



Department  
of Health

# Antimicrobial Resistance: a disaster in the making?

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Department of Health*

British Society for Microbial Technology 29<sup>th</sup> Annual Scientific Meeting  
May 2014

# AMR – a disaster in the making

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- Extent of the threat
- UK Strategy
- Challenges
- Actions

# Key messages:

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**Antimicrobial resistance is a global problem with a significant impact on public health**

**There are major challenges in reducing this threat**

**The UK is acting but more needs to be done**

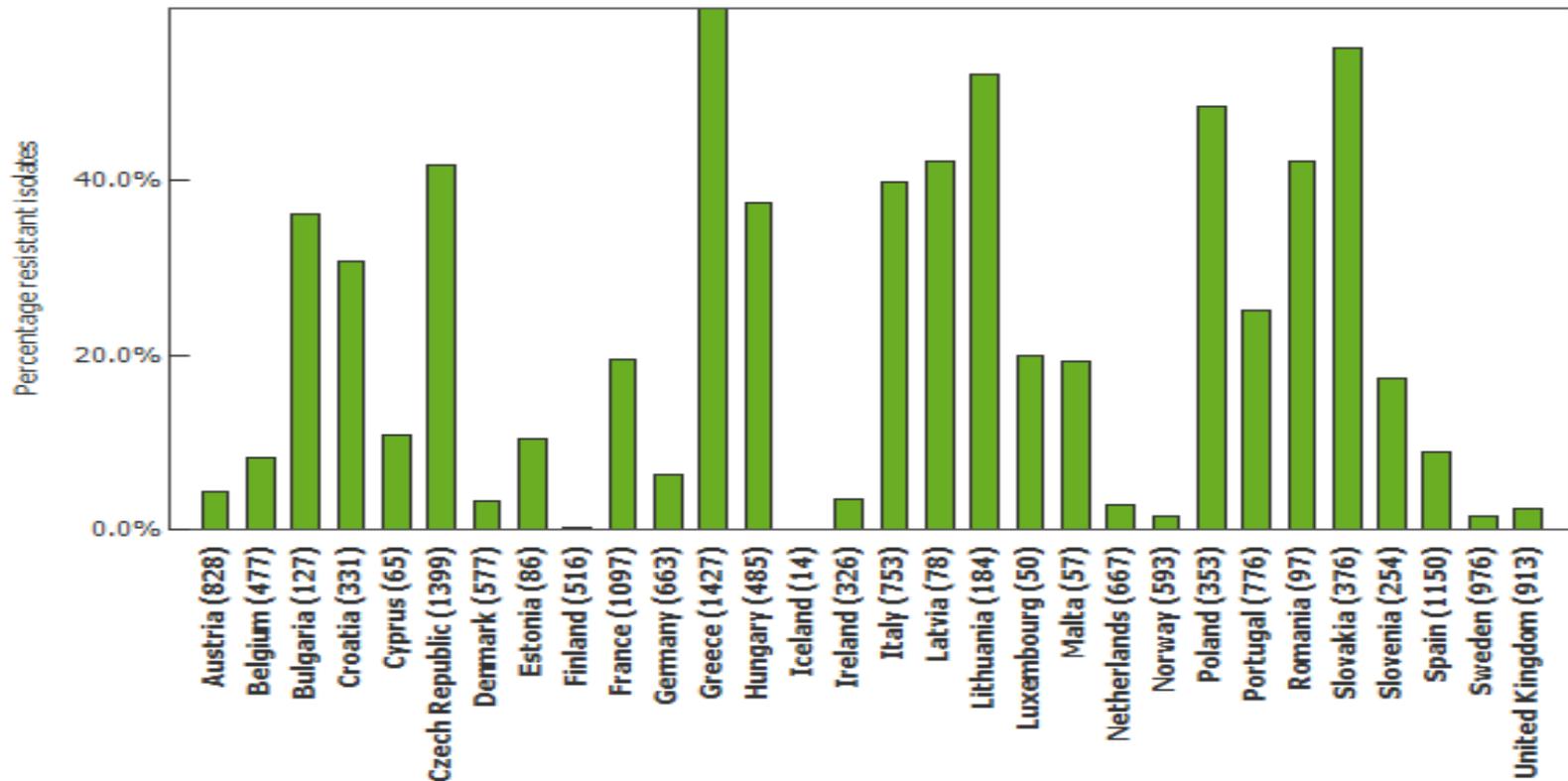


# Resistance is a deadly reality

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- **25,000** people per year in Europe die of sepsis caused by resistant bacteria
- **23,000** deaths per year from sepsis caused by resistant bacteria in United States (conservative estimate)
- **1 child every 5 minutes** dies of infection caused by resistant bacteria in South East Asia

# Multidrug-resistant *Klebsiella pneumoniae* Isolates in Participating Countries in 2012 (Resistant to Third-generation Cephalosporins, Fluoroquinolones and Aminoglycosides)



