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## Ecoprotective measures and Biomonitoring of Intestinal gut pathogens of poultry birds in Ajmer region of Rajasthan.

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### ABSTRACT

Common pathogens specially *E.coli*, *Salmonella*, *Clostridium perfringens*, *Eimeria tenella*, etc. emerging as a most serious threat to the poultry industry due to their wider spreading and acquiring nature of resistance against chemical drugs. These pathogens are regularly administered in the gut of the bird through feed, water and environment. Hence in the present field study, biomonitoring of parameters related to the feed, water and environment has been done in the four poultry farms of Ajmer region near Jaipur Road, Rajasthan, India. Dead poultry birds were collected from different poultry farms of Ajmer (Rajasthan) and were dissected to expose the viscera. Different types of bacterial diseases were diagnosed from the sample birds and the study revealed that *E.coli* infection was present in the entire population of the sample birds. Coccidiosis was also seen frequently in sample birds. Necrotic Enteritis has also been found in sample birds while developing in the later stages of Coccidiosis. At last, various biosecurity measures related to feed, water and environment have been recommended to the poultry farmers of the Ajmer region which have immense potential to excel in this profitable field.

**Keywords:** Poultry Birds, Pathology, Ecoprotection, Coccidiosis, Necrotic Enteritis, Biosecurity.

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## INTRODUCTION

Infectious problems are a constant threat to the poultry industry in Ajmer which boasts of 250 poultry farms, the highest number in Rajasthan with 2,500,000 birds including 1,200,000 layer chickens producing about 700,000 eggs daily [10]. In spite of adequate research for proper measure to control, prevent and treat these infectious bacterial diseases such as Colibacillosis, Coccidiosis and Necrotic Enteritis, these still incur high economic and animal welfare cost. In general, Coccidiosis prevalence is maximum in deep litters while occasionally found in cages in layers in various conditions (like, transportation of feed ingredients e.g. rice polish etc, in the old used gunny bags at deep litter are being commonly used, which makes transmission of oocytes) [2, 3 & 7]. In the poultry industry, the use of water with adequate physical, chemical and microbiological quality is of fundamental importance. The protective flora which establishes itself in the gut of poultry birds is very stable, but it can be influenced by some dietary and alkaline environmental factors [1, 4-6, 8, 9, 11, 12].

The present field study aim to biomonitor the parameters related to drinking water, feed and environmental predisposing factors contributing to the high incidences of infectious bacterial diseases and to determine the incidence of Colibacillosis, Coccidiosis and Necrotic Enteritis in dead chickens (layers) that has to be collected from deep litter poultry farms of Rasulpura in Ajmer region for the necropsy, for studying bacterial pathology and diagnosis of bacterial diseases.

## MATERIALS AND METHODS

Regular inspection of fowls (*Gallus gallus*) was done in order to collect the data regarding water, feed and environment of birds.

**Biomonitoring of parameters related to Drinking Water, Feed and Environment:** Source of drinking water and mode of transfer of water to the birds were watched and recorded. Constituents of feed of birds were analysed percentage-wise Disinfection and sanitation procedures in poultry farms were observed. Ventilation, stocking density, and hygiene of deep litter poultry farms were observed and noted down. Faecal contaminations through feed and water were checked in the premises of poultry farms using gram staining.

**pH analysis of underground water:** Analysis of underground water in the Ajmer region in the Rasulpura belt was done and was found that the pH value of the water ranges from 7.8 - 8.8 and sometimes, even upto 9.

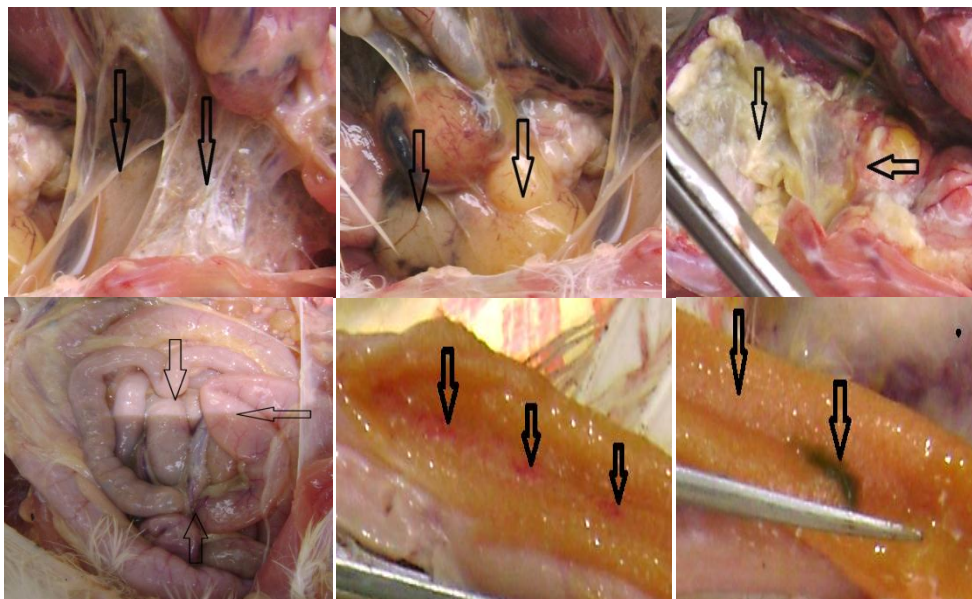
**Necropsy:** A total of 12 dead birds (layers) were collected, 3 each from 4 deep litter poultry farms of Rasulpura in Ajmer region for performing necropsy to expose the viscera especially liver, lungs, air sacs, ovary, small intestine, large intestine and caeca.

**Pathology and Diagnosis of bacterial diseases:** All the birds with open viscera were observed pathologically by viewing the lesions on different affected organs of the birds and ultimately were diagnosed (Table 1).

## RESULT AND DISCUSSION

Source of water is bore-well and underground water in these poultry farms. Water is made to flow in cemented pipe or channels from where birds used to drink their water. The ingredients of feed of poultry birds are Maize in grinded form (45 percent) and Concentrate (55 percent). Concentrate, in turn composed of lime-stone grit or marble grit (source of calcium carbonate), deoiled soya cake (proteins), deoiled groundnut cake, deoiled sunflower cake, grