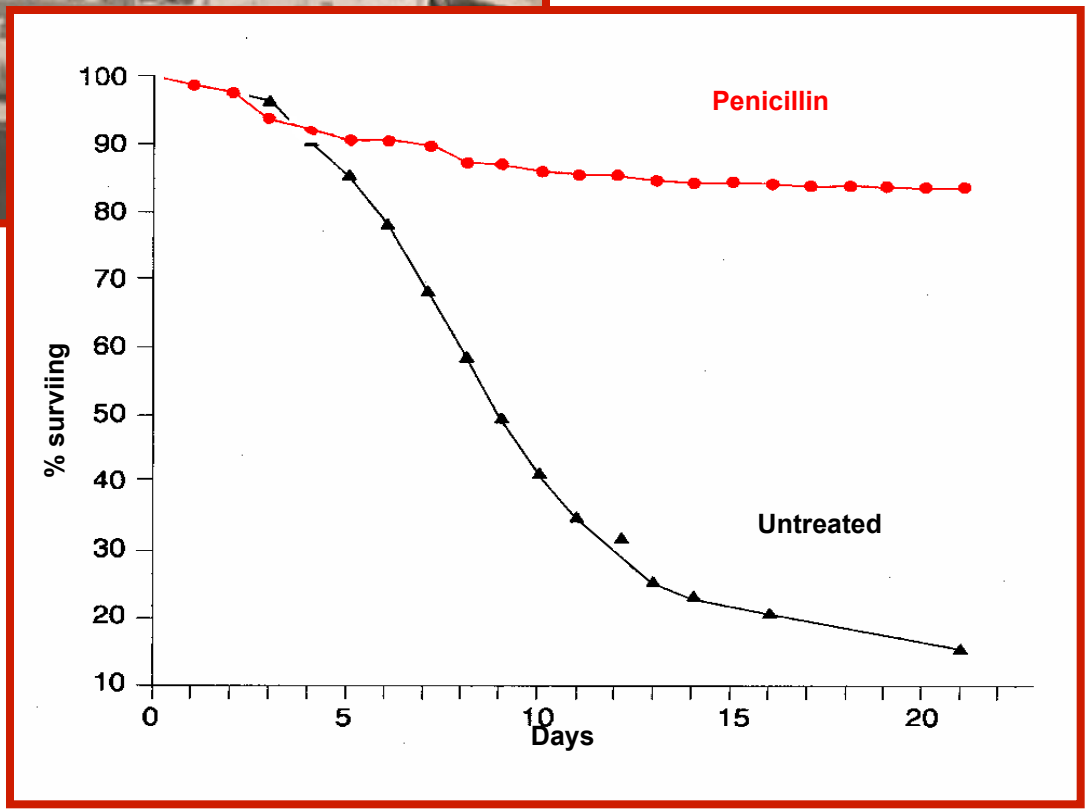
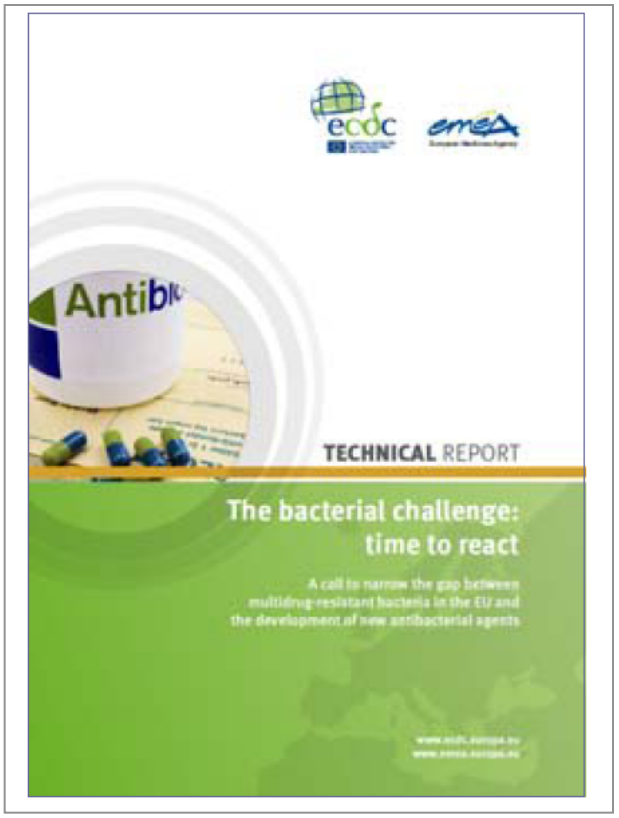
Patients with pneumonia and bacteria in blood



Penicillin increased the chance of survival from 10% to 90%

Antibiotic resistance - The extent of the problem



- Infections by multidrug-resistant bacteria are in the EU associated with 25 000 extra deaths per year

- These infections costs about 1.5 billion Euros of extra economic burden per year

- There are many reasons to believe that these figures correspond to an underestimate of the human and economic burden

