



Pollution Monitoring Laboratory (PML), at Centre for Science and Environment tested for antibiotics in chicken samples in Delhi NCR. In total, 70 raw samples were tested. The samples were transferred to the PML in dry ice and analyzed. The tests were conducted in two phases. Three tissues—muscle, liver and kidney—were tested for the presence of six antibiotics widely used in poultry: oxytetracycline, chlortetracycline and doxycycline (from class tetracyclines); enrofloxacin and ciprofloxacin (from fluoroquinolones) and neomycin, an aminoglycoside (see Table 1). 50 samples were tested during Sept-Oct, 2013 and remaining 20 were tested during May-June, 2014. PML is an ISO 9001:2008 accredited laboratory.

Table 1: Summary of antibiotics found in chicken in Delhi NCR (µg/kg)

Antibiotics found in chickens	Chickens with antibiotic (number)	Level of antibiotic (µg/kg)	Level of antibiotic in muscle (µg/kg)	Level of antibiotic in liver (µg/kg)	Level of antibiotic in kidney (µg/kg)
Oxytetracycline	11.4% (8)	8.25–15.16	8.45-13.60	9.13	8.25
Chlortetracycline	1.4% (1)	10.20	10.2	ND	ND
Doxycycline	14.3% (10)	11.94–20.66	14.61-20.66	11.94	15.73
Enrofloxacin	20% (14)	3.37–131.75	3.84-58.06	3.37-131.75	ND
Ciprofloxacin	14.3% (10)	3.55 – 64.59	3.55-26.27	7.55-64.59	ND

Methodology: Each chicken meat sample was analysed in triplicate for six antibiotics of three classes using High Performance Liquid Chromatograph (HPLC) with Diode Array Detector (DAD) and Fluorescence Detector (FLD). Methodologies used were based on published methods and validated.

Note: Neomycin was not found in phase 1 and was not tested in phase 2. No. of samples collected in Delhi: 36, Noida: 12, Gurgaon: 8, Ghaziabad: 7 and Faridabad: 7.

DETAILS

- Five out of six antibiotics tested were found present in chickens. Antibiotics were found in all types of tissues tested i.e. muscles, kidney and liver. The levels found were in the range 3.37-131.75 µg/kg.
- Forty percent (28) chickens had atleast one antibiotic. 22.9 percent (16) chickens had one antibiotic and 17.1 percent (12) had more than one antibiotic.
- Fluoroquinolones were found in more number of chickens i.e. 28.6 percent (20). Tetracyclines were found in 14.3 percent (10) of the chickens.

ANALYSIS

- Presence of antibiotics in chicken suggests that they have been used for growth promotion, disease prevention or therapeutic purposes. Antibiotic residues also suggest that the designated withdrawal period is not followed.
- Fluoroquinolones as a class of antibiotics are of critical importance for human use. They are banned to be used in many parts of the world. Enrofloxacin is particularly regulated as its use in animals is linked with resistance to ciprofloxacin which is widely preferred to treat gut infections in humans. Tetracycline is also considered as a highly important class of antibiotics.
- Classes of antibiotics that are used in poultry but have not been tested by PML include cephalosporins, penicillins and macrolides. Cephalixin, a cephalosporin, amoxicillin from the penicillin group and azithromycin, which is a macrolide are used in broilers and are critical for human use as per the World Health Organization (WHO) list of 2011.¹ Antibiotics of these classes are most commonly used in India. Enzymes like beta-lactamases (which prevent the action

of cephalosporins and penicillins) are known to significantly contribute to the growing problem of resistance.

RESISTANCE IN HUMANS TO ANTIBIOTICS FOUND IN CHICKEN

Based on analysis of the data from 13 studies conducted at various hospitals in India, it is evident that a very high level of resistance is present against the antibiotics such as ciprofloxacin, tetracycline and doxycycline (see Table 2). Bacteria such as *Escherichia coli*, *Klebsiella* spp., *Pseudomonas* spp., *Enterobacter* spp. and *Enterococcus* spp. which are responsible for a large number of infections in humans are found resistant.

Table 2: Resistance to ciprofloxacin, doxycycline and tetracycline in select bacteria of importance in India

	Common infections caused	Ciprofloxacin (resistance range in %)	Doxycycline (resistance range in %)	Tetracycline* (resistance range in %)
Gram negative				
<i>Escherichia coli</i>	Diarrhea; infections of urinary tract and respiratory tract	69-93		
<i>Klebsiella</i> spp ^a	Pneumonia; blood stream infections; meningitis	37-91	53.3	
<i>Pseudomonas</i> spp ^b	Pneumonia; eye and ear infections	52.2-98.5	28.6-88.4	
<i>Enterobacter</i> spp ^c	Infections of blood stream, urinary tract and lower respiratory tract	30-100	100	
<i>Citrobacter</i> spp ^d	Infections of urinary tract and blood stream	44.9-100	50	
<i>Acinetobacter</i> spp ^e	Pneumonia; Infections of blood stream and urinary tract	40.7-95	82.6	
<i>Proteus</i> spp.	Infections of urinary tract and blood stream	0-63		
Gram positive				
<i>Enterococcus</i> spp ^f	Infections of urinary tract and blood stream	70-96.5		50-100
Methicillin resistant <i>S. aureus</i> (MRSA) ^g	Pneumonia; Infections of blood stream, skin and soft tissues	85		61-72

a-Includes *Klebsiella pneumoniae*; b-Includes *Pseudomonas aeruginosa*; c-Includes *Enterobacter aerogenes*; d-Includes *Citrobacter freundii*; e-Includes *Acinetobacter baumannii*; f-Includes *Enterococcus faecium* and *Enterococcus faecalis*; g-includes MRSA coagulase positive was considered. *Resistance data mentioned is against tetracycline antibiotic and not class.

Note: Based on the resistance levels found across different studies, samples and time frame the lowest and the highest resistance value is represented through the range. The data was collected from studies performed during 2002-2013 in both private and government hospitals. Samples were clinical isolates which was obtained from sources like urine, blood and pus. Not all studies included the combination of bacteria vs. antibiotic listed. Data in a few studies was published as percentage susceptible/sensitive, which was converted into resistance after confirmation with the authors.

Resistance data: Sree Siddhartha Medical College, Tumkur, Karnataka²; Fortis Escorts Hospitals, Jaipur, Rajasthan³; Seth GS Medical College and KEM Hospital, Mumbai⁴; Karpaga Vinayaga Institute of Medical Sciences, Pondicherry⁵; Basaveshwara Medical College and Hospital, Chitradurga, Karnataka⁶; Dr. Vasantrao Pawar Med. College, Nashik⁷; Nizam's Institute of Medical Sciences, Hyderabad⁸; Sawai Man Singh Medical College, Jaipur, Rajasthan⁹; Sir Ganga Ram Hospital, New Delhi¹⁰; Vardhman Mahavir Medical College & Safdarjang Hospital, New Delhi¹¹; Postgraduate Institute of Medical Sciences, Rohtak, Haryana¹²; PGIMER, Chandigarh¹³ and Narayana Health (unpublished).

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