from Nature, 13th July 2013

Movement of two strains of Carbapenem-resistant Klebsiella pneumoniae 2000 - 2008

KPC
• 2006: First found in North Carolina
• 2003: Isolates spread rapidly through New York
• 2005: Found to be widespread throughout Israel
• After 2005: Spreads to Italy, Columbia and Sweden

NDM
• Before 2003: Resistance first identified in India
• 2008: Discovered in Sweden
• 2010: Discovered in the UK
• 2010: Discovered in Canada

1 New Delhi Metallo-beta-lactamase
We have abused antibiotics

- as patients
- as doctors
- in food production
No new class of antibiotics has been discovered for 26 years.
Challenges

- Conserve the drugs we have
  - In human medicine and veterinary and industrial uses

- Economic
  - How can we make development of new antimicrobials financially worthwhile?

- Global challenge
  - Infectious diseases do not respect international

- Research challenge

Hygiene and infection control

- CATCH IT: Germs spread easily. Always carry tissues and use them to catch your cough or sneeze.
- BIN IT: Germs can live for several hours on tissues. Dispose of your tissue as soon as possible.
- KILL IT: Hands can transfer germs to every surface you touch. Clean your hands as soon as you can.

Now Wash your Hands
Variation in use of antibiotics

Map shows incidence of GP antibiotic prescription in England by CCG in 2012

Substantial variation:
- 8.4% in Newcastle West (highest)
- 4.0% in Camden (lowest)

National average: 6.4%

We need to use

- right antibiotic for the bug
- right dose
- right time
What the UK is doing

1. Improving infection prevention and control practices in human and animal health
2. Optimising prescribing practice
3. Improving professional education, training and public engagement
4. Developing new drugs, treatments and diagnostics
5. Improving use of surveillance data
6. Improving identification and prioritisation of AMR research
7. Strengthening international collaboration

Can we make a difference?

Recent 12 month trends in MRSA bacteraemia (all ages) and C. difficile cases (aged 2+)

Covering the 5 year period April 2009 to March 2014

MRSA cases

CDI cases
What is being done at a global level?

Participating on AMR work in a wide range of international fora including:

- WHA Resolution – May 2014
- Working with WHO and other UN bodies (OIE, FAO, Codex).
- Working with EU Commission on surveillance, research, legislative and drug pipeline issues to tackle AMR.
- Working with the Commonwealth to support improved surveillance and infection prevention and control.
- G7 and G20 meetings.
- International Chatham House round table discussions on AMR.
- European Academies Science Advisory Council (EASAC) discussions.
- WISH Conference – chairing the panel on AMR.

Research

- The National Institute for Health Research (NIHR) provides strategic co-ordination and support.
- Co-funders of the UKCRC Translational Infections Research initiative and the Health Innovation Challenge Fund.
- The NIHR funds applied health research:
  - running a themed call on AMR across 8 NIHR funding streams,
  - funding two Health Protection Research Units on AMR and HCAI,
  - funds initiatives aimed at supporting new diagnostics
- AMR Research Funders Forum established to align funding decisions, MRC lead.
- International research collaboration (JPU AMR, IMI).
Rapid diagnostics.

- Rapid diagnostics offer a major and rapidly evolving opportunity to slow the growth and impact of AMR across the world.

- We need:
  - Innovation,
  - Quality routine testing and interpretation of results to improve diagnosis and treatment of infections.

Longitude Prize – a hope for a solution???

- A shortlist of six challenges which includes AMR – development of a rapid diagnostic
- The BBC, through "Horizon" is facilitating a public vote – closes 25th June, 7:10pm.
- Scientists, entrepreneurs, academics and others will then compete to resolve the chosen challenge by 2020 to win the £10million prize.

Previous challenge = a solution to the challenge of navigating longitude at sea to support global trade – 2014 is the 300 year anniversary.
We need to get to a point where:

• hygiene, good infection prevention and control measures to help prevent infections occurring in the first place become the norm in all sectors of human and animal health,
• infections can be diagnosed quickly and the right treatment deployed,
• patients and animal keepers fully understand the importance of antibiotic treatment regimens and adhere to them,
• surveillance and monitoring are in place which quickly identifies new threats or changing patterns in resistance, and
• there is a sustainable supply of new, effective antimicrobials for human use.

Public information and education
Anti-microbial resistance is one of the challenges.

*Vote at: [bbc.co.uk/horizon](http://bbc.co.uk/horizon) or text ANTIBIOTICS to 60011*

*Voting closes: Wednesday 25th June, 7:10pm*

*Find out more: longitudeprize.org, @longitude_prize*