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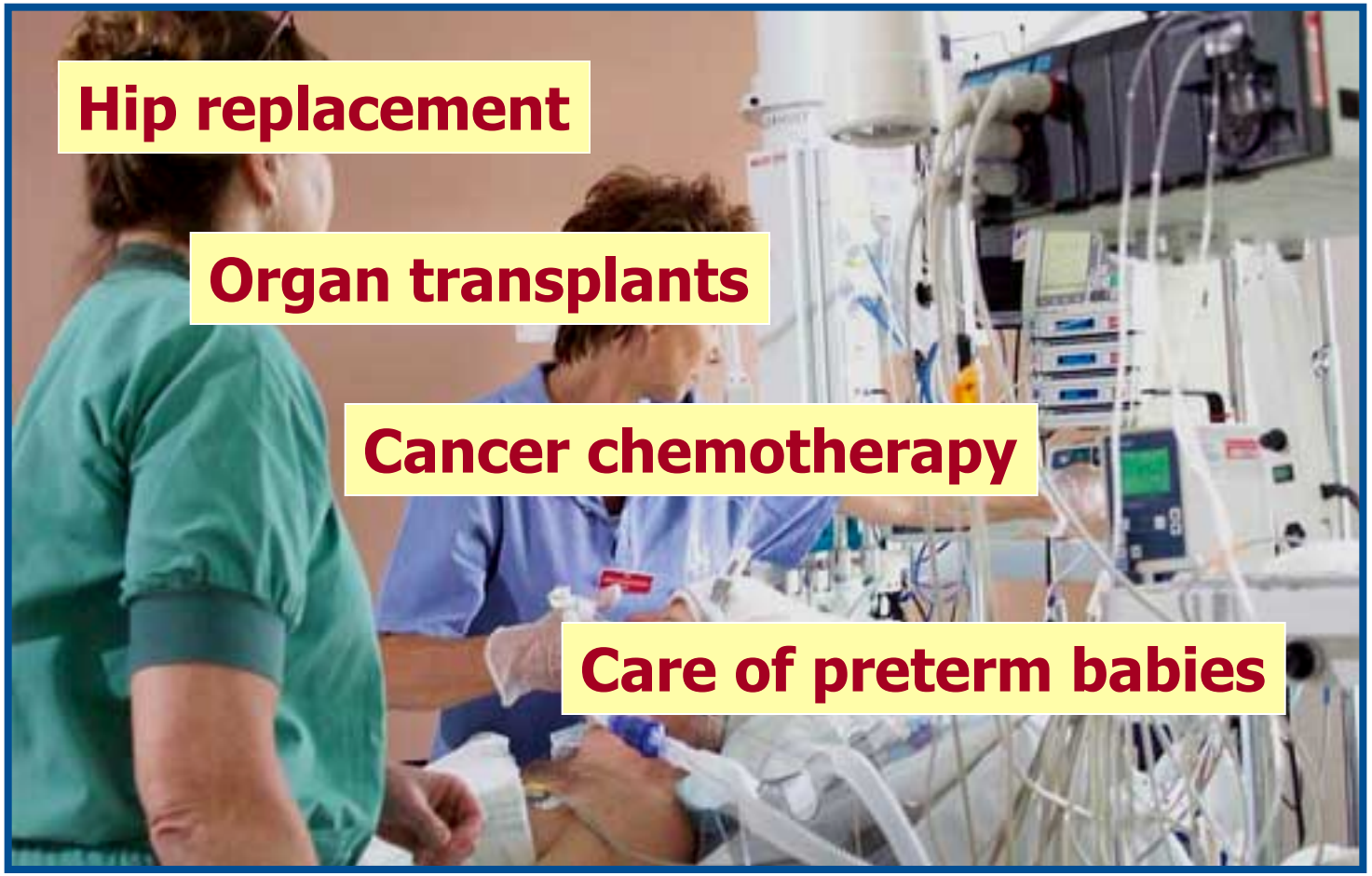
Modern medicine is built on access to effective antibiotics



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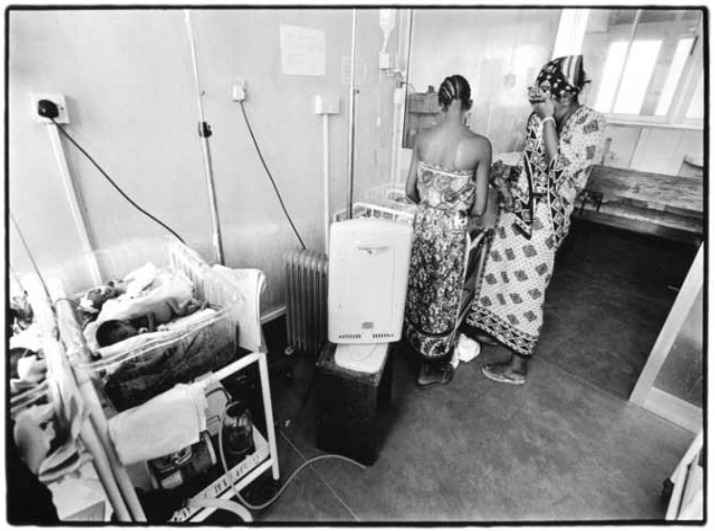
Orphanage in Bamako, Mali

ESBL colonized 100% of the children and 63%, of the adult staff studied.

Tandé et al. Emerg Infect Dis. 2009 Mar;15(3):472-4.



Mumhibili hospital, Tanzania

The mortality rate from Gram-negative bloodstream infection was 43 %, more than double that of malaria..

Blomberg et al. BMC Infect Dis. 2007 May 22;7:43.