\* Number of isolates in brackets after the country name

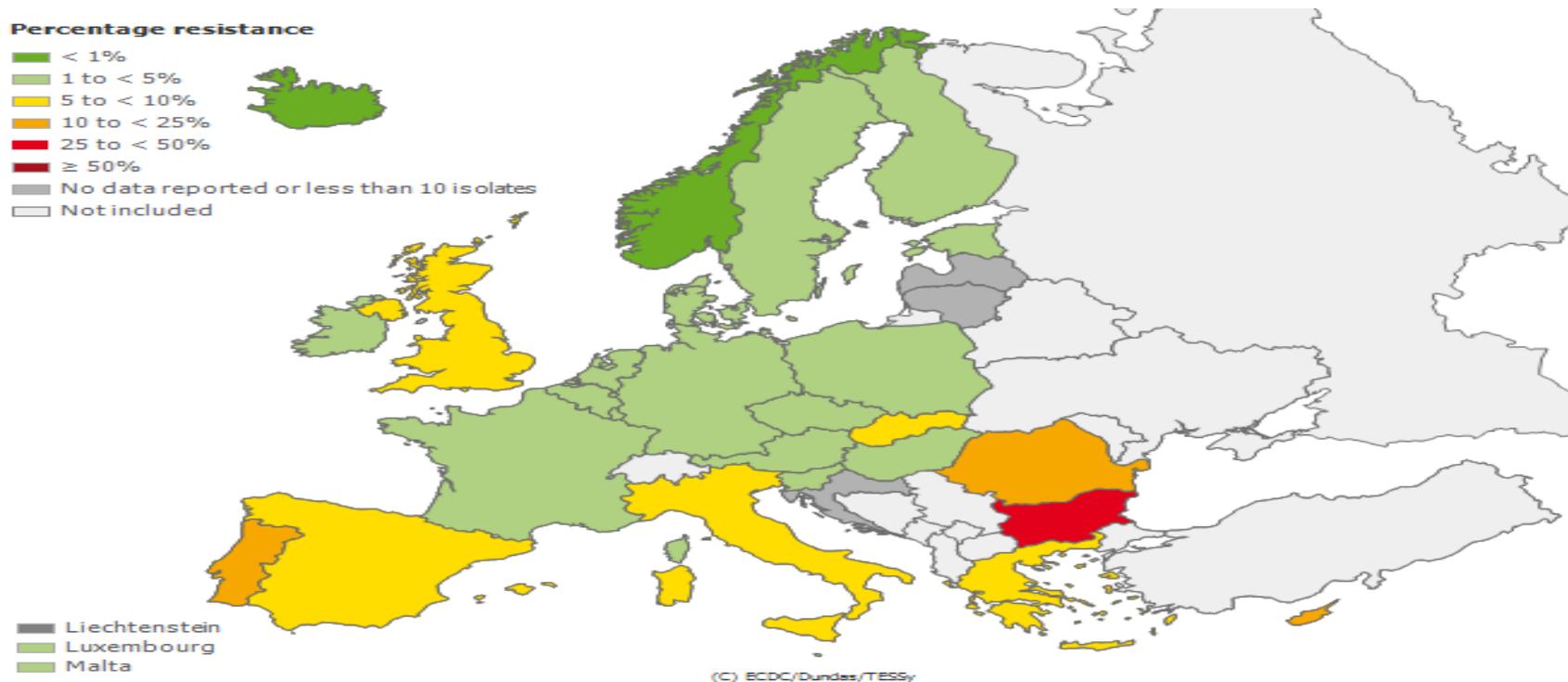
This report has been generated from data submitted to TESSy, The European Surveillance System on 2014-05-13.  
Page: 1 of 1. The report reflects the state of submissions in TESSy as of 2014-05-13 at 17:00

# Susceptibility of Escherichia coli Isolates to 3rd gen. cephalosporins in United Kingdom, 2003 - 2012

Country	Year	Antibiotic Group	S	I	R	Total N	%S	%I	%R
United Kingdom	2003	3rd gen. cephalosporins	1952	0	66	2018	96.7 %	0.0 %	3.3 %
United Kingdom	2004	3rd gen. cephalosporins	1840	3	61	1904	96.6 %	0.2 %	3.2 %
United Kingdom	2005	3rd gen. cephalosporins	1771	2	119	1892	93.6 %	0.1 %	6.3 %
United Kingdom	2006	3rd gen. cephalosporins	1633	3	136	1772	92.2 %	0.2 %	7.7 %
United Kingdom	2007	3rd gen. cephalosporins	1651	5	172	1828	90.3 %	0.3 %	9.4 %
United Kingdom	2008	3rd gen. cephalosporins	2037	4	152	2193	92.9 %	0.2 %	6.9 %
United Kingdom	2009	3rd gen. cephalosporins	3563	11	369	3943	90.4 %	0.3 %	9.4 %
United Kingdom	2010	3rd gen. cephalosporins	4126	13	408	4547	90.7 %	0.3 %	9.0 %
United Kingdom	2011	3rd gen. cephalosporins	4662	21	499	5182	90.0 %	0.4 %	9.6 %
United Kingdom	2012	3rd gen. cephalosporins	4900	19	744	5663	86.5 %	0.3 %	13.1 %

