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Science Advisory Council

# **The challenges of infectious diseases**

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**President of EASAC**



# What is EASAC?

- **Coalition of the National Academies of Science of the member states of the EU incl. the pan-European Academy of Science (Academia Europaea) the Association of All European Academies (ALLEA), and the Federation of European Academies of Medicine (FEAM), as observer.**
- **EASAC was founded in 2001, to provide independent policy advice from EU Science Academies to EU institutions**

# Infectious diseases

- **The minor infectious ailments of everyday**  
(e.g., common cold, urinary tract infection)
- **The classic communicable diseases**  
(e.g., typhoid fever, cholera)
- **The infections of medical progress**  
(e.g., hospital infections, ventilator associated pneumonia, infections at the extremes of life)
- **Emerging infectious diseases**  
(e.g., chikungunya, SARS, MERS)
- **Outbreaks**  
(e.g., Ebola, pandemic influenza, Q fever)

# Dynamics of infectious diseases

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- **Poverty**
- **War**
- **Climate change**
- **Migration, travel and transport**
- **Population densities**
- **Aging and frailty**
- **Impairment of host defence**
- **Modern livestock breeding**

# Tackling major global problems

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- **Antimicrobial resistance**
- **Early warning**
- **Outbreak management**
- **Hygiene (inside and outside hospitals)**
- **Compliance with vaccine programmes**

# Infectious disease

|                        | Antibiotic resistance | Early warning | Outbreak management | Poor hygiene | Vaccine compliance |
|------------------------|-----------------------|---------------|---------------------|--------------|--------------------|
| Everyday ID            | +                     |               |                     | +            | +                  |
| Classic ID             | +                     |               |                     | +            | +                  |
| ID of medical progress | ++                    |               | (+)                 | +            |                    |
| Emerging ID            | +                     | +             | +                   | +            | +                  |
| Outbreaks              | +                     | +             | ++                  | +            | +                  |

## Major global problems

### Antimicrobial resistance

#### Current crisis:

- **Indiscriminate use of antibiotics**
  - In human populations
  - In animal populations
  - In plant breeding
- **Stagnant development of new drugs**

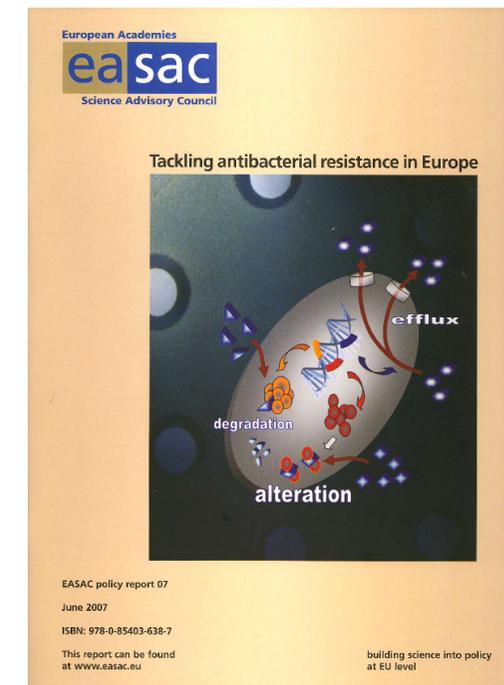
# EASAC's 2007 recommendations for priority action

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- 1. Develop novel diagnostics**
- 2. Strengthen the science base**
- 3. Support industry innovation in drug development**



# Antimicrobial drug development

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- **Why is there no progress?**



## EASAC Herrenhausen meeting March 2014\*



### Antimicrobial drug discovery: greater steps ahead

#### Summary

Infectious diseases account for a substantial proportion of deaths worldwide. Continuing progress in the treatment of many infections is threatened by the growing resistance of pathogens to antimicrobial drugs. For example, in the European Union (EU) it is estimated that 25,000 people die annually of sepsis caused by resistant bacteria. The epidemiology of resistance is complex but the problem is compounded by recent lack of success in developing novel antibiotic classes.