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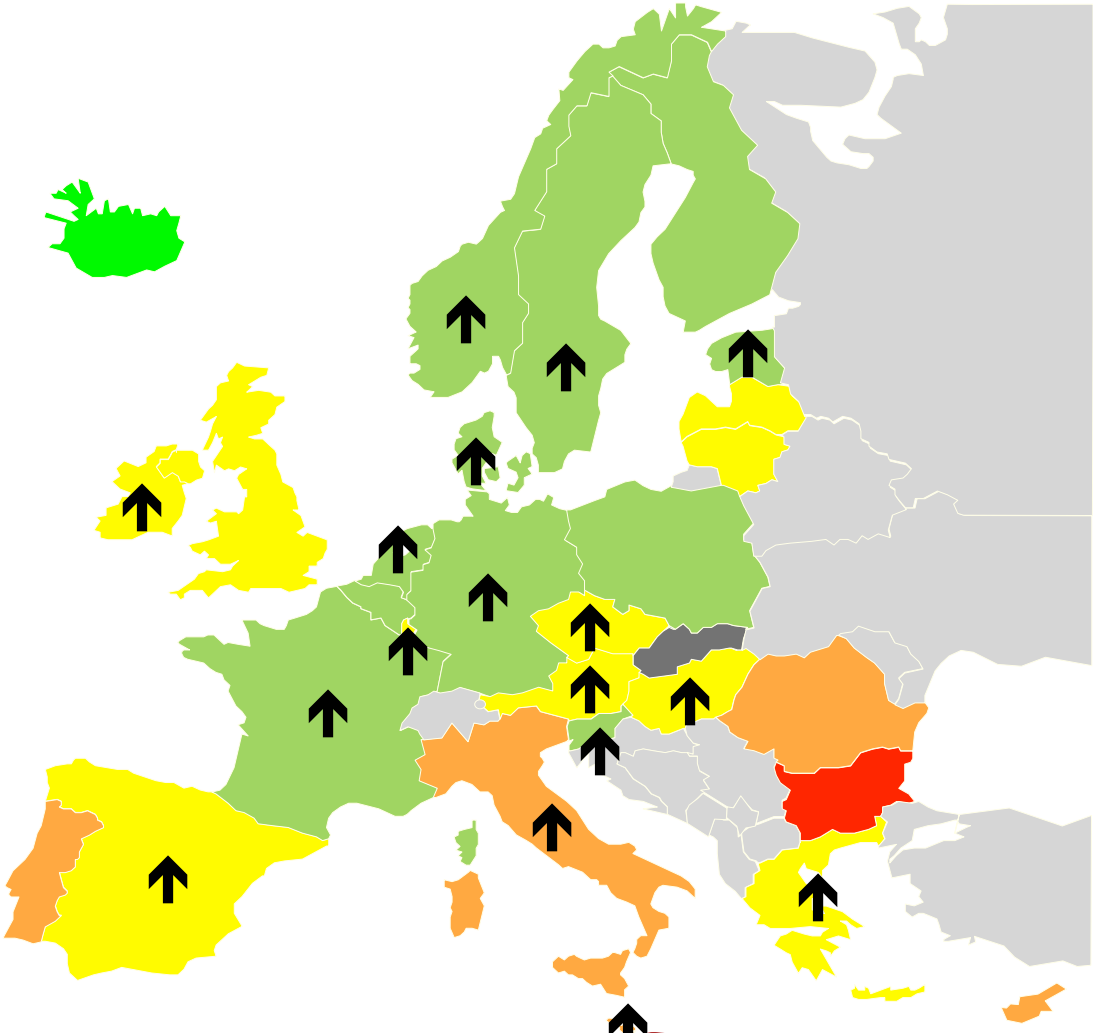
Third-generation cephalosporin-resistant *Escherichia coli*, blood and CSF, 2008

- <1%
- 1– 5%
- 5–10%
- 10–25%
- 25–50%
- >50%
- No data/low number
- Other countries



Country with:

- ↑ Significant increase (2005-2008)
- ↓ Significant decrease (2005-2008)

Source: European Antimicrobial Resistance Surveillance System (EARSS), 2008

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Antibiotic susceptibility proportions for NDM-1-positive Enterobacteriaceae isolated in the UK and India

	UK (n=37)	Chennai (n=44)	Haryana (n=26)
Imipenem	0%	0%	0%
Meropenem	3%	3%	3%
Piperacillin-taz	0%	0%	0%
Cefotaxime	0%	0%	0%
Ceftazidime	0%	0%	0%
Cefpirome	0%	0%	0%
Aztreonam	11%	0%	8%
Ciprofloxacin	8%	8%	8%
Gentamicin	3%	3%	3%
Tobramycin	0%	0%	0%
Amikacin	0%	0%	0%
Minocycline	0%	0%	0%
Tigecycline	**64%**	**56%**	**67%**
Colistin	**89%**	**94%**	**100%**

From Kumarasamy *et al.* Lancet Infect Dis 2010

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Antibiotic resistance: The causes

- The indiscriminate effects of antibiotics
- The indiscriminate use of antibiotics
- The rapid dynamics of gene transfer between bacteria and the global spread of resistance
- Poor sanitation and hygiene
- Alarming decline in drug development

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Illegal OTC antibiotic sale in the EU

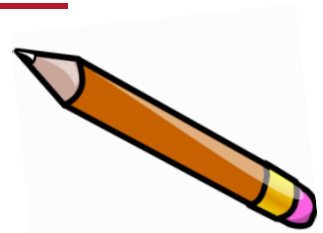
Athens, Greece 2008 (174 pharmacies) 2008:

