FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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Integrated Study of Food borne Antimicrobial Resistance (AMR) in Kenya

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Outline

1. Introduction
2. Study scope and Objectives
3. Study design and Sampling
4. Methodology
5. Provisional Results
6. Follow-up activities, outputs/outcomes

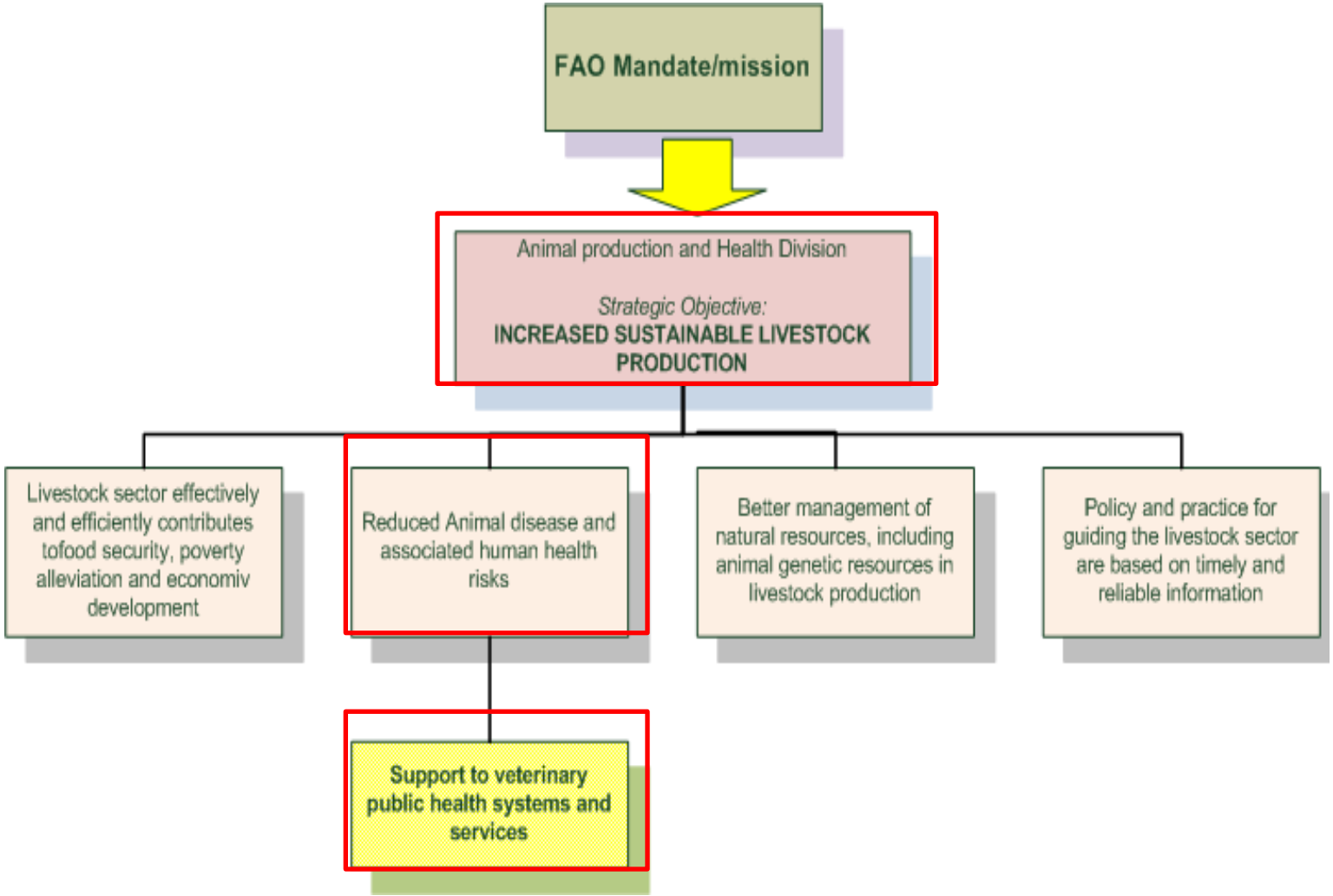
FAO mandate

"Food security exists when all people, at all times, have physical, social and economic access to sufficient, ***safe and nutritious*** food" [FAO World Food Summit, 1996]

