We are facing a world without effective antibiotics-

The urgent need for collective action

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Antimicrobial resistance or Antibiotic Resistance - a semantical confusion?

Antimicrobial resistance (AMR)

- Antiviral agents (e.g. drugs for HIV)
- Antiparasitic agents (e.g. drugs for malaria)
- Antibacterial agents = Antibiotics (e.g. drugs for tuberculosis) and other bacterial diseases …
Penicillin increased the chance of survival from 10% to 90%.

Patients with pneumonia and bacteria in the blood

Adapted from Austrian et al. Ann. Int. Med 1964; 60, 759
Antibiotic resistance - a rhetorical problem?

- Compared to other health problems, we are not talking about a specific disease.
- Instead, we are talking about a medical product that is no longer working against bacteria causing many common infectious diseases.
Common diseases- becoming non-treatable

Antibiotic Resistance

- Blood infections
- Gonorrhea
- Typhoid fever
- Pneumonia
- Surgical infections
In addition, many *medical procedures* are affected and threatened by ABR.
Who is affected by ABR?

Everyone!

However ......

→ ... vulnerable populations with the highest infectious disease burden pays the highest price

→ ... these populations are also the ones that have least access to current and future interventions to manage antibiotic resistance
Some parts of the world have already run out of effective antibiotics

Muhimbili hospital, Dar es Salaam Tanzania

The mortality rate from Gram-negative bloodstream infection in children (43.5%) was more than double that of malaria.

*Blomberg et al. BMC Infect Dis. 2007*

About 70% of neonatal systemic infections can not be treated with the antibiotics recommended by WHO….

*Lancet 2005; 365: 1175–88*
COST IMPLICATIONS OF GROWING ANTIBIOTIC RESISTANCE ARE HUGE

Typhoid fever

<table>
<thead>
<tr>
<th>Cost of antibiotics for non-resistant cases</th>
<th>$3-5</th>
</tr>
</thead>
</table>

Cost of antibiotics for resistant cases

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azithromycin</td>
<td>$35-42</td>
</tr>
<tr>
<td>Oral cephalosporins (cefixime)</td>
<td>$37-42</td>
</tr>
<tr>
<td>Parenteral cephalosporins (ceftriaxone)</td>
<td>$84-104</td>
</tr>
</tbody>
</table>

Average Treatment Costs for Typhoid (US$)
Child weighing 20 kg using standard treatment guidelines

Source: AKU Pharmindex 2004 & WHO guidelines 2003
The MDG:s

- Eradicate extreme poverty and hunger
- Achieve universal primary education
- Promote gender equality and empower women
- Reduce child mortality
- Improve maternal health
- Combat HIV/AIDS, malaria and other diseases
- Ensure environmental sustainability
- Develop a global partnership for development
New strains of superbug hit hospitals

m-seekers anger protest

Is of Zimbabwean seekers in detention began a hunger strike and's decision to send 2k to face torture by Mugabe's regime. Page 3

Dollar's call

Brown called on the right to end its anti-Israeli actions and a radical economic package to turn it from 40c into a global force. Page 2

HOSPITALS FEAR OVER SUPERBUG EPIDEMIC

Vulnerable patients in danger from deadly bacteria running riot on wards

EXCLUSIVE BY ANDREW BEYTS

This spread of a deadly superbug in British hospitals is reaching epidemic proportions, a leading academic warned yesterday.

Over the past nine years, there has been a 50-fold increase in the incidence of the bug known as MRSA, which is resistant to all but the most powerful antibiotics. Medical historians and the West Midlands, however, have been cautious. Dr. David Latham, head of the Public Health Laboratory Service, said: The epidemic has increased and it is particularly virulent forms of the bacteria which are becoming widespread.

Doctors and nurses were being warned to step up infection control measures. Doctors and nurses are being warned to step up infection control measures. Doctors and nurses are being warned to step up infection control measures. Doctors and nurses are being warned to step up infection control measures.
Burden of multidrug-resistant bacteria in the EU

- Attributable deaths: approx. 25,000 / year
- Extra hospital days: approx. 2.5 million / year
- Total costs: approx. € 1.5 billion / year

Limitation: these are underestimates.
Burden of Antibiotic Resistance

Antibiotic resistance (ABR) poses an increasing threat to human health across the world. No country can escape from the medical and economic impacts from this serious problem.