-100% of all visited pharmacies sold Amoxicillin/clavulanate acid OTC

- 53% sold Ciprofloxacin OTC, despite extra restrictions for fluoroquinolone prescriptions

Plachouras et al. Euro Surveill. 2010

Strategies to ~~stop~~ manage antibiotic resistance



Prolong the lifespan of existing drugs

Rational Use, Optimization of dosage,
Better diagnostics

Prevent the spread of resistant bacteria

Improved hygiene
Infection control
Hospital structure

Development of new antibiotics

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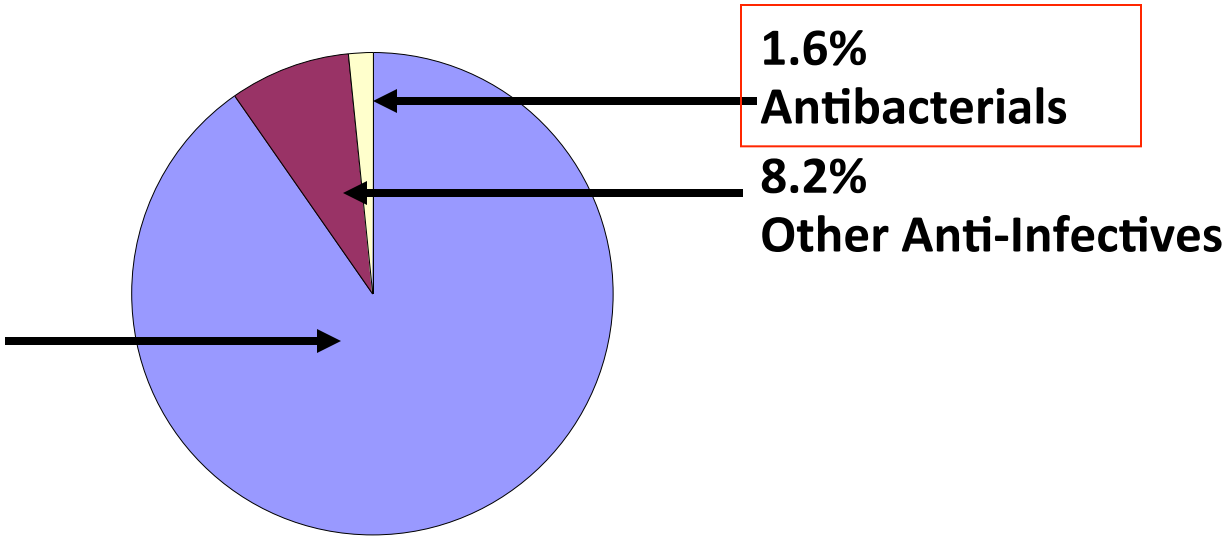
Antibacterials in the Pipeline

New Molecular Entities Publicly Disclosed in R&D Programs of the World's 15 Largest Pharmaceutical Companies



Adapted from Spellberg, 2004

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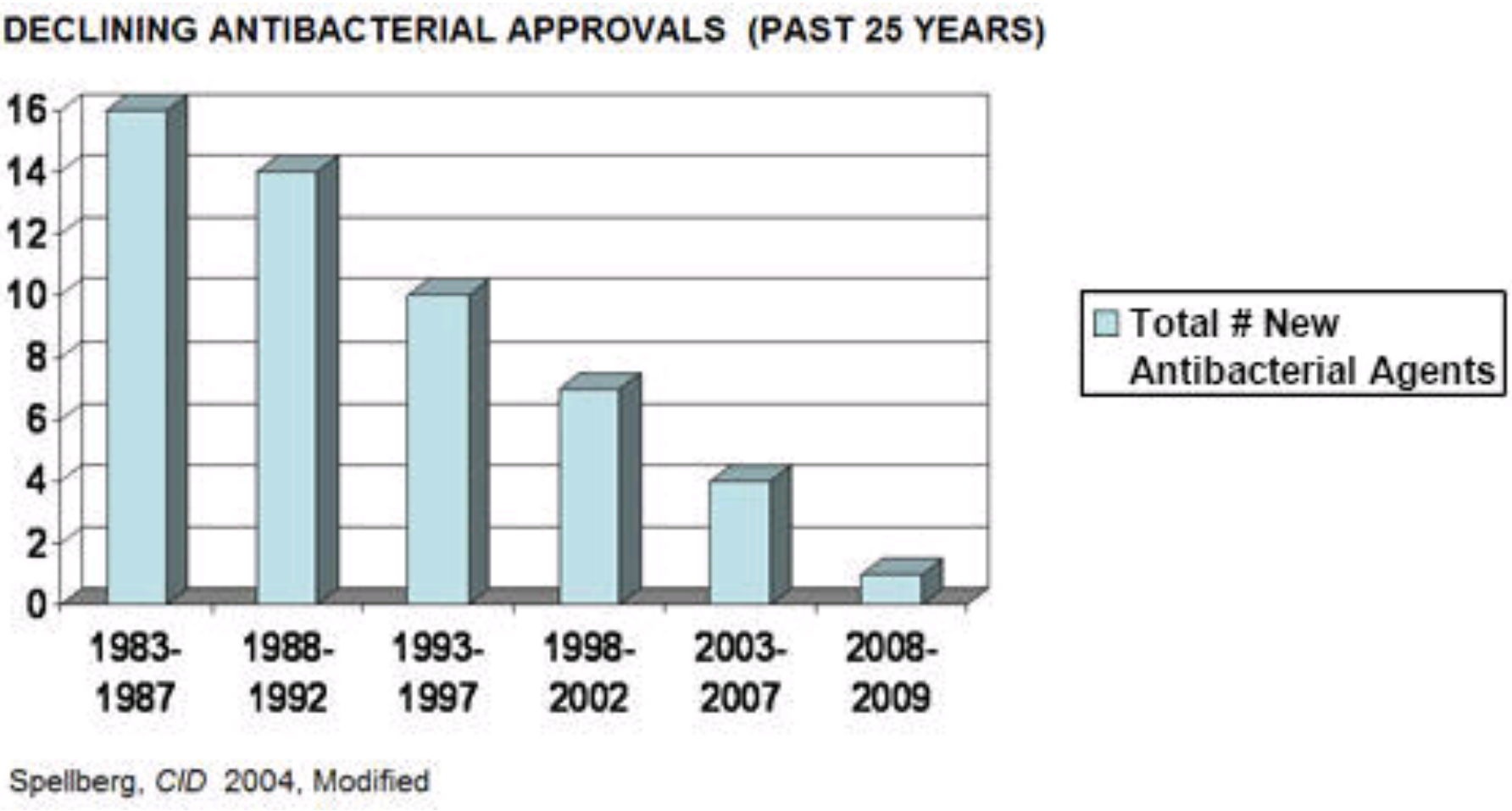
New antibiotic approvals in decline