FAO HQ - Rome

Food Safety is key to health and nutrition = the ultimate goals of Food Security

Strategic Framework and Context



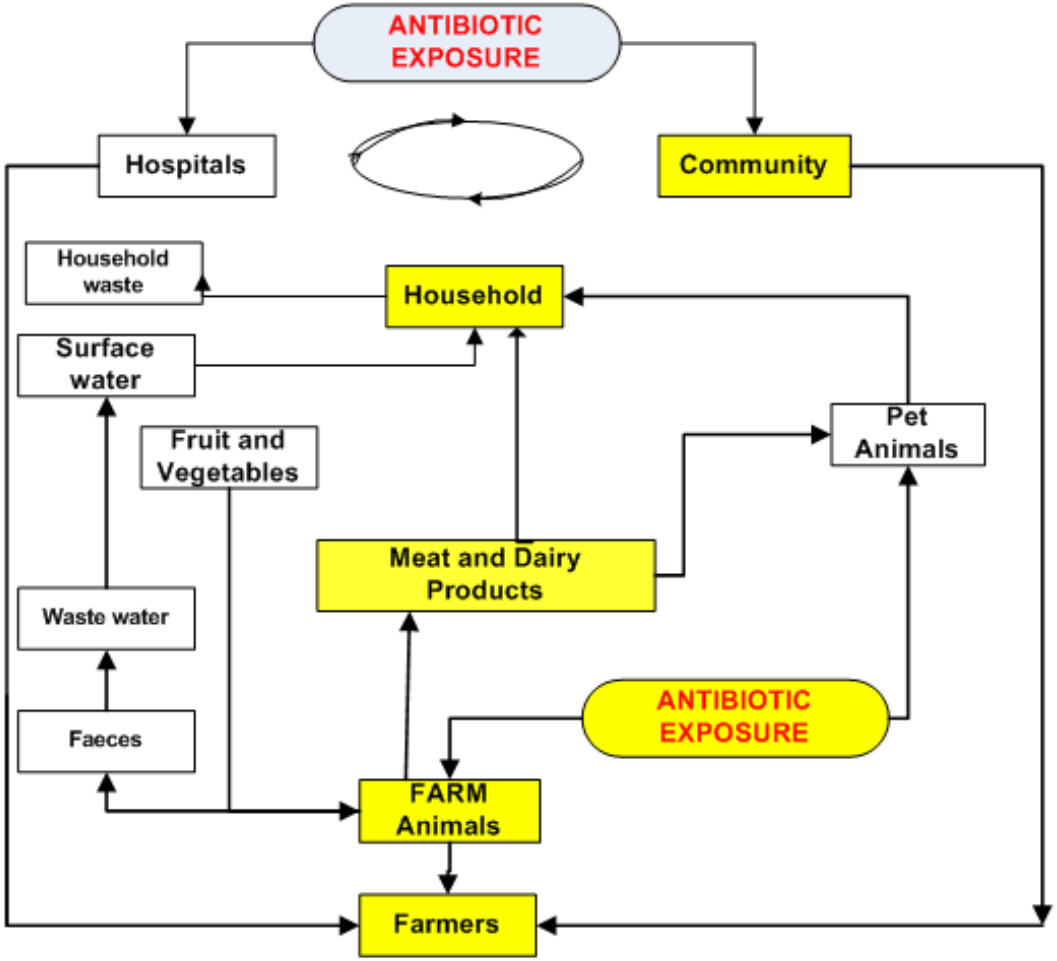
FAO AMR objectives

- Promote prudent and responsible use of antimicrobial drugs: support livelihoods of livestock owners and economies; and minimize human health risks;