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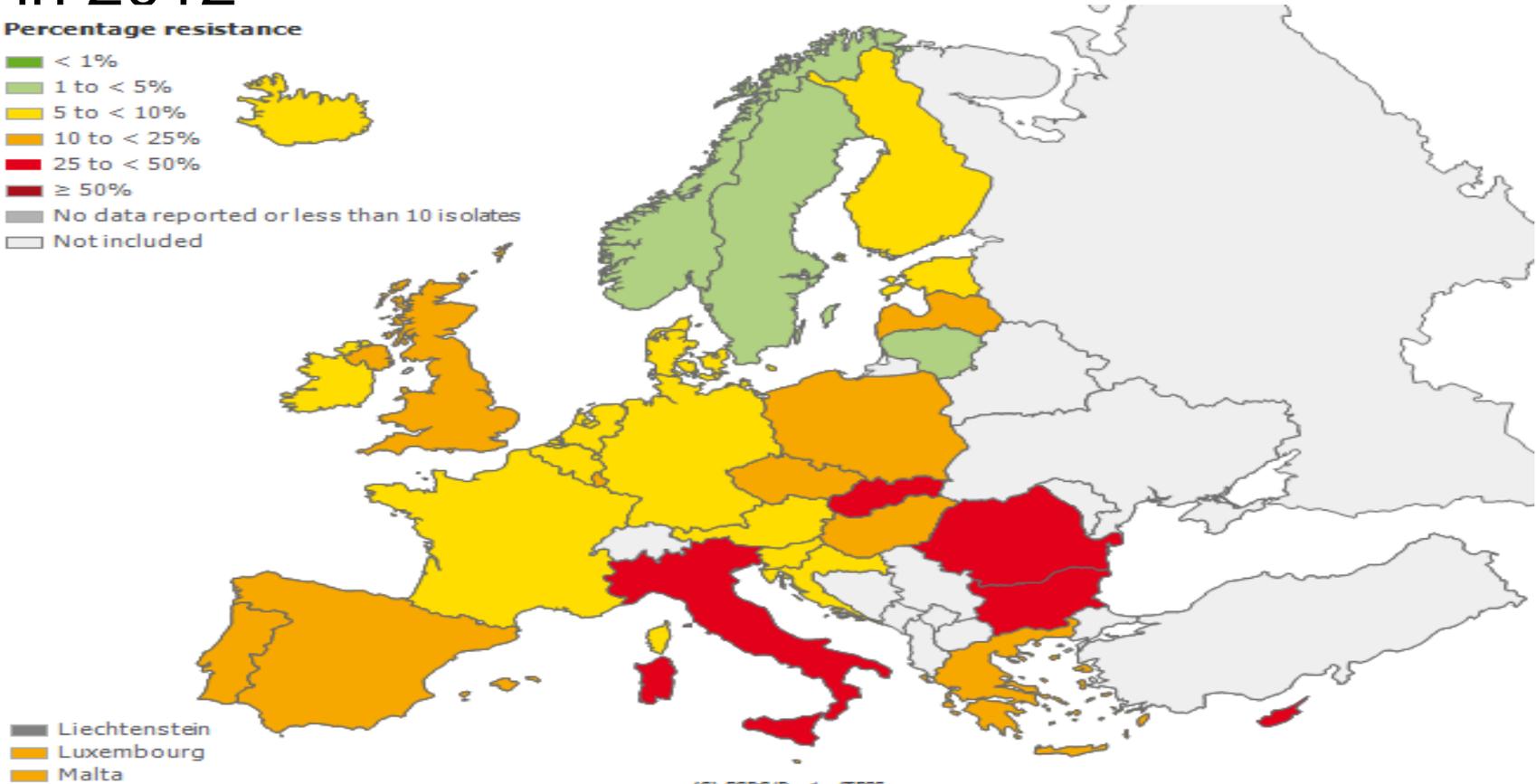
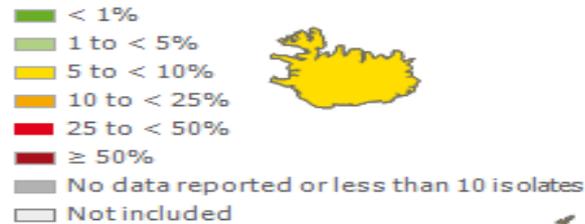
# Proportion of 3rd gen. cephalosporins Resistant (R) Escherichia coli Isolates in Participating Countries in 2005



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# Proportion of 3rd gen. cephalosporins Resistant (R) Escherichia coli Isolates in Participating Countries in 2012

