Survey results from Kerala: Effectiveness of CIAs in human health and antibiotic use practice in poultry sector

National Workshop on Development and Implementation of State Action Plan on Antimicrobial Resistance

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About the Survey

Objective

- Study effectiveness of critically important antimicrobials (CIA) in human health and antibiotic use practice in poultry sector in Kerala

Sample size

- Human health experts – 5
- Poultry experts – 8

Methodology

- Experts were identified and emailed a standard questionnaire
- Questionnaires sought information related to use of CIA for humans and non-therapeutic use of antibiotics in poultry sector in Kerala
- Experts were requested to share information based on their experience
- Responses were received, collated and analyzed

Use of critically important antimicrobials for humans in Kerala

Survey questions

1. Antibiotics which are most commonly used, antibiotics that are becoming ineffective, and resistance observed in bacteria in Community, hospitals and ICU settings.
2. Which diseases in Kerala are becoming difficult-to-treat because of antibiotics becoming ineffective?
3. Which diseases are becoming untreatable because of antibiotics becoming ineffective?
4. Which set up (community, hospitals, ICU) is likely to be more impacted with antibiotics becoming ineffective?
5. Please comment on use of Critically Important Antimicrobials (CIAs) in above settings (antibiotics used, whether highest priority CIA, setting where used, effectiveness, frequency of use etc.)
6. Please comment on status of last resort antibiotics in above settings (antibiotics used, setting where used, effectiveness, frequency of use etc.)

Antibiotics which are most commonly used

Q-1

Community	Hospitals	ICU	
Cefixime	Ceftrixone Cefotaxime	Tigecycline	CIA
Azithromycin	Azithromycin	**Colistin,** Polymyxin B	CIA
Fluoroquinolones Ciprofloxacin	Quinolones Ciprofloxacin		CIA
	Amikacin Gentamicin Aminoglycosides	Aminoglycosides	CIA
	Meropenem Linezolid	Penems Carbapenems Meropenem Fosfomycin	CIA
	Cefoperazone		Highly important
Amoxycycline Amoxicillin	Amoxycillin Ampicillin Piperacillin	Piperacillin	Highly important
Doxycycline	Doxycycline		Highly important
Nitrofurantoin Cotrimoxazole			Imp

HPCIA

Inference:

- CIAs are used across all settings– community, hospitals and ICU in Kerala
- Out of these, some are common across all settings

Antibiotics that are becoming ineffective

Q-1

Community	Hospitals	ICU	
Cefixime	Ceftrixone	Cefotaxime Tigecycline	CIA
Azithromycin	Azithromycin	**Colistin** Polymyxin B	CIA
Quinolones Fluoroquinolones Ciprofloxacin	**Quinolones** Ciprofloxacin	**Quinolones**	CIA
	Aminoglycosides	Aminoglycosides Carbapenems Meropenem Imepenem Fosfomycin	CIA
	Cefoperazone		Highly Imp
Penicillin Ampicillin	Amoxycillin Piperacillin Doxycycline	Piperacillin	Highly Imp

HPCIA

Inference:

- By and large, antibiotics which are being used across all settings are becoming ineffective
- Antibiotics belonging to almost all HPCIA classes are becoming ineffective

Resistance observed in bacteria

Q-1

Community	Hospitals	ICU
ESBL [producer]	ESBL [producer], *Klebsiella* spp.	ESBL [producer], *Klebsiella* spp.
Enterobacteriaceae	Enterobacteriaceae	Enterobacteriaceae
	Pseudomonas spp.	*Pseudomonas* spp.
	Acinetobacter spp.	*Acinetobacter* spp.
Pneumococci spp.		
Methicillin resistant *Staphylococcus aureus* (MRSA)		

ESBL: Extended spectrum beta-lactamases produced by Gram negative bacteria e.g. *E. coli, Klebsiella* spp.

Which diseases in Kerala are becoming difficult-to-treat because of antibiotics becoming ineffective?