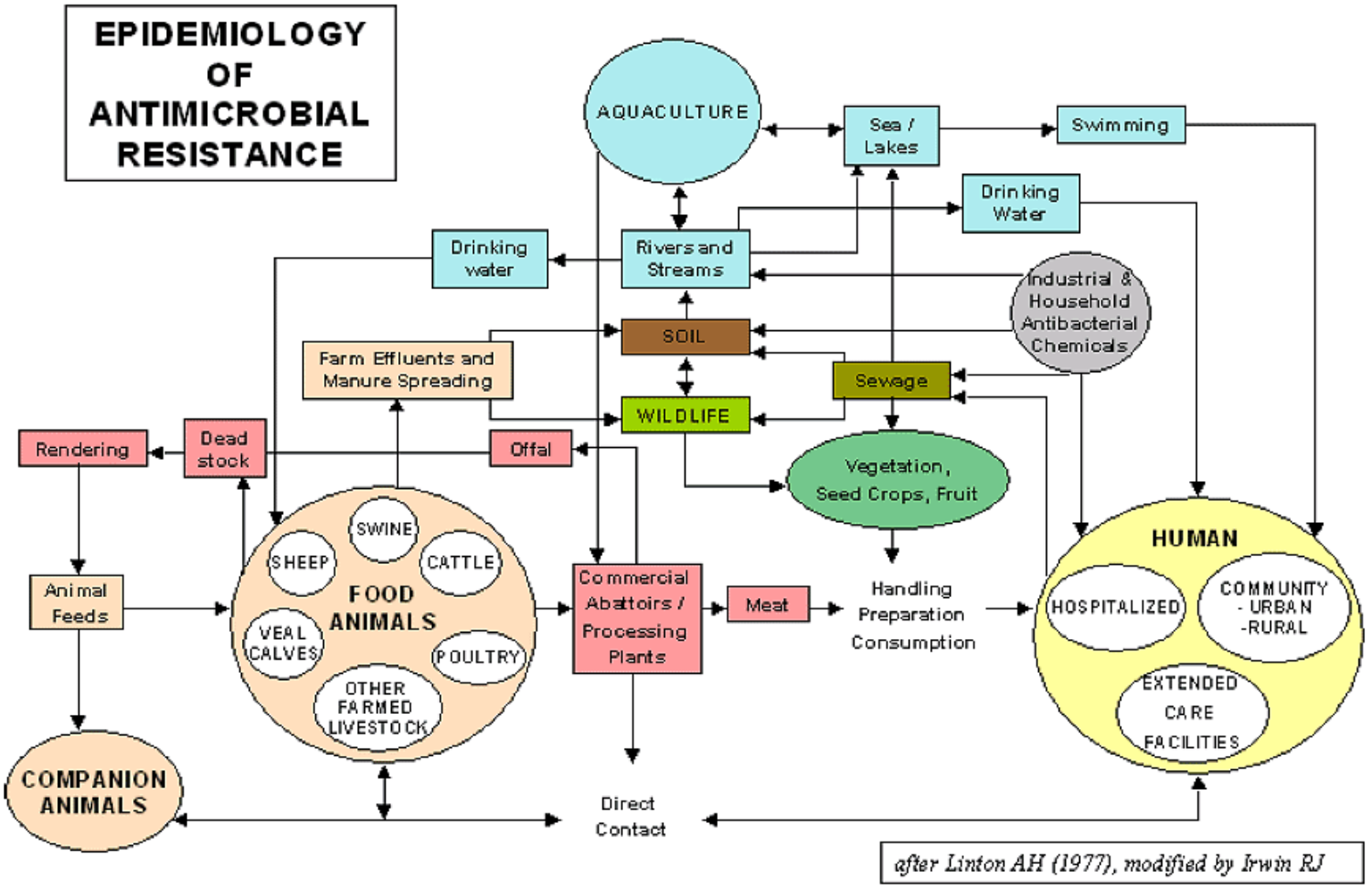
- support national/regional capacities to manage AMR risks – at all stages of the food chain;

- Collaboration with international partners, esp. WHO and OIE in development of tools/guidelines and contribute to standards setting functions.