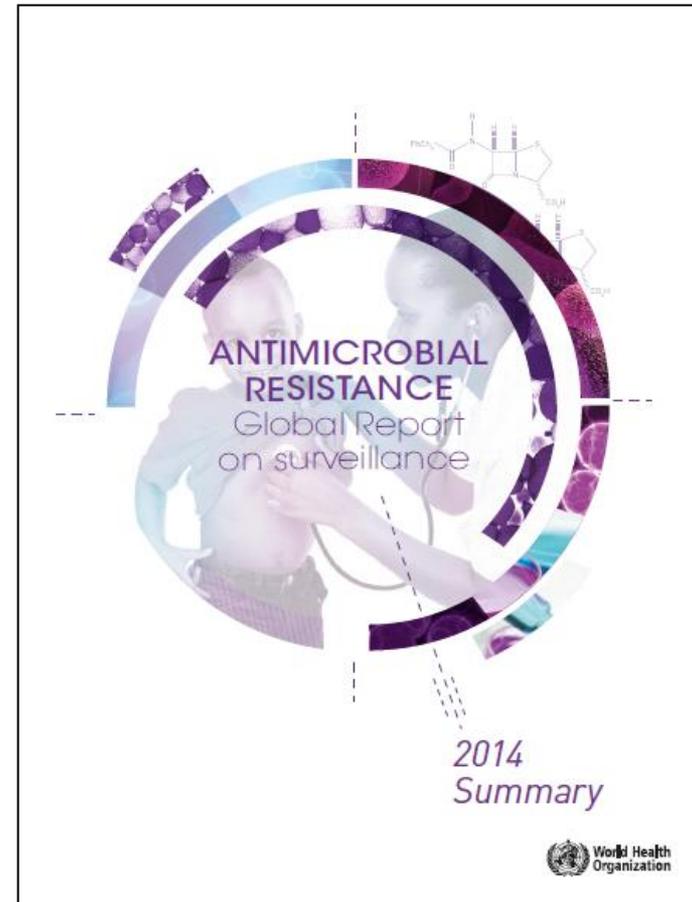
## Percentage resistance



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# WHO – Global report on surveillance

- A post antibiotic era is a real possibility.
- Resistance to common bacteria at alarming levels in some parts of the world
- Increasing levels of anti-HIV drug resistance
- Significant gaps in information highlighting the need for better global surveillance.

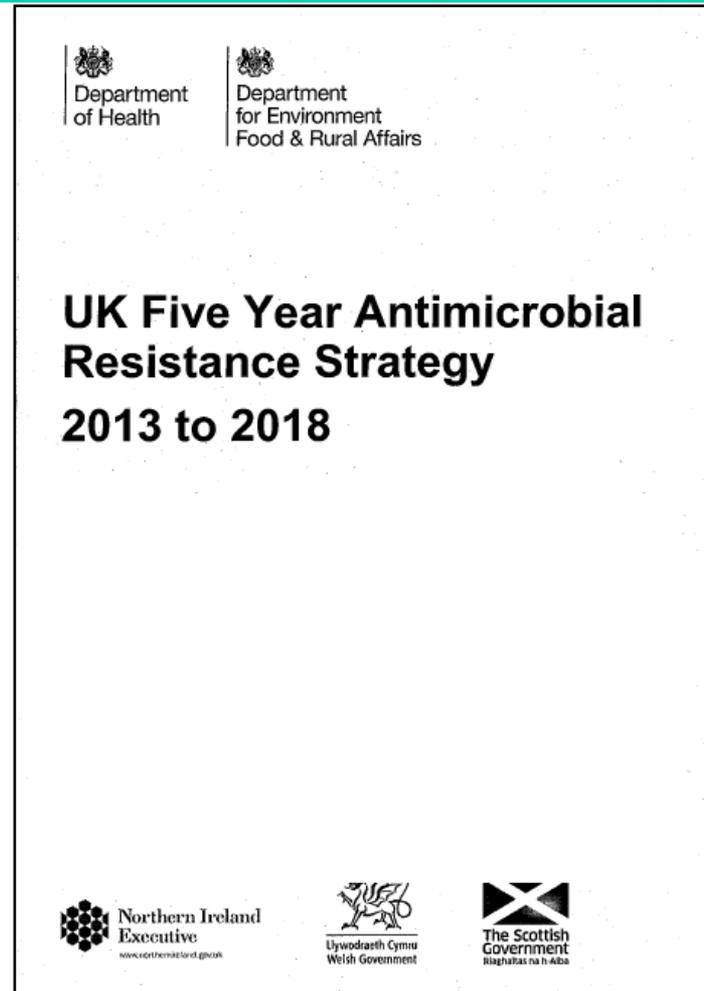


# Annual report of the Chief Medical Officer for England, published in 2013



Chapter 1 <b>Chief Medical Officer's summary</b>	
Chapter 2 <b>Epidemiological overview of infectious disease in England</b>	Chapter 3 <b>Health inequalities and infectious diseases</b>
Chapter 4 <b>Healthcare-associated infections</b>	Chapter 5 <b>Antimicrobial resistance</b>
Chapter 6 <b>Life stage: Perinatal</b> <small>Chapter authors: Mike Stubbins, Frances Colburn, Mary Stammers, Paul Hoadly, Simon Linton, Elizabeth Kelly, Alan Clarke, Jo Keenan, Paul Collins</small>	Chapter 7 <b>Life stage: Child</b>
Chapter 8 <b>Life stage: Adolescents and young adults</b>	Chapter 9 <b>Life stage: Adult</b>
Chapter 10 <b>Life stage: Older adult</b>	Chapter 11 <b>Future challenges</b>