In this Statement, EASAC builds on a long-standing interest in the opportunities and challenges associated with tackling infectious diseases to re-examine the current situation, to consider how to search for new scientific directions for antimicrobial innovation and to remove impediments in translating research advances to drug development. In March 2014, EASAC, together with its member academies in Germany and the Netherlands, organised a meeting in Hannover to explore new paths in antibiotic research. Among key topics discussed and exemplified were the following:

- How can we learn from previous examples of success, and lack of success, in antibiotic research and development?
- What are the functions of antibiotics in their natural environments?
- What are the opportunities for novel approaches to tackling pathogens, for example based on virulence modulation or immune stimulation?
- How might pathogen-specific pathways be influenced?
- Can host cell targets be found that inhibit intracellular bacterial infection?
- Are there new sources of antimicrobial compounds and delivery systems that can capitalise on emerging technologies?

There was consensus among the participants at the meeting on the urgency to develop critical mass to support and generate good new science, to dismantle the bureaucratic obstacles to using the outputs from that science and to ensure that innovation can be sustained in the longer term.

EASAC recommendations focus on the following areas.

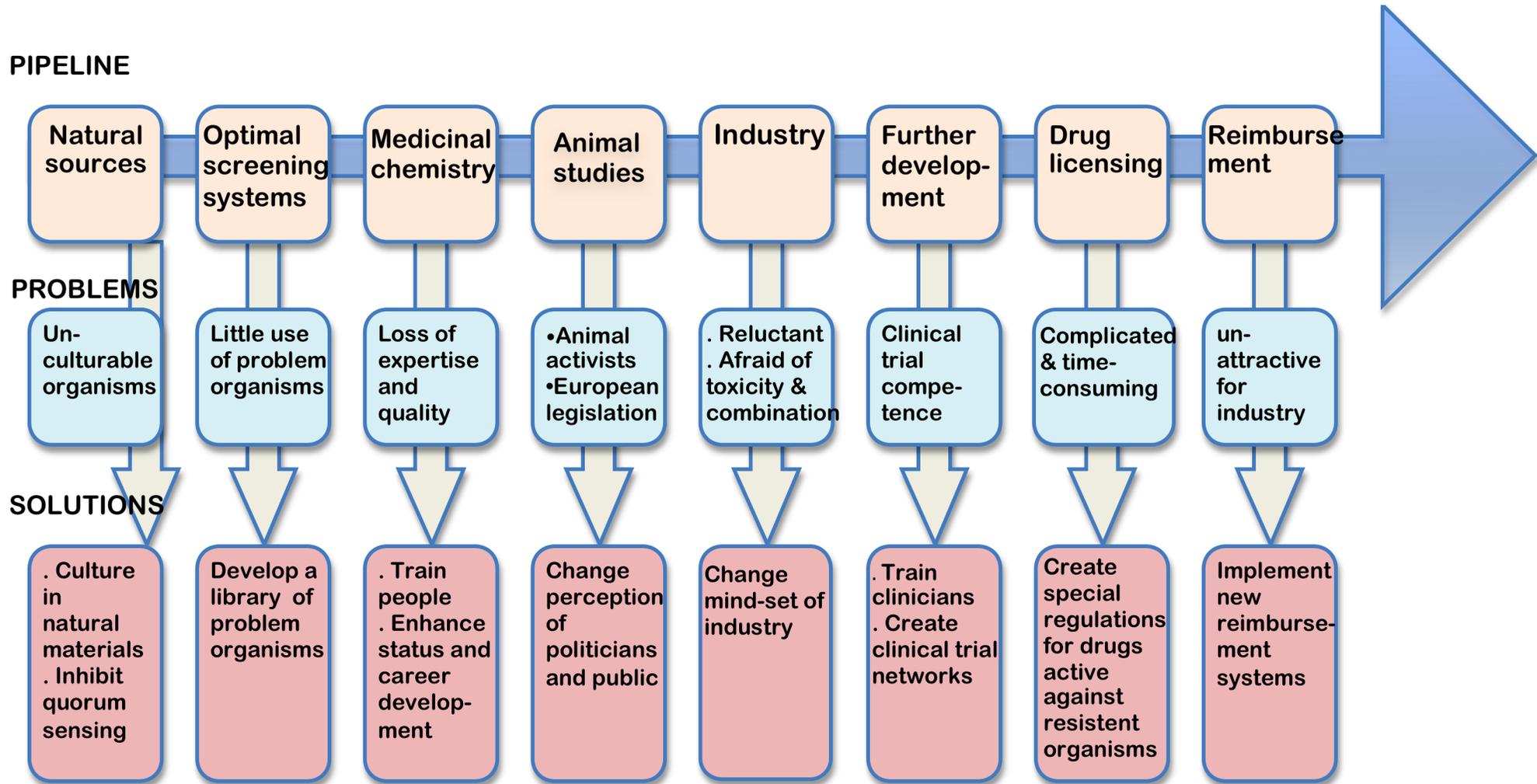
Support for basic research to include the social sciences as well as biosciences and allied disciplines, to understand antimicrobial resistance and provide the resource to underpin diverse scientific approaches to combatting pathogens. Increased investment in fundamental research must be accompanied by other action to ensure the field is attractive to young investigators and draws on appropriate