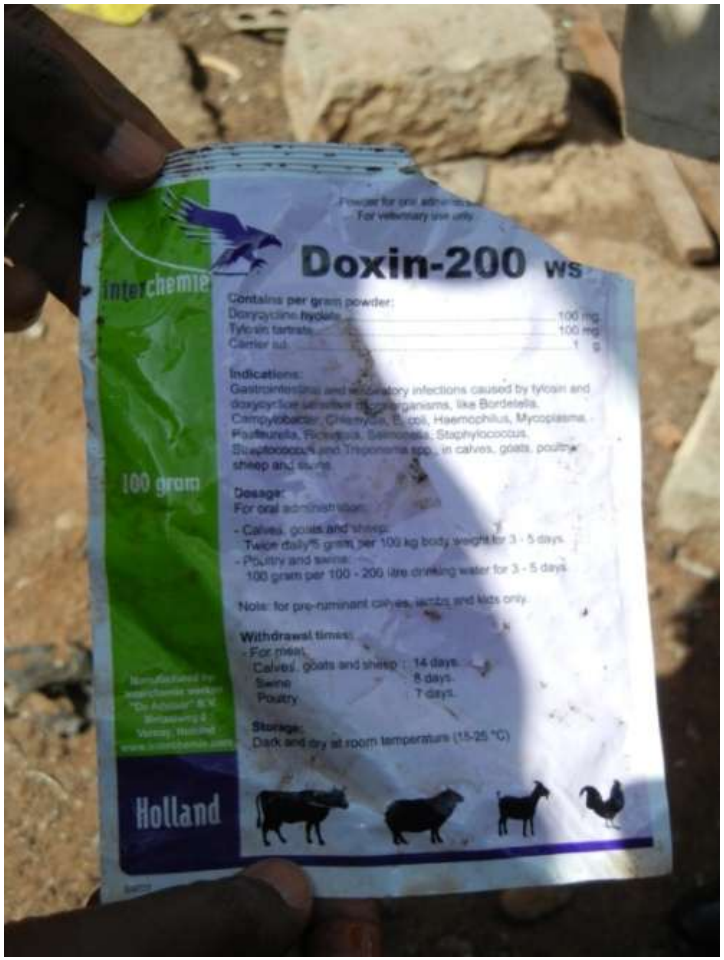
AMR pathways: *exposure and spread*



Integrated Program for Antimicrobial Resistance Surveillance (CIPARS)



Usage of veterinary antimicrobials



Overall Objective of Kenya study

To undertake a baseline *integrated* prevalence study of food pathogen contamination and antimicrobial resistance in farm animals, abattoirs and retail meat outlets - as well as from human clinical specimens in selected sites in Kenya.

- FAO /WHO Collaboration
- Implementing partner: *Kenya Medical Research Institute (KEMRI)*

Specific Objectives

1. To determine the prevalence of *Salmonella spp*, *Campylobacter* spp, *E. coli* and *Enterococcus* spp in food animals, carcasses and retail meats as well as from human clinical specimens in selected regions in Kenya - *ongoing*

2. To determine the antimicrobial susceptibility patterns of these foodborne pathogens to commonly available classes of antimicrobials - *ongoing*

3. To investigate *in-vitro* transferability of antibiotic resistance determinants in *E. coli* and *Enterococcus* spp (indicator organisms) isolated from animals and meat products – *pending*

4. Beef/Poultry/(Pig) Value Chain Assessments

   - value chain assessment, review of national food safety information/data and analysis of food safety institutional framework - *completed*.

Study sites

Study sites

1. **Nairobi and Thika County** – farms, main public abattoirs run by the City and municipal authorities and meat outlets served by these abbatoirs
2. **Nyanza**: abbatoirs, farms and outlets in Kisumu, Maseno and Kakamega
3. **Coast**: slaughter houses, farms and outlets in Mombasa, Kwale and Malindi

Differences in:

- size,
- rural/urban,
- production systems,
- management and hygiene standards

Study Design and Methods

SAMPLING

- Farms
  - Droppings
  - Animal feeds
  - Cloacal swabs
- Animal Slaughter Establishments
  - Carcase swabs/Neck skin
  - Rectal swabs
  - Lymph nodes
  - Effluent
  - Ingesta
- Retail
  - Retail meat
  - Neck skin- poultry
  - Carcase swabs
- Human stool

SAMPLE HANDLING/ PROCESSING

- Transport
- Pre-enrichment
- Enrichment
- Isolation
- Antimicrobial susceptibility testing
  - tetracyclines, chloramphenicol, sulphonamides, β-lactams and quinolones

QUESTIONNAIRES

- Value Chain actors: Feed Producers, Farmers, Abattoir Operators, meat retailers, pharmaceuticals supplies, Agro-vet suppliers..etc
- Policy/Regulatory Agencies
- Pre-enrichment

VALUE CHAIN ANALYSIS

- POULTRY
- BEEF
- PiG
- Types of production systems
  Structure
  Linkages
  Inter-relationships..etc

ASSESSMENT of POLICY, INSTITUTIONAL, LEGISLATIVE FRAMEWORK

- Adequacy of existing food safety policies and legislation
- Identification of institutions, their roles and inter-relationships
- Identification of gaps and overlaps
- Guidance and recommendations