# The UK Five Year Antimicrobial Strategy



*Link to Strategy:*

<https://www.gov.uk/government/publications/uk-5-year-antimicrobial-resistance-strategy-2013-to-2018>

# Key aims of the UK strategy

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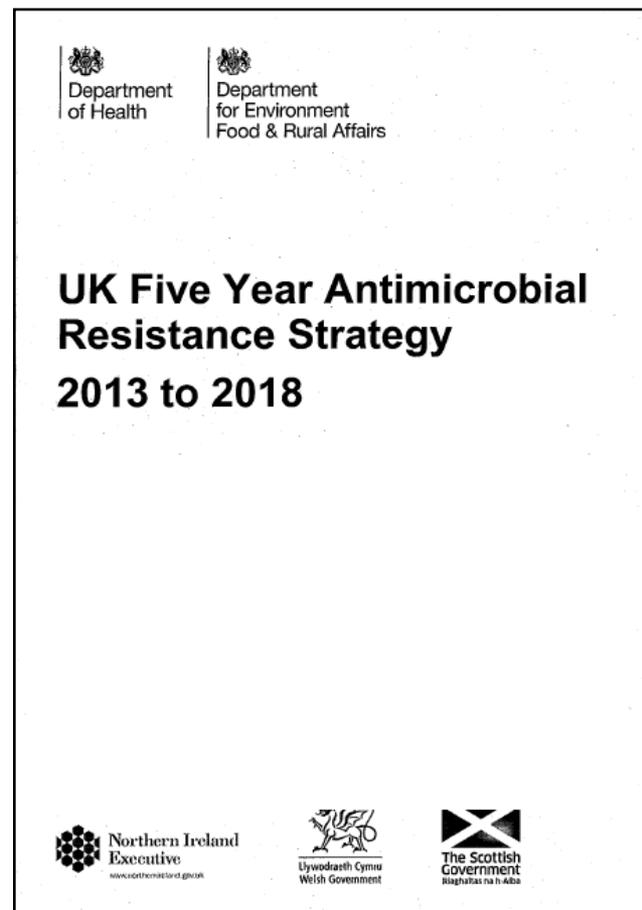
- **Prevent** (people from being infected)
- **Preserve** (the antibiotics we have)
- **Promote** (development of new antimicrobials, new approaches, better diagnostics)

Underpinning: knowledge and understanding of AMR

# Main activities

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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



# A Comprehensive, Integrated Programme

- The interdepartmental High Level Steering Group, chaired and supported by the DH. PHE, Defra and DH, lead implementation
- The Government cannot deliver the actions alone, contributions are needed across sectors:
  - Human Health and Social Care
  - Livestock, food retail and veterinary
  - Research councils, other research funders and academics
  - The pharmaceutical industry
- To strengthen international collaboration we are working with and through a wide range organisations to influence opinion, galvanise support and mobilise action to deliver the scale of change needed globally.

# Challenges

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- Scientific
- Economic
- Behavioural
- Access/organisational/regulation

# The Scientific Challenges

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- Molecular basis of emergence and spread of AMR
- Burden of AMR (surveillance)
- Transmission pathways – humans, animals and the environment
- Rapid diagnostic tests
- The discovery and development of new antimicrobials
- Novel treatments - bacteriophages, the microbiome, antiseptics
- Effective stewardship - behavioural and educational research