Ref: http://www.idsociety.org/10x20.htm

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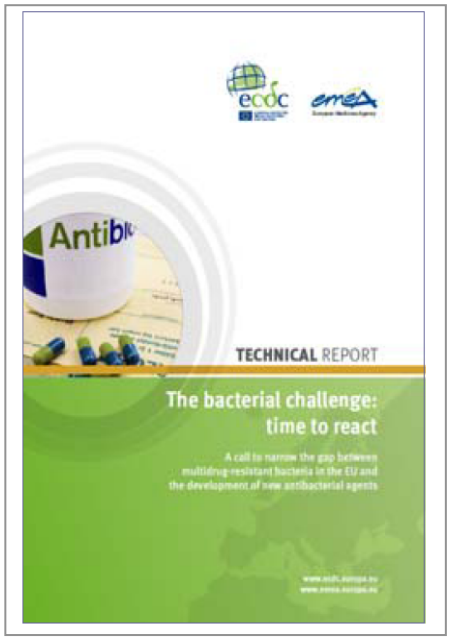
Pipeline Analysis



90 agents with direct activity on multidrug-resistant bacteria

66 agents were new active substances

15 **"novel"** agents with **systemic** administration

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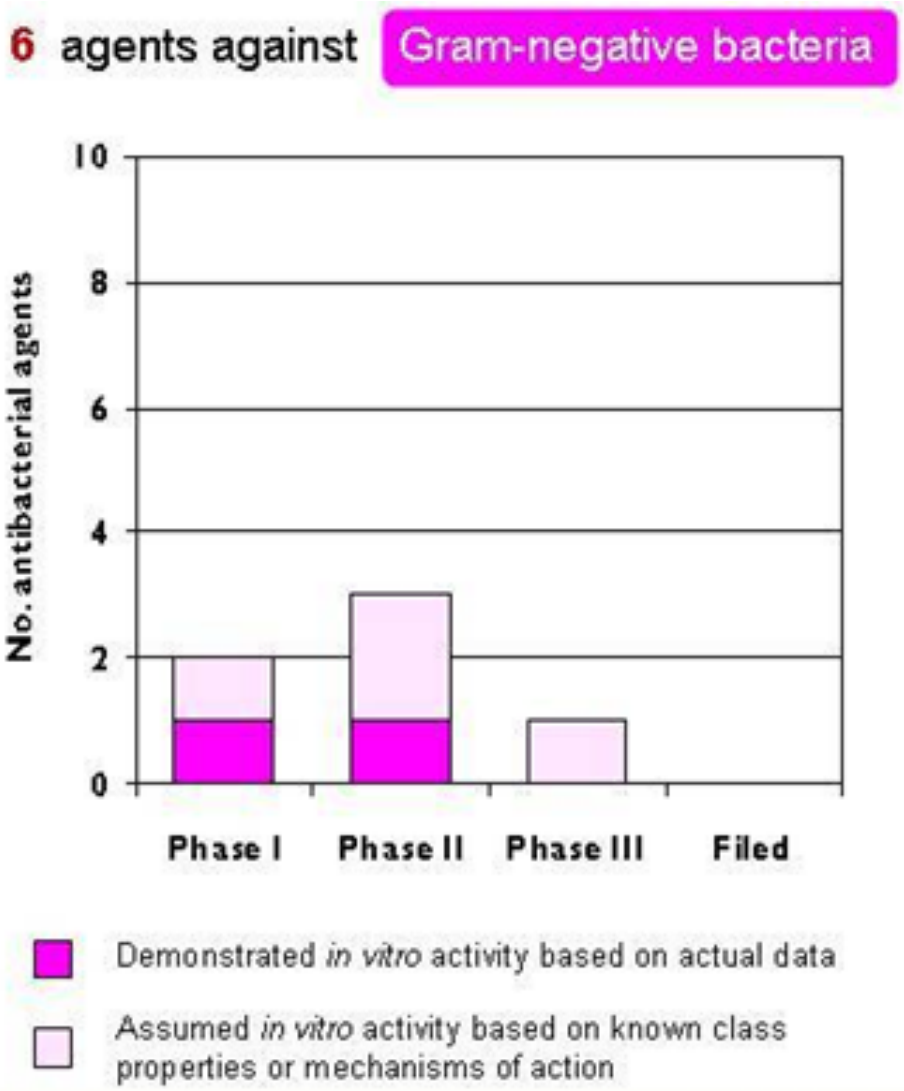
The pipeline is empty!