statement

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# Recommendations of the EASAC meeting

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- 1. Support basic research**
- 2. Install EU platforms for compound identification, lead optimisation and characterisation**
- 3. Address bottlenecks in pre-clinical and early clinical development**
- 4. Optimise EU partnerships for research and strategy**
- 5. Rethink regulatory frameworks**
- 6. Raise public awareness**

# EASAC's continuing work on antibiotics

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- **EASAC organised further discussion in Brussels, December 2014 (published on [www.easac.eu](http://www.easac.eu)), bringing together European Commission, industry, new funding sources (Foundations) and academia**
- **Agreed vital to move on from analysis to action, including new models for research partnership and for rewarding industry innovation**
- **Priority to link national, regional and global activity, including research and innovation agendas**
- **Opportunities for implementing One Health strategy worldwide**
- **Ensuring commitment to political engagement and public education: (i) including recognition of role of animal research in innovation and (ii) providing antibiotics to all who need them worldwide**

# Major global problems

## Early warning

- **Scientifically neglected area (What are needs? Optimal methods?)**
- **Syndrome signalling**
  - Exciting new methods using smart phones and other modern media**
- **Microbiological signalling**

# Major global problems

## Outbreak management

- **Scientifically neglected area**
- **Lessons (to be) learned from the Ebola outbreak and other recent outbreaks: coordination, data-sharing, accelerating new product R&D, collaboration between governments, charities, regulators and companies to deliver innovative products and improved services (discussion in EASAC meeting, Brussels, December 2014)**

# Future outbreak management

- **Coordinated by an authoritative global institution**
- **Enabled to make fast decisions at global level**
- **Optimized early warning and detection, scalable during epidemic**
- **Reserve corps of trained personnel and volunteers; preparedness exercises**
- **Improved health systems in low/middle- income countries**
- **Expanded R&D and improved regulatory pathways**

*Adapted from Bill Gates, New England Journal of Medicine 2015, April 9*

## Major global problems

### Hygiene (inside and outside hospitals)

- **Cost effective and relatively easy**
- **Unacceptable poor compliance of health-care workers**

**→ More help needed from Social Sciences**

**Poor hygiene + antibiotic overuse + resistant microbes = disaster**

## Major global problems

### Compliance with vaccine programmes

- **Vaccines are highly effective, beneficial and safe**
- **Anti-vaccine lobby is major threat**
- **Power of lobby on the internet has been underestimated**
- **Science has not responded adequately**
  - **More help needed from Social Sciences**

## Major global problems

- **Antimicrobial resistance**
- **Early warning**
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