# English Surveillance Programme for Antimicrobial Usage and Resistance (ESPAUR)

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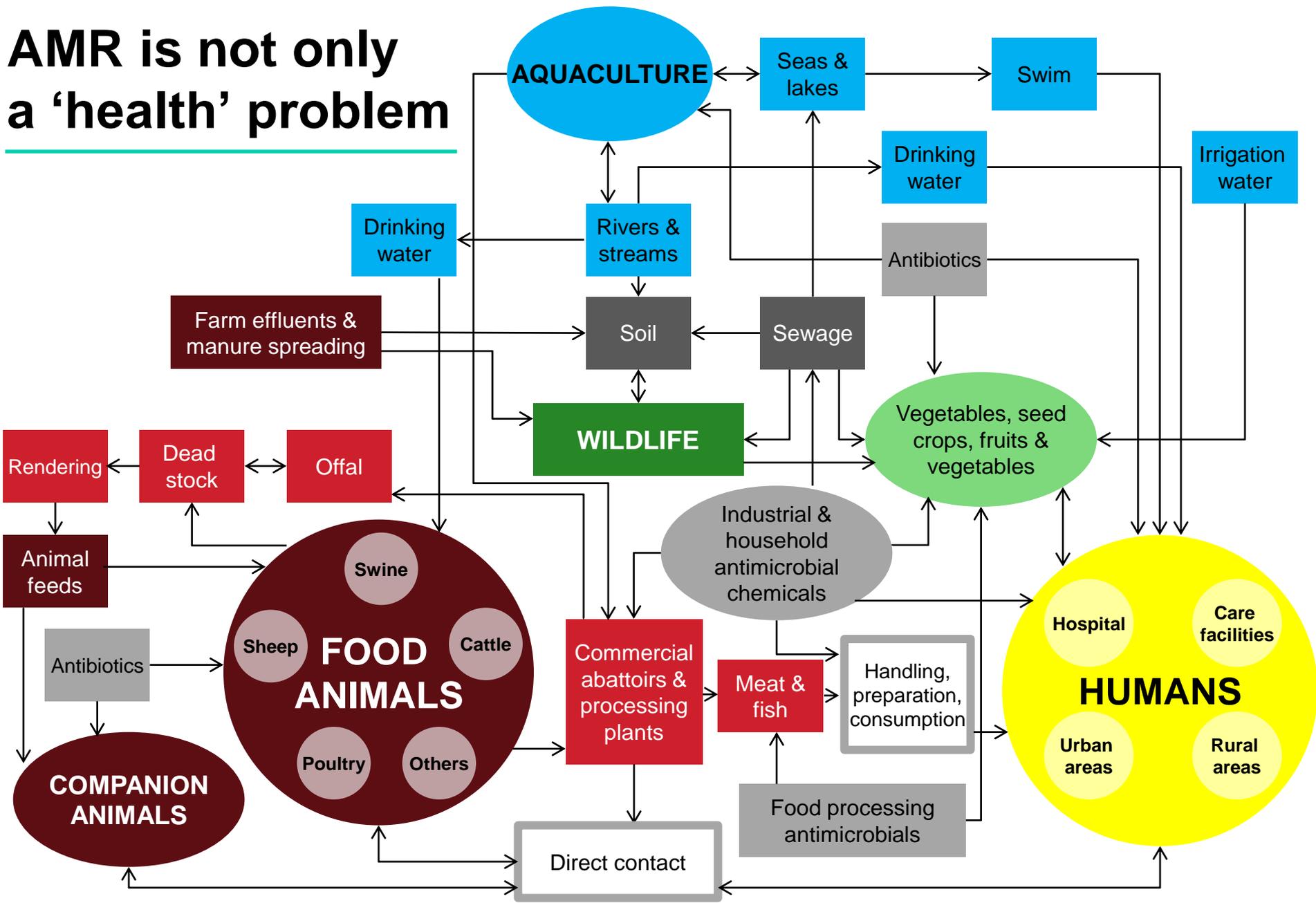
- Establishment of a dedicated surveillance programme for AMR and AMU
- Contribute to the integration of existing AMR and AMU datasets across primary and secondary care
- Contribute to the real-time monitoring and measurement systems for antibiotic consumption in hospitals - to support antimicrobial stewardship in the NHS and the independent sector
- Development and publication of local susceptibility data reports by English region
- Review the systems developed to ensure that the antimicrobial usage data can be linked with *C. difficile* rates and other bacterial resistance surveillance data
- Enhance data analysis and advice on use of carbapenems and other Critically Important Antibiotics in the NHS and the independent sector

# The Scientific Challenges

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# AMR is not only a 'health' problem



# The Scientific Challenges

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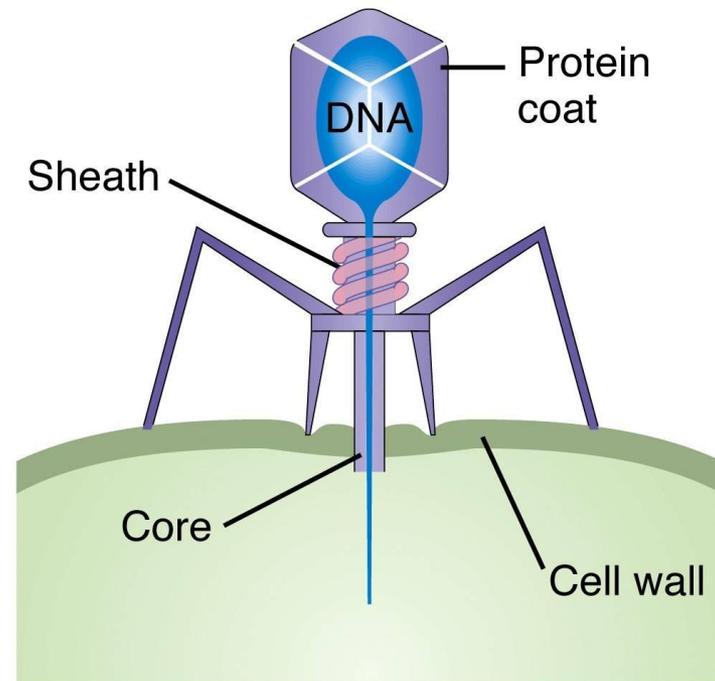
# Rapid diagnostics

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

# Novel Approaches

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- Alternative treatments, including phages, antiseptics, monoclonal antibodies and vaccines, to inform possible future action,



# Newly marketed antimicrobial agents in UK 1990–2010

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	<b>Antibacterial agents</b>	<b>Antiviral agents</b>	<b>Antifungal agents</b>	<b>Antiparasitic agents</b>
<b>1990-1992</b>	<b>10</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>1993-1995</b>	<b>7</b>	<b>4</b>	<b>1</b>	<b>1</b>
<b>1996-1998</b>	<b>3</b>	<b>9</b>	<b>1</b>	<b>1</b>
<b>1999-2001</b>	<b>3</b>	<b>8</b>	<b>0</b>	<b>1</b>
<b>2002-2004</b>	<b>3</b>	<b>8</b>	<b>2</b>	<b>0</b>
<b>2005-2007</b>	<b>3</b>	<b>7</b>	<b>1</b>	<b>0</b>
<b>2008-2010</b>	<b>1</b>	<b>4</b>	<b>2</b>	<b>0</b>

Antimicrobial Chemotherapy. Eds. Finch RG, Davey P, Wilcox MH, Irving W. OUP, 2012.