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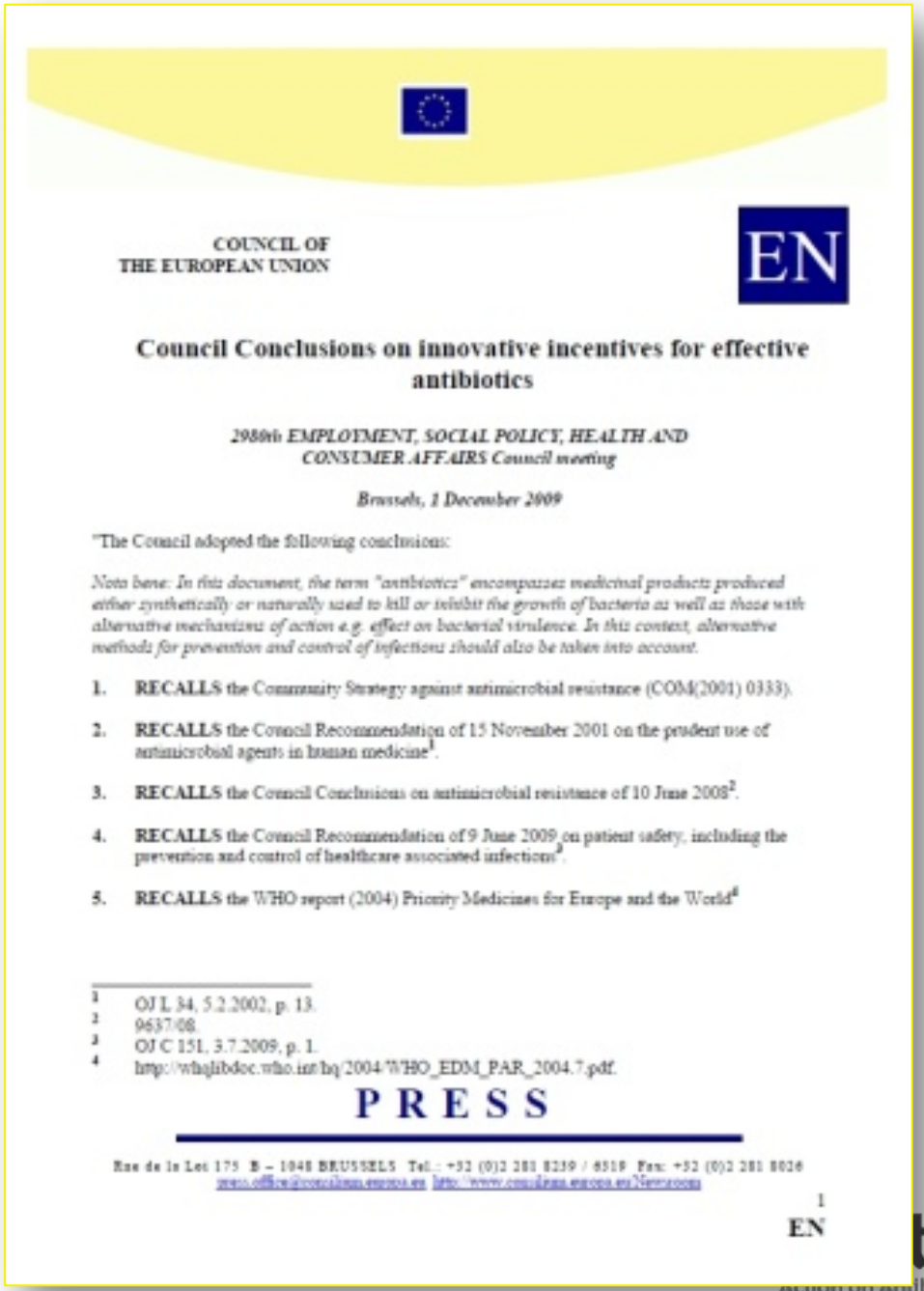
Innovative Incentives for Effective Antibacterials



COUNCIL OF
THE EUROPEAN UNION

EN

Council Conclusions on innovative incentives for effective antibiotics

2980th EMPLOYMENT, SOCIAL POLICY, HEALTH AND CONSUMER AFFAIRS Council meeting

Brussels, 1 December 2009

"The Council adopted the following conclusions:

Note here: In this document, the term "antibiotics" encompasses medicinal products produced either synthetically or naturally used to kill or inhibit the growth of bacteria as well as those with alternative mechanisms of action e.g. effect on bacterial virulence. In this context, alternative methods for prevention and control of infections should also be taken into account.