Certain bacteria such as multi-resistant Gram-negative bacteria are particularly worrisome. In the US, two-thirds of deaths due to bacterial infections are caused by Gram-negative bacteria.

Common diseases resulting from these bacteria are e.g. blood stream infections, urinary tract infections, post-operative wound infections and intra-abdominal infections.

The lack of effective antibiotics for treating these infections will increasingly lead to serious health problems and premature deaths.

The consequences of antibiotic resistance affect patient’s lives but also reach far beyond the individual patient affecting healthcare systems and societies across the world.

Within just a few years, we may very well be faced with untreatable infections, medically, socially and economically, unless we act now.

The ongoing pandemic spread of resistant bacteria illustrates that the problem can only be addressed through international cooperation.

The studies in this fact sheet were published between 2003 and 2012.

PATIENT GROUPS ESPECIALLY AFFECTED BY ABR

Newborns and children
- ESBL-producing bacteria are frequently causing infections in newborns. In an Indian hospital, Klebsiella and E. coli were the most common Gram-negative bacteria among infants with BSIs. About 13% of ESBL-infections were deadly in spite of available newer antibiotics and other supportive care.
- In a study from Pakistan, 37 of 78 newborns (less than 6 days old) with infections due to Acinetobacter died within a short time frame. 71% of the bacteria were resistant to all antibiotics except polymyxin.
- In an outbreak in India caused by NDM-1 E. coli, 4 newborn babies contracted blood stream infections (BSIs). All four died.
- Three premature babies in a German neonatal ward died due to an outbreak of ESBL-producing Klebsiella pneumoniae from an unknown source.
- In a study of Tunisian children, the BSI rate was as high as 13.9%. One third of those children died. The death rate from Gram-negative BSI (43.3%) was more than double that of malaria (20.2%). One significant risk factor for death was treatment with ineffective antibiotics due to antibiotic resistance.

Transplantation and cancer patients
- In Spain, among 176 patients undergoing transplantations of kidneys, 58 were infected with multi drug resistant (MDR) bacteria, most often Gram-negative. BSIs occurred in 14% of those. Death or graft loss was significantly more frequent among those with MDR infections (19% vs. 8%).
- In the US, an outbreak of E. coli multiresistant causing infections among liver transplant recipients killed two patients. A larger outbreak involving 24 patients soon followed the two initial cases in the ward.
- In another study from the US, recent organ
How did we end up here?

- 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 antibiotics development
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
ESBL (CTX-M) producing *Enterobacteriaceae*

2001-2002

2007
THE DRUG DEVELOPMENT PIPELINE FOR ANTIBIOTICS HAS GONE DRY
The drug development pipeline for antibiotics has gone dry.

- The last antibiotic class was discovered in 1987!
- The older antibiotics are rapidly becoming ineffective due to antibiotic resistance.
- The pharmaceutical industry has neither the innovative capacity nor the commercial interest to develop novel antibiotics.

No new drugs for:
- Typhoid fever
- Shigella
- Gonorrhoea
- Urinary tract infections
- Blood infections
- ...
We are facing a public health crisis

Antibiotic Resistance

Morbidity
Mortality
Costs

Drug Development
Strategies to stop antibiotic resistance

Prolong the lifespan of existing drugs
   Rational Use
   Better diagnostics

Prevent the spread of resistant bacteria
   Improved hygiene
   Infection control

Development of new antibiotics
   New collaborative models

Controlled distribution and use of new future antibiotic
   A new global system to preserve the effectiveness of antibiotics
Develop national action plans on antibiotic resistance!

- **Surveillance**: Decrease the need for antibiotics
  - Monitor: antibiotic usage and resistance patterns
  - Reduce disease incidence and prevent spread of bacteria

- **Use antibiotics properly**: Improve diagnostics and usage (human & veterinary sectors)

- **Coordinate national activities**

- **Knowledge education, research**

- **International collaboration**
Antibiotic Resistance

Caused by human activity and by over-consumption of a global resource

A failure of public policy & global governance, research prioritization and the current market system

It is a collective responsibility by governments, supranational organizations and individuals to take action

Nasa 1969: Earthrise over the moon from Apollo II
COMBAT DRUG RESISTANCE

No action today, no cure tomorrow