Sampling

- Feed Producers
  - *Animal Feeds*
- Farms
  - *Animal feeds*
  - *Cloacal/rectal swabs*
  - *Droppings*
- Animal Slaughter Establishments
  - *Carcase swabs/Neck skin*
  - *Ingesta/intestinal contets*
  - *Lymph nodes*
  - *Effluent*
- Retail
- Clinical specimens

Experts Panel advice on sampling and study methodology

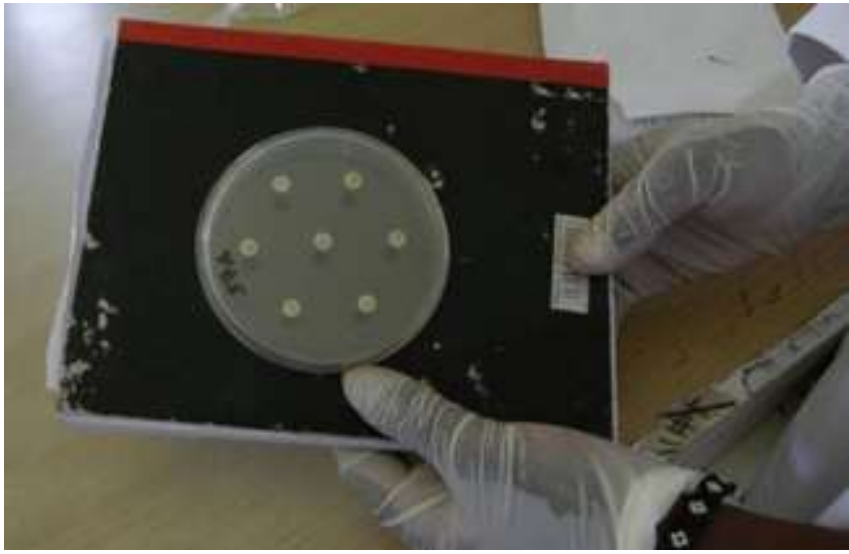
Laboratory procedures: *isolation & enumeration*

- Isolation: Enrichment, selective enrichment, biochemical tests and Gram stain for identification:
  - *Salmonella* spp
  - *E. coli*
  - *Enterococcus* spp
  - *Campylobacter* spp
- Enumeration of total E. coli and coliform counts by 3M Petrifilm plate method

Antibiotic susceptibility Tests

Antibiotic Susceptibility Tests – Kirby-Bauer Disk diffusion Technique (Bauer et al. 1966)

Antibiotic class	Antibiotic
β-lactams	• Ampicillin • Co-Amoxyclav • Ceftriaxone • Cefotacime
Tetracycline	
Quinolones	• Nalidixic acid • Ciproflaxin
Aminoglycocides	• Gentamycin • Streptomycin • Kamamycin