1. **RECALLS** the Community Strategy against antimicrobial resistance (COM(2001) 0333).

2. **RECALLS** the Council Recommendation of 15 November 2001 on the prudent use of antimicrobial agents in human medicine[1].

3. **RECALLS** the Council Conclusions on antimicrobial resistance of 10 June 2008[2].

4. **RECALLS** the Council Recommendation of 9 June 2009 on patient safety, including the prevention and control of healthcare associated infections[3].

5. **RECALLS** the WHO report (2004) Priority Medicines for Europe and the World[4]

1 OJ L 34, 5.2.2002, p. 13.
2 9637/08.
3 OJ C 151, 3.7.2009, p. 1.
4 http://whqlibdoc.who.int/hq/2004/WHO_EDM_PAR_2004.7.pdf.

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Action on Antibiotic Resistance

ReAct and Uppsala University hosted the conference *"The Global Need for Effective Antibiotics"* in 2010

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Some causes for lack of antibiotic innovation

- **Return of Investment** is much safer from medicines for treatment of chronic diseases
  - -antibiotics given in short courses
  - -new products must be conserved
- **Pharma industry consolidation** - fewer people in fewer companies doing antibiotic research
- **Highly genericised market** – overall price is low
- **Clinical drug development costly** for antibiotics
- **Inevitability of resistance** limits antibiotic lifespan – limits duration in market place
- **Unclear regulatory demands** on antibiotics – creates uncertainty
- **Major scientific challenges**

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There have been numerous initiatives to promote action to stimulate R&D for novel antibiotics

In the US…..

BAD BUGS, NO DR

As Antibiotic Discovery Stagnates ...
A Public Health Crisis Brews

Bad Bugs Need Drugs

Draft Action Plan – *A Public Health Action Plan to Combat Antimicrobial-Resistance* 2010

A PUBLIC HEALTH ACTION PLAN TO COMBAT ANTIMICROBIAL RESISTANCE

Interagency Task Force on Antimicrobial Resistance

Co-Chairs:

Centers for Disease Control and Prevention

Food and Drug Administration

National Institutes of Health

IDSA
Infectious Diseases Society of America

July 2004

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In the EU…..


Priority Medic
for Europe and
the World
EU INTER
Antibi
ecdc
emea
European Academies
easac
Science Advisory Council
European public health and innovation policy for infectious disease: the view from EASAC
Essentia
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Initiative during the Swedish Presidency of the EU 2009

Establishment of a transatlantic taskforce on urgent antimicrobial resistance issues

Agreed at the EU-US Summit on the 3rd of November. The task force is to focus on appropriate therapeutic use of antimicrobial drugs in the medical and veterinary communities, prevention of both healthcare- and community-associated drug-resistant infections, and **strategies for improving the pipeline of new antimicrobial drugs**

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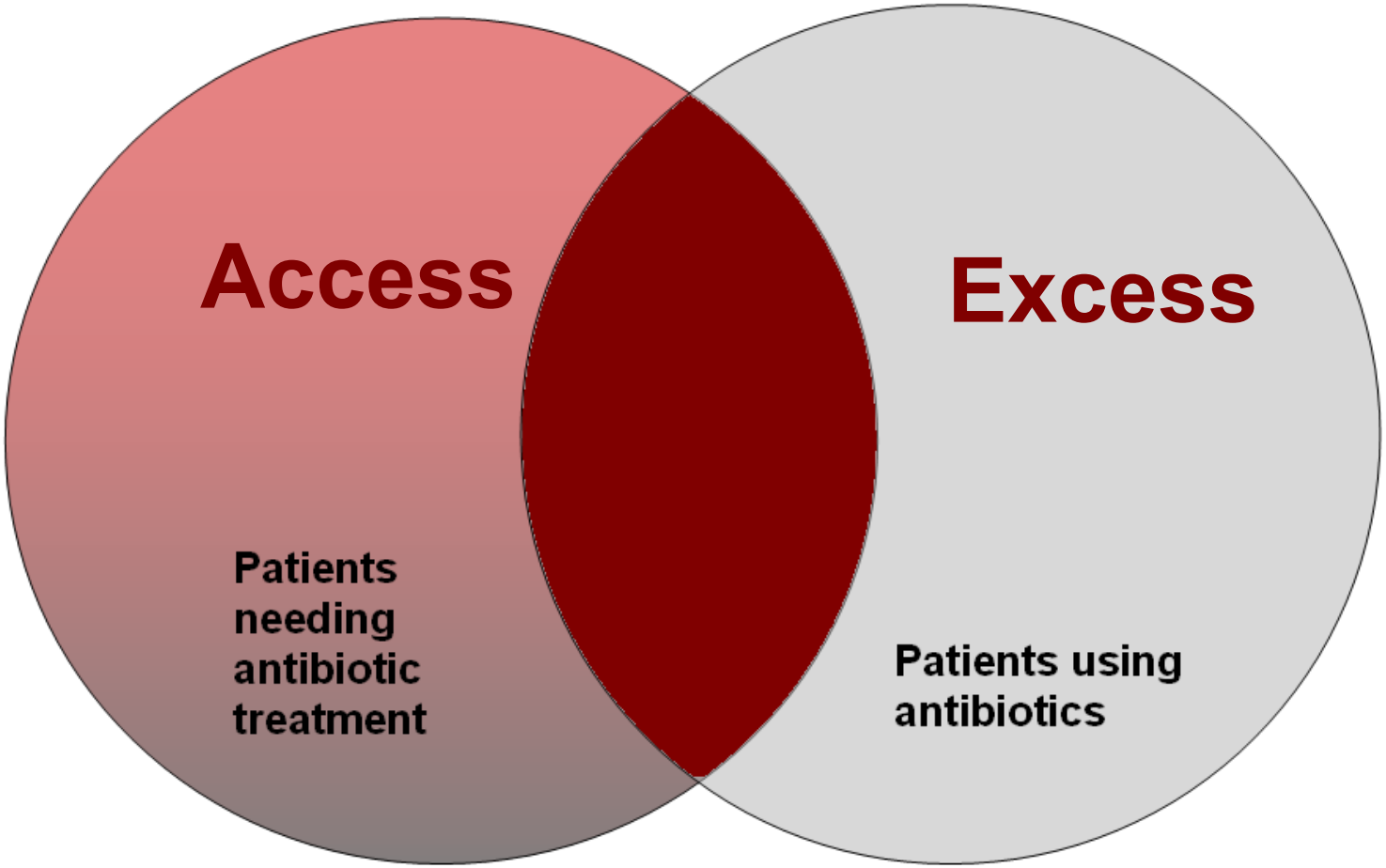
A new business model must be built on the **global needs** and secure **access and affordability** as well as rational use