Q-2

- Ventilator-associated pneumonia
- Urinary Tract Infections (UTI) and Catheter-associated Urinary Tract Infections (CA-UTI)
- Carbapenem Resistant Enterobacteriaceae (CRE) infections
- Central Line-associated Blood Stream Infection
- ESBL infections

Which diseases are becoming untreatable because of antibiotics becoming ineffective?

Q-3

- Pneumonia and ventilator-associated pneumonia
- Urinary Tract Infections (UTI) and Catheter-associated Urinary Tract Infections (CA-UTI)
- Carbapenem Resistant Enterobacteriaceae (CRE) infections especially sepsis cases
- Central Line-associated Blood Stream Infection
- Surgical site infections
- Enteric fever, Typhoid

Which set up is likely to be more impacted with antibiotics becoming ineffective?

Q-4

Community	Hospitals	ICU
0	0	4
Total respondents = 4		

Respondent comments:

- Colistin resistance among bacteria (*Enterobacteriacea*) is a reality in healthcare-associated infections

Survey to study antibiotic use practice in poultry sector in Kerala

Survey questions

1. Are antibiotics used for growth promotion? (yes/no)
2. Please list the common antibiotics used for growth promotion.
3. Are antibiotics used for disease prevention? (yes/no)
4. Please list the common antibiotics used for disease prevention
5. Please list bacterial diseases for which disease prevention is preferred.
6. Please list non-bacterial diseases for which disease prevention is preferred.
7. In view of rising antibiotic resistance, which antibiotics (of those listed in Q 2 and 4), you think should not be used?
8. Do you think above antibiotics (mention in Q7) could be replaced? (with antibiotics that are narrow spectrum and not CIAs/HPCIAs)

   Please give e.g. of antibiotics, which could substitute the one listed in 7, individually
9. Please list/comment on some alternatives that can be used (in place of antibiotics which should not be used) [Vaccines, probiotics and prebiotics, better farming practices , better waste management or any other alternative-elaborate]
10. Would replacing/phasing out antibiotics for growth promotion impact disease prevention?
11. Are farmers aware of the health impacts of antibiotic abuse in poultry? (yes/no)
12. How are antibiotics for non-therapeutic use procured? [Feed manufacturers, Medical stores (human health medicines), veterinary shops, clinics and dispensaries, online , other-elaborate]

Are antibiotics used for growth promotion? (yes/no)

Q-1

	Broilers	Layers
Total respondents = 8		
Yes	4	2
No	3	6
Not sure	1	

Inference:

- Antibiotics are used to promote growth in both layers and broilers

Common antibiotics used for growth promotion

Q-2

Broilers	Layers	
Tylosin Erythromycin, Tylvalosin	Tylosin	CIA
Colistin		CIA
Quinolones Ciprofloxacin Enrofloxacin Danofloxacin	**Quinolones** Enrofloxacin Danofloxacin	CIA (HPCIA)
Amikacin, Gentamycin Neomycin, Streptomycin	Neomycin	CIA
Lincomycin		Highly important
Virginiamycin		Highly important
Sulpha ?	Sulpha ?	Highly important
Doxycycline Chlortetracycline Oxytetracycline Tetracycline	Doxycycline Chlortetracycline Tetracycline	Highly important
Bacitracin Tiamulin		Imp
Monensins, Salinomycin	Monensins	

Inference:

- Antibiotics used across broiler and layer are similar
- Number (about 20+) and classes (~10) of antibiotics used are quite high
- Antibiotics of almost all classes of HPCIAs are being used

Are antibiotics used for disease prevention? (yes/no)

Q-3

	Broilers	Layers
Total respondents = 8		
Yes	8	7
No	0	1

Inference:

- Antibiotics are used for disease prevention (DP) in both broilers and layers in Kerala