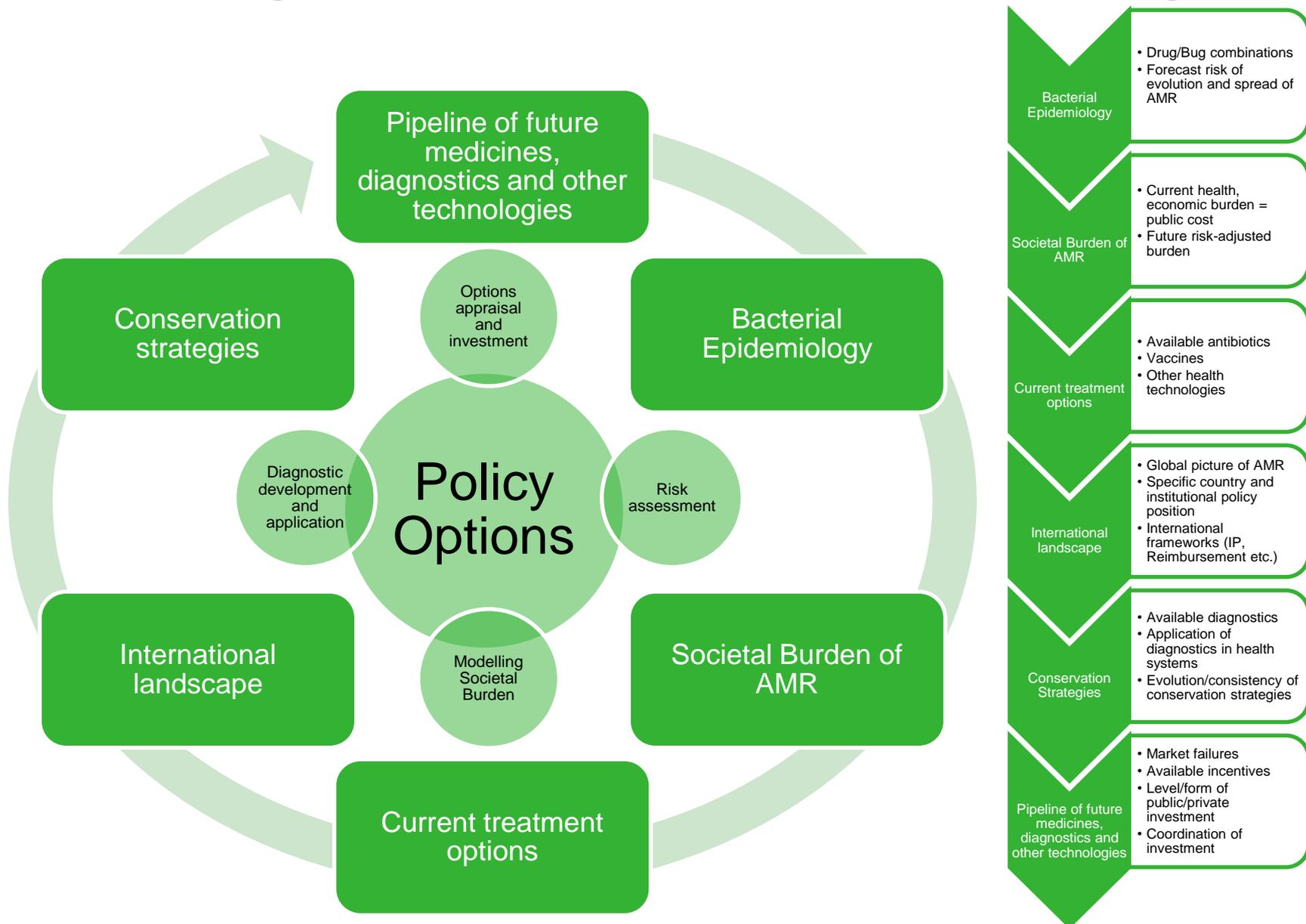
# Economic challenges

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- How can we make development of new antimicrobials worthwhile?
  - Antibiotics are relatively cheap compared to other medicines
  - Antibiotics are used for short durations (low sales volumes)
  - Resistance to new antibiotics can develop quickly

**Current arrangements deliver a low level of return on investment and are not economically attractive to industry**

# Factors affecting investment into the R&D of antimicrobial drugs



# The Scientific Challenges

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- Molecular basis of emergence and spread of AMR
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# Changing behaviour