Adapted from Källander, 2005

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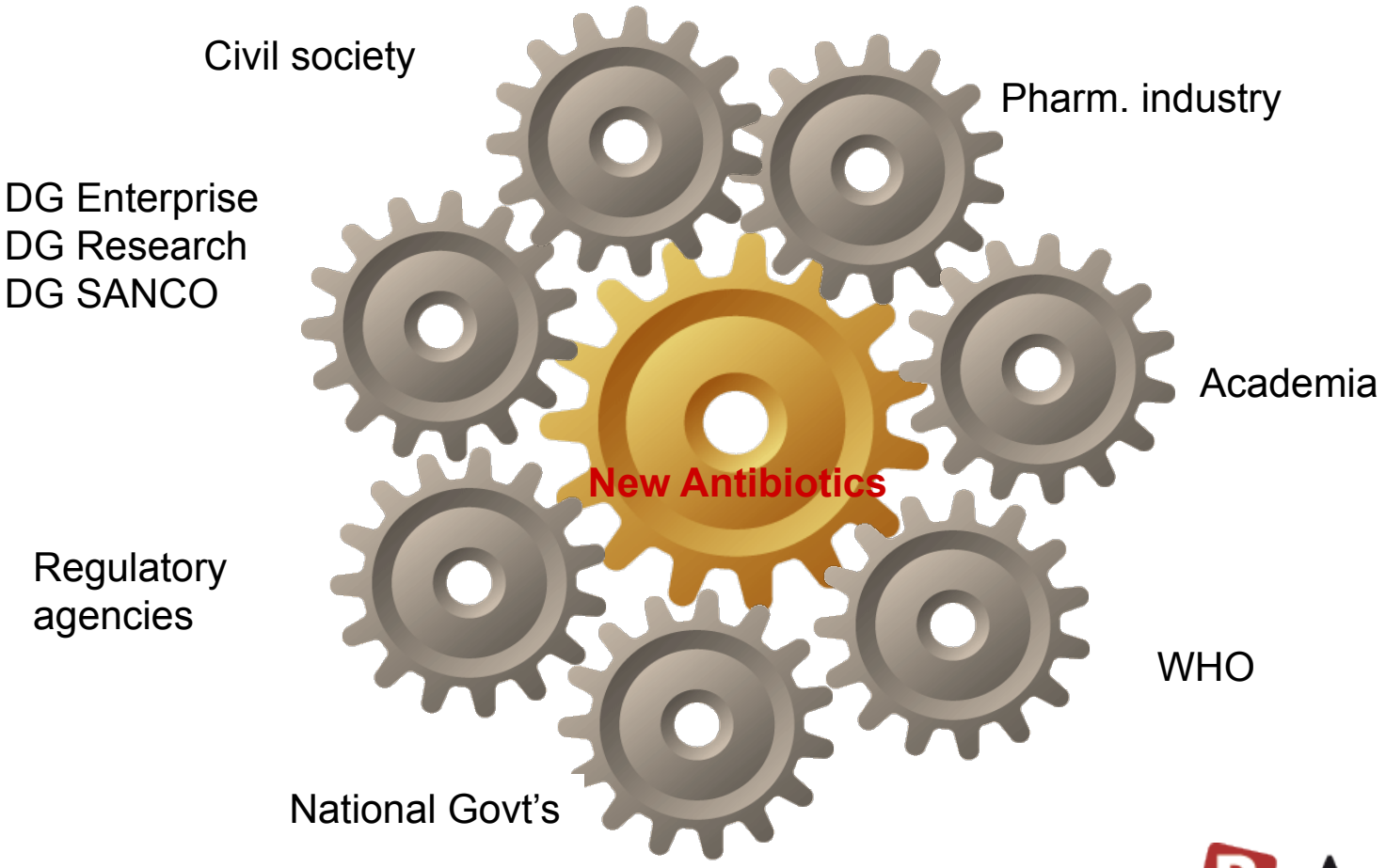
The solution: collaboration for innovation



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