Antimicrobial use in developing countries

WVA/WMA GLOBAL CONFERENCE ON ONE HEALTH
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Madrid, Spain

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Demand for antibiotic use
Gains in meat consumption in developing countries are outpacing those of developed
Most livestock are in developing countries

Livestock numbers (37 billion)

% world aquaculture

- China
- India
- Viet Nam
- Indonesia
- Bangladesh
- Thailand
- Myanmar
- Philippines
- Japan
- Rep Korea
- Asia
- 4
Animal disease is a key constraint:
Remove it and animal productivity increases greatly

As livestock systems intensify in developing countries, diseases may increase

Annual mortality of African livestock
(Around half due to preventable or curable disease)

<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
Livestock in developing countries suffer a high burden of preventable disease

Estimates from BMGF
Livestock drug use
What drugs are used?

Tonnes used per annum

- USA
- Latin America
- Japan
- Mid East & Africa
- China
- India
- Germany
- UK

- Cephalosporin
- Aminoglycoside
- Macrolide
- Sulfa
- Penicillin
- Tetracycline
Who uses drugs?

Legend

<table>
<thead>
<tr>
<th>No. of public vets</th>
<th>No. of private vets</th>
<th>No of cattle and shoots ('000,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 20</td>
<td>0 - 20</td>
<td>0 - 2.5</td>
</tr>
<tr>
<td>21 - 50</td>
<td>21 - 50</td>
<td>2.5 - 5</td>
</tr>
<tr>
<td>51 - 200</td>
<td>51 - 200</td>
<td>5 - 10</td>
</tr>
<tr>
<td>201 - 500</td>
<td>201 - 500</td>
<td>10 - 50</td>
</tr>
<tr>
<td>Above 500</td>
<td>Above 500</td>
<td>Above 100</td>
</tr>
</tbody>
</table>

0 375 750 1,500 Kilometers
How are drugs used, west Africa?
How are drugs used, Vietnam?

Livestock farmers
- 45 antibiotics from 10 classes
- 100% industrial farmers treat themselves; 60% of household farmers

Human drugs
- In one commune, 75% of children medicated by parents each year
2001, India became the world’s leading milk producer. Indian cows and buffaloes produced 135 million tons of milk in 2013.

BRICS countries accounted for 76% of global increase in antibiotic consumption 2000-10

Prescription not needed

Pilot in Assam found 87% of milk samples from cows had aminoglycoside residues— but only two farmers could name an antibiotic containing this.

New project studying antimicrobial residues in peri-urban dairy, aiming at doing a risk assessment.
Veterinary antibiotic usage among dairy farmers in the largest milk producing state of Punjab, India

- All farmers give antibiotics to treat disease
- Some reported used for prophylaxis or to treat perceived “weakness” in animals
- At least 20% use 5 or more antibiotics on the farm
- All small farms reported using 3 antibiotics or less
- FQ residues were found at levels 3 to 8 times the MRL (100 ppb), and TC residues at levels 3 to 10.5 times the MRL (100 ppb).
- More often in farms selling to branded companies than in farms selling to local supply

<table>
<thead>
<tr>
<th>Class of antibiotic</th>
<th>% farms using antibiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetracyclines</td>
<td>83%</td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td>73%</td>
</tr>
<tr>
<td>Beta lactams</td>
<td>47%</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>47%</td>
</tr>
</tbody>
</table>
How much antibiotic is used in developing countries?
Livestock distribution and production

- Sub-national Livestock data
  - Global livestock maps
    - Livestock maps by production system
      - Livestock production estimates
        - Data collection, cleaning and geo-registration
        - Livestock distribution modelling
        - Production systems modelling
        - Herd / production modelling

ILRI
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ULB
Global antimicrobial use in food animals

(mg per 10km pixel)

- Total consumption in the livestock sector in 2010 estimated at 63,151 tons
- Global antimicrobial consumption will rise by 67% by 2030
Global antimicrobial use in food animals

(mg per 10km pixel)

- Total consumption in the livestock sector in 2000s estimated at 400,000 tonnes

Antibiotics (tn)

Source: Grace, 2015
Antibiotic residues and Antimicrobial resistance
## Antimicrobial resistance

<table>
<thead>
<tr>
<th>Population</th>
<th>Disease type / pathogen</th>
<th>Antimicrobial Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free-ranging pigs, Kenya</td>
<td>Animal (salmonella)</td>
<td>Older %: 37 (ampi)</td>
</tr>
<tr>
<td>Urban dairy, Ethiopia</td>
<td>Zoonoses (NTS)</td>
<td>Newer %: 4 (cipro)</td>
</tr>
<tr>
<td>SH chicken, Nigeria</td>
<td>Zoonosis (S. aureus)</td>
<td>Older %: 100 (ampi)</td>
</tr>
<tr>
<td>Intensive chicken, China</td>
<td>Zoonosis (E coli)</td>
<td>Newer %: 0 (cipro)</td>
</tr>
<tr>
<td>Cockles, Malaysia</td>
<td>Zoonosis (NCV)</td>
<td>Older %: 88 (ampi)</td>
</tr>
<tr>
<td>Salads, shops Nigeria</td>
<td>Zoonoses (Listeria)</td>
<td>Newer %: 17 (gent)</td>
</tr>
<tr>
<td>Cow dung, India</td>
<td>Zoonoses (E. coli)</td>
<td>Older %: 93 (ampi)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Newer %: 4 (cipro)</td>
</tr>
</tbody>
</table>

### Factors Contributing to Antimicrobial Resistance

- Lack of awareness & concern
- Lack of surveillance
- Lack of alternatives
- Poor integration between medical & vet sectors
- Presence fake & substandard drugs
Rational drug use for informal sector

Ntura ba ani cike misi 2 foroko dennen
Ntura ba ani cike misi 1,5 foroko dennen
Misi san fila 1 foroko dennen
Misi deni 0,5 foroko

Ntura ba ani cike misi 25ml
Ntura ba ani cike misi 20ml
Misi san fila 10ml
Misi deni 5ml
Results

Improvements in knowledge

Change in practice
– Less under-dosage
– Higher use prophylactics
– No increase in drug use

Better clinical outcomes
– Fewer failures (halved)
– Fewer side affects
More research for development responses

- ‘One Health’ approaches and ‘Rational Drug Use’ for both people and animals
- Delivery systems for dispersed farmers: CAHW; franchises
- Surveillance systems to detect drug resistance
- Pro-poor packaging / marketing (e.g., smaller packages, thermostable)
- Development of vaccines for Newcastle disease, East Coast fever
- Rapid diagnostics for residues and AMR
- Quality assurance for veterinary medicines
Policy responses

Vietnam
- One health task force
- Situational analysis
- Policy workshops
- Member of regional initiatives
- Compliance international norms (export only)
- National Action plan

Kenya
- One health taskforce
- Global partnerships
- Situational analysis
- Compliance: export only
Acknowledgements

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