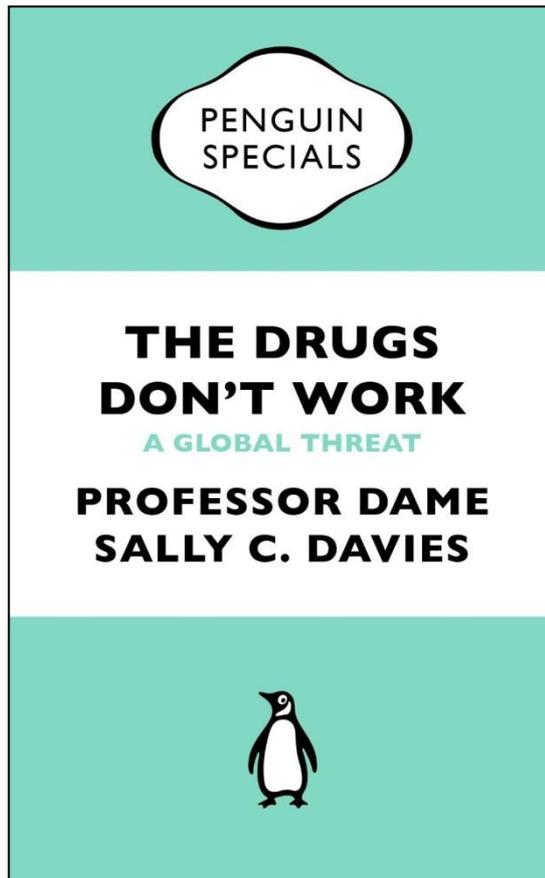
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Knowledge → Attitude → Behaviour

**Goal: Improving antimicrobial stewardship / conserving existing treatments**

- **Professionals:** improving prescribing practices
  - Primary care: GP prescribing
  - Secondary care: hospital prescribing
- **Public:** improving understanding about appropriate antibiotic use

# Awareness Raising



PENGUIN SPECIALS

**THE DRUGS DON'T WORK**  
A GLOBAL THREAT

**PROFESSOR DAME SALLY C. DAVIES**



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# How are we doing this?

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- **Antimicrobial prescribing and stewardship competencies** - embedded in national curricula
- Development of **Antimicrobial Prescribing Quality Measures** for primary and secondary care
- Primary care: **TARGET campaign**: antibiotic prescribing guidance, learning resources and patient information leaflets
- Secondary care: **Start Smart - Then Focus campaign** – rapid treatment with appropriate antibiotics supported by rapid microbiology diagnosis
- **European Antibiotics Awareness Day (EAAD)**: professionals and public awareness
- **National workshops** to explore and debate radical solutions to the AMR problem
- **Identifying evidence-based behavioural interventions** (e.g. delayed prescribing)

# DH/NIHR funded AMR research

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Strategic co-ordination and support is provided through:

Co-funders of the:

- UKCRC Translational Infections Research initiative and the
- Health Innovation Challenge Fund
- The National Institute for Health Research (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,
- International

# Global mobilisation and co-operation

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At the international level we need to:

- Raise **awareness** of the issue
- **Prevention** - collaborate to prevent the global spread of AMR (infection prevention and control, stewardship and conservation aspects)
- Research to understand **transmission**
- “**One health**” approach to tackling AMR and developing evidence on the AMR transmission interface between human, animal and wider environment
- to work with WHO, UN and other key international bodies to develop innovative **financing and regulatory** (licensing) approaches which will help stimulate development of new antibiotics.

# International engagement to promote alignment and coordinated action

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- AMR Thought Leaders meeting at Chatham House, June 2013
- G8 Science Ministers meeting, June 2013
- CMO England chairs WHO Strategic Technical Advisory Group (STAG),
- Keynote address at Chatham House conference “Antimicrobial Resistance - Incentivising Change towards a Global Solution” October 2013
- CMO chaired AMR session at the World Innovation Summit for Health in Doha, December 2013
- Proposed WHA resolution supported by over 50 countries, agreed at the WHO Executive Board in January and will go to WHA this month

# We need to get to a point where:

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- 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 is 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.

# Key web links

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- UK Five Year Antimicrobial Resistance Strategy 2013 to 2018  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/244058/20130902\\_UK\\_5\\_year\\_AMR\\_strategy.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244058/20130902_UK_5_year_AMR_strategy.pdf)
- NIHR – website includes information on the Health Protection Research Units and the AMR themed call - [www.nihr.ac.uk](http://www.nihr.ac.uk)
- Health Innovation Challenge Fund [www.hicfund.org.uk](http://www.hicfund.org.uk)
- UK Clinical Research Collaboration - <http://www.ukcrc.org/>
- WHO AMR Global Report on surveillance 2014 Summary [http://apps.who.int/iris/bitstream/10665/112647/1/WHO\\_HSE\\_PED\\_AIP\\_2014.2\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/112647/1/WHO_HSE_PED_AIP_2014.2_eng.pdf)
- ECDC <http://www.ecdc.europa.eu/en/Pages/home.aspx>