Present and future use of antimicrobials in pigs with case studies from Uganda and Vietnam

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Antimicrobial resistance

The O’Neill Report (2014)

• AMR infections currently claim at least 50,000 lives each year across Europe and the USA alone …... with many hundreds of thousands more dying in other areas of the world

• In 15 European countries more than 10% of bloodstream *Staphylococcus aureus* infections are caused by methicillin-resistant strains (MRSA) …... closer to 50% in several of these

Source: O’Neill (2014)
Livestock numbers & consumption increasingly driven by developing countries
Livestock numbers & consumption increasingly driven by developing countries

Pork Consumption in China and the United States, 1960-2012

Source: USDA
Livestock numbers & consumption increasingly driven by developing countries

![Bar graph showing livestock numbers and consumption by type and region.](image-url)

- **Cattle**
  - Developing: 1,300,000,000
  - Developed: 50,000,000

- **Goat**
  - Developing: 1,200,000,000
  - Developed: 10,000,000

- **Sheep**
  - Developing: 1,100,000,000
  - Developed: 30,000,000

- **Swine**
  - Developing: 1,000,000,000
  - Developed: 20,000,000

- **Poultry '00**
  - Developing: 200,000,000
  - Developed: 10,000,000
Modelling pig systems

Source: Gilbert et al. 2015
Modelling pig systems

Extensive

Semi-intensive

Intensive

Source: Gilbert et al. 2015
Antimicrobial resistance

Global antimicrobial consumption in livestock
(mg per 10km pixel)

Log10 [(mg / pixel) +1]

Source: Van Boeckel et al. (2015)
Antimicrobial use in livestock

- Total consumption in the livestock sector in 2010 estimated at 63,151 tons
- Global antimicrobial consumption will rise by 67% by 2030
- It will nearly double in BRICS
- Poultry > pork: e.g. in Asia, chicken by 129%, pork 124% by 2030
Reality check
Animal disease is a key constraint:

- Animal disease is a key constraint: Remove it and animal productivity increases greatly.
- Africa: every year one in two young animals and one in five adult animals die, mostly of preventable disease.

### Annual mortality of African livestock

<table>
<thead>
<tr>
<th></th>
<th>Young</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>22%</td>
<td>6%</td>
</tr>
<tr>
<td>Shoat</td>
<td>28%</td>
<td>11%</td>
</tr>
<tr>
<td>Poultry</td>
<td>70%</td>
<td>30%</td>
</tr>
</tbody>
</table>

*Otte & Chilonda, IAEA*
Antimicrobial use varied and high: highest outside the OECD

**Antibiotic grams/VLU**

Norway, Sweden, Iceland, New Zealand, Slovenia, Ireland, Lithuania, Denmark, Austria, Estonia, Australia, Switzerland, United Kingdom, Czech Republic, Poland, France, Belgium, Portugal, Japan, Netherlands, Chile, Hungary, Germany, Spain, Rep Korea, USA, Italy.
Global antimicrobial use in food animals

- Total consumption in the livestock sector in 2000s estimated at 400,000 tonnes (vs. 64,000 tonnes from models)

**Antibiotics (tn)**

- China, USA, Thailand
- France, Iran, S Africa
- Norway, Kenya, Sweden

**Antibiotic grams/VLU**

- China, Thailand
- USA, Philippines, S Africa
- Sw, Nor, Kenya

Source: Grace, 2015
What contribution does agriculture make to AMR in human medicine?

- In high use countries, great majority of antimicrobial sales are in the agricultural sector.
- Developing countries very little information on antimicrobial use.
- Probably some countries use at much higher rates than OECD.
- Large problem of antimicrobial under-use.
Antibiotic use: Vietnam

Livestock farmers
• 45 antibiotics from 10 classes
• 100% industrial farmers treat themselves; 60% of household farmers
Antibiotic use: Uganda
1. Kampala pig abattoir

<table>
<thead>
<tr>
<th>Category</th>
<th>TET</th>
<th>AMP</th>
<th>PEN</th>
<th>SXT</th>
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</thead>
<tbody>
<tr>
<td>resistant</td>
<td>22 (44%)</td>
<td>39 (78%)</td>
<td>11 (22%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>susceptible</td>
<td>19 (38%)</td>
<td>1 (2%)</td>
<td>30 (60%)</td>
<td>41 (82%)</td>
</tr>
<tr>
<td>intermediate</td>
<td>9 (18%)</td>
<td>10 (20%)</td>
<td>9 (18%)</td>
<td>9 (18%)</td>
</tr>
</tbody>
</table>

Tinega, 2014
Kampala pork butcheries: *Salmonella*

All isolates were confirmed *Salmonella* at FUB using species primer  

<table>
<thead>
<tr>
<th></th>
<th>S. enteritidis %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw pork</td>
<td>33</td>
</tr>
<tr>
<td>Flies</td>
<td>25</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>8</td>
</tr>
<tr>
<td>Roasted pork</td>
<td>1.3</td>
</tr>
</tbody>
</table>
Drug sensitivity tests

- So far 25 of the 60 isolates tested (agar diffusion test)
Way forward

- Very difficult to regulate use in the developing and emerging economies
  - Global problem: Concerted action
  - Emotion high, reason low problem: Strengthen evidence base
  - Goldilocks challenge: Address the “too little” as well as “too much problem”
Acknowledgements

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