Common antibiotics used for disease prevention

Q-4

Broilers	Layers	
Cefpodoxime	Cefpodoxime	CIA
Tylosin Erythromycin, Tylvalosin	Tylosin Erythromycin, Tylvalosin	CIA
Colistin	**Colistin**	CIA
Ciprofloxacin, Enrofloxacin	**Ciprofloxacin, Enrofloxacin**	CIA
Amikacin, Gentamycin Neomycin, Streptomycin	Amikacin, Gentamycin Neomycin , Streptomycin	Highly important
Cephalexin	Cephalexin	Highly important
Lincomycin	Lincomycin	Highly important
Virginiamycin	Virginiamycin	Highly important
Amoxicillin, Cloxacillin	Amoxicillin, Cloxacillin	Highly important
Sulpha ?	Sulpha?	Highly important
Doxycycline Chlortetracycline Oxytetracycline Tetracycline	Doxycycline, Chlortetracycline Oxytetracycline Tetracycline	Highly important
Bacitracin Tiamulin	Bacitracin Tiamulin	Imp
Salinomycin	Salinomycin	

HPCIA

Inference:

- Large number and type of antibiotics are being used for disease prevention
- Except cephalosporins, almost all antibiotics are similar to the ones used in growth promotion
- Similar antibiotics are used in both broilers and layers
- Antibiotics like colistin, quinolones, amoxycillin, doxycycline are becoming ineffective in healthcare settings

Bacterial diseases for which disease prevention is preferred

Q-5

Broilers	Layers
E coli infections such as colibacillosis, colisepticaemia	*E coli* infections
Salmonellosis	Salmonellosis, *Salmonella* spp infections
Pullorum disease	Pullorum disease
Staphylococcus spp. and *Streptococcus* spp. infections	*Staphylococcus* spp and *Streptococcus* spp infections
Fowl cholera/Pasteurellosis	Fowl cholera/Pasteurellosis
Chronic Respiratory Disease (CRD)/Mycoplasmosis	Chronic Respiratory Disease (CRD)
Necrotic enteritis	Necrotic enteritis
	Klebsiella spp infections

Inference:

- Antibiotics are used to prevent same bacterial diseases in both broilers and layers, which explains use of similar antibiotics

Non-bacterial diseases for which disease prevention is preferred

Q-6

Broilers	Layers
Coccidiosis	Coccidiosis
New castle disease (ND)/Ranikhet Disease (RD)	New castle disease (ND)/Ranikhet Disease (RD)
Infectious Bursal Disease (IBD)	Infectious Bursal Disease (IBD)
Infectious Bronchitis (IB)	Infectious Bronchitis (IB)
Mareks Disease (MD)	Mareks Disease (MD)
	Fowl Pox (FP)

Respondent comments:

- Effective vaccines to prevent the above viral diseases of poultry are available

Inference:

- Antibiotics are used for preventing **viral** diseases of poultry, despite vaccines being available

In view of rising antibiotic resistance, which antibiotics (of those listed in Q2 and 4), you think should not be used?

Q-7

Broilers	Layers	
Cephalosporins	Cephalosporins	CIA
Tylosin **Erythromycin**	**Erythromycin**	CIA
Colistin	**Colistin**	CIA
Quinolones Ciprofloxacin, Enrofloxacin	**Quinolones**	CIA
Tetracycline Doxycycline	Tetracycline	HI
Polypeptides	Polypeptides	
All antibiotics	**All antibiotics**	

HPCIA

Inference:

- Response ranges from not to use almost all classes of HPCIAs to eliminating all antibiotics for both layers and broilers, in case of growth promotion as well as disease prevention

Do you think above antibiotics (mentioned in Q7) could be replaced? (with antibiotics that are narrow spectrum and not CIAs/HPCIAs)

Q-8

	Broilers	Layers
Total respondents = 8		
Yes	4	3
Not filled	3	5
Not clear	1	

Respondent comments:

- Doxycycline could be used as a substitute to CIA and HPCIA
- Synthetic penicillins could be used as a substitute to quinolones
- Antibiotic sensitivity assay should be done to decide which antibiotics are to be used

Inference:

- Those responded, have done so affirmatively
- If the aim is to phase-out growth promotion and disease prevention, replacing one antibiotic with other will address the issue partly
- Replacement will be useful in case of phasing out CIAs for both therapeutic and non-therapeutic purposes

Some alternatives that can be used (in place of antibiotics which should not be used)

Q-9

	Vaccines	Probiotics Prebiotics	Better farming practices	Better waste management	Others
Broilers	7	6	8	8	5
Layers	7	6	8	8	5
	Total respondents=8				