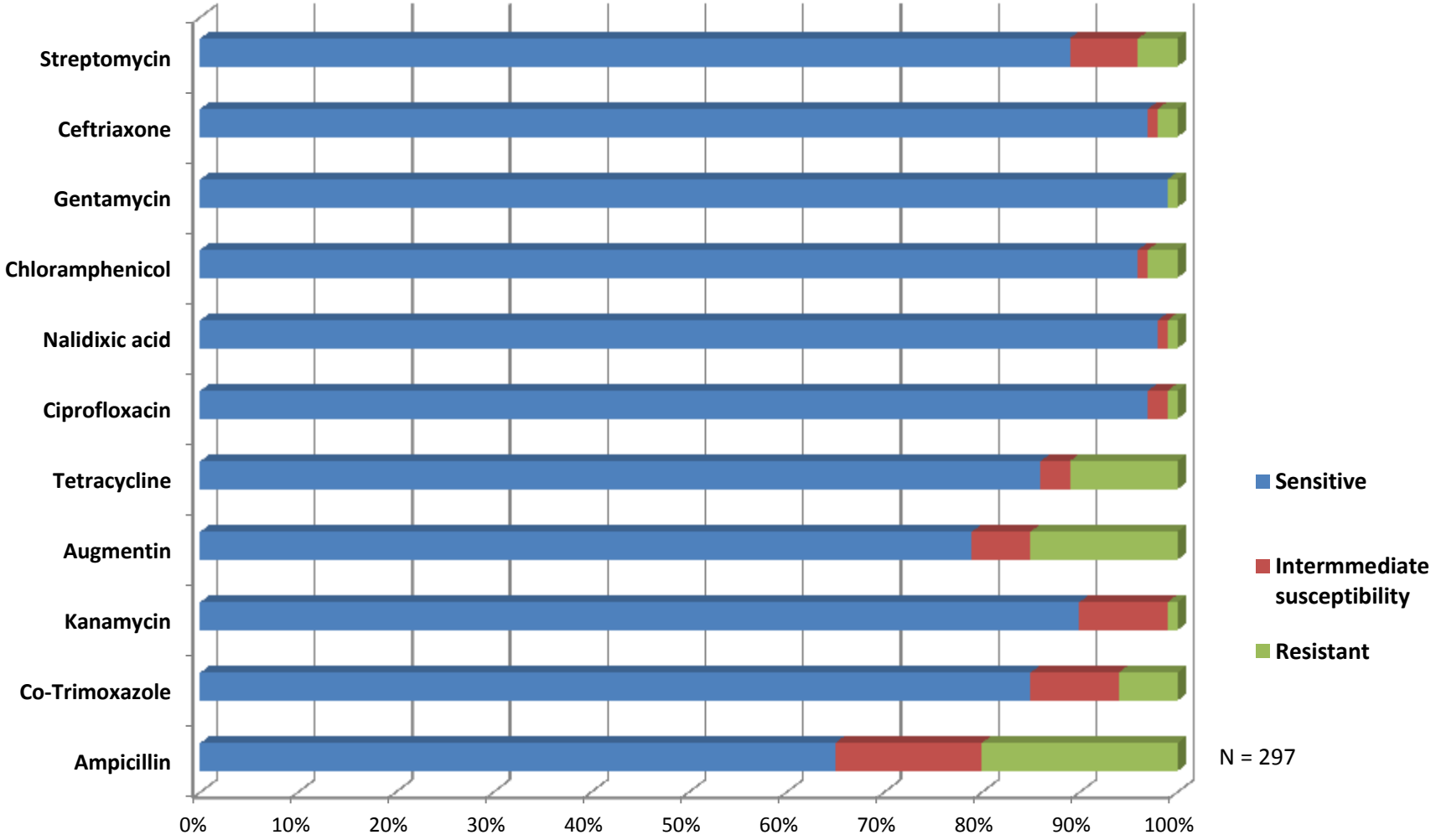


Campylobacter spp. Isolates – all tested for susceptibility to Erythromycin, tetracycline and ciproflaxin (agar dilution method)

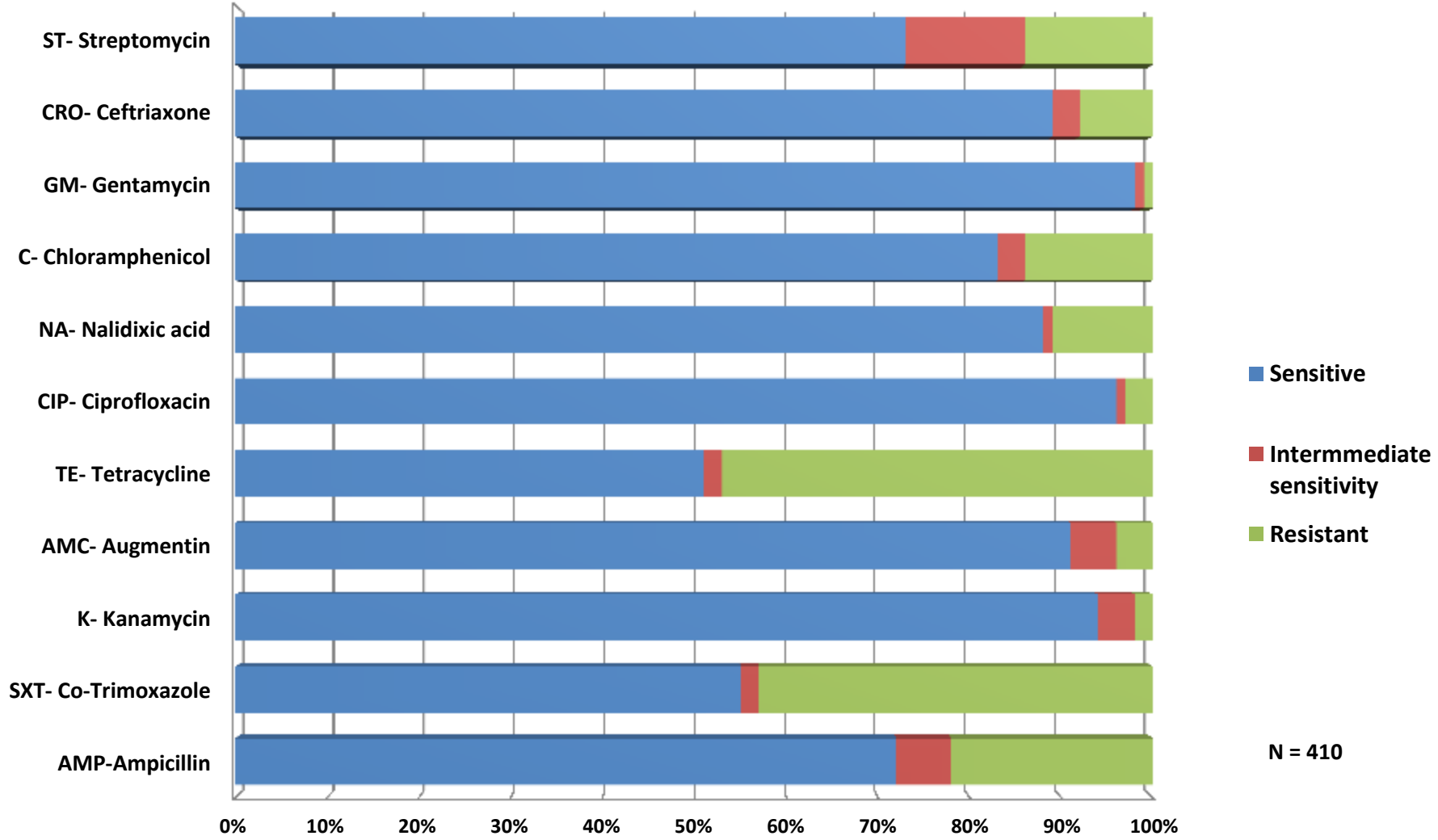
Total bacterial isolations per each type of specimen