Some alternatives that can be used (in place of antibiotics which should not be used)

Q-9

Respondent comments:

- Better farming practices include avoiding overstocking, improving ventilation, sheds, biosecurity, providing clean feed and high pH water, use of technology for mass production and use of disinfectants, not using animal/bird carcasses in feed
- Better waste management should include waste incineration, use of waste managing technology e.g. manure conveyers and drying units
- Research on probiotics and prebiotics should be encouraged
- Strengthen vaccination programs, treatment under veterinary supervision, promoting ethno-veterinary practice, government-sponsored insurance schemes for farmers and regular farm inspections by government agencies

Inference:

- Alternatives can be used in place of antibiotics
- Non-chemical alternatives, good farming practices, better animal husbandry, better waste management have been suggested as possible alternatives

Would replacing/phasing out antibiotics for growth promotion impact disease prevention?

Q-10

	Broilers	Layers
Total respondents = 8		
Yes	3	3
No	4	3
Not filled		1
Not clear	1	1

Inference:

- Mixed responses received

Are farmers aware of the health impacts of antibiotic abuse in poultry?

Q-10

	Broilers	Layers
Total respondents = 8		
Yes	4	4
No	4	3
Not filled		1

Respondent comments:

- Majority of the farmers don't know the seriousness of the issue
- Farmers are aware 'up to some extent'

Inference:

- Mixed responses about farmers' awareness

How are antibiotics for non-therapeutic use procured?

Q-11

Broilers					Layers				
Feed manufa-cturers	Medical stores (human health medicines)	Vet shops, clinics, dispensary	Online	Other	Feed manufa-cturers	Medical stores (human health medicines)	Vet shops, clinics, dispensary	Online	Other
4	**7**	**4**	**4**	**1**	**4**	**7**	**4**	**4**	**1**
Total respondents = 8									

Respondent comments:

- Farmers procure antibiotics directly from companies through representatives, whole sale dealers and through broiler integrators

Inference:

- Antibiotics for non-therapeutic purposes are procured from almost all sources
- Antibiotics are procured from medical stores for human medicine as well as online

List of survey respondents: Human health experts

Name	Organization
Dr Aravind Reghukumaar	Head Department of Infectious Diseases Government Medical College Thiruvananthapuram
Dr Arya RV	Clinical Microbiologist General Hospital Ernakulam
Dr Lancy Justus	Professor Government Medical College Ernakulum
Dr P S Sivaprasad	Nodal Officer Sepsis Management Project General Hospital Ernakulam
Dr Sanjeev Singh	Medical Superintendent Amrita School of Medicine Kochi Ernakulam

List of survey respondents: Poultry experts

Name	Organization
Dr Ajith Nair	Veterinary Surgeon State Institute or Animal Diseases, Palode
Dr C Latha	Dean College of Veterinary and Animal Sciences, Mannuthy
Dr Jalaluddin Chemmengath	Manager Regional Poultry Farm, Calicut, Chathamangalam
Dr Prathiush PR	Veterinary Surgeon State Institute for Animal Diseases, Palode
Dr Sanjay Devrajan	Veterinary Surgeon Department of Animal Husbandry, Kerala
Dr Sudhi Rangorath	Veterinary Surgeon Department of Animal Husbandry, Kerala
Dr Swapna Susan Abraham	Chief Disease Investigation Officer State Institute for Animal Diseases, Palode
Dr V M Harris	President Kerala State Veterinary Council Thiruvanathapuram

Thank you

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Poultry sector in Kerala

19th livestock census data (2012)	
Total poultry population	24.29 million
Share of poultry population	3.33 %
Total birds in backyard	10.62 million
Layer poultry in farms/hatcheries in rural and urban areas	0.85 million
Broiler poultry in farms/hatcheries in rural and urban areas	11.8 million
Households having backyard poultry	1.95 million
Egg production from desi/LIT birds	872.02 million
Meat production from poultry	182 tonnes
Share of meat production	4.8 %

Poultry farming in Kerala

- Two main models – backyard and integrated
- Broilers mainly in the integrated model