Type of animal sampled	Total no. of specimen sampled	Type and total no. of bacteria isolated
Cattle	1492	1053 E. coli,12 Salmonella spp., 33 Enterococcus spp., 6 Citrobacter spp., 9 Providencia spp., 2 Kluvyera spp., 5 Enterobacter spp., 1 Tatumella spp., 1 Psedomonas spp., 1 Budvicia spp., 28 Campylobacter spp., 1 Vibrio metschiikonii, 1 Klebssiella spp., 3 Shigellaa spp., 2 Yersinia spp., 5 Proteous spp.,7 Aeromonas spp.
Pig	69	48 E. coli, 1 Citrobacter spp., 2 Klebsiella spp.
Chicken	1792	1254 E. coli, 18 Salmonella spp., 2 Citrobacter spp., 2 Klebsiella spp., 10 Proteous spp., 1 Morganella spp., 1 Pseudomonas spp., 16 Enterococcus spp., 172 Campylobacter spp.
Effluent	181	139 E. coli, 12 Salmonella spp., 1 Citrobacter spp., 4 Enterococcus spp., 2 Campylobacter spp., 1 Tatumella spp., 1 Proteous spp.,2 Providencia spp.
Chicken feeds	75	64 E. coli, 7 Enterococcus spp

Beef Isolates: Antibiotic susceptibility patterns for *E.coli*



Poultry Isolates: Antibiotic susceptibility patterns for *E. coli* isolates



Prioritization of interventions

Codex Guideline for Risk Analysis of Food borne AMR (CAC/GL-2011)

- *Risk Assessment*
- *Risk management*
- *Surveillance of use of AM agents and AMR organisms and AMR determinants*
- *AMR Risk Communication*

High

- **Tetracyclines; Co-Trimoxazole and Ampicillin**

Medium

- **Streptomycin, Chloramphenicol, Nalidixic acid and Ceftriaxone**

Low

- **Augmentin, Kanamycin, Ciproflaxin and Gentamycin**

Follow-up activities and outputs/outcomes

1. Regional Technical Meeting (August 2011): to review preliminary results and discuss follow-up actions in context of regional harmonization;

2. Support development and implementation of national/regional programmes on surveillance of use of antimicrobial agents, and AMR;

3. Other collaborative projects - *replication of initiative in other developing countries;*

4. Development guidance and support implementation:
   - *Policy*
   - *Prudent use of antimicrobials in animal production*
   - *Risk-based hygiene controls in abattoirs*

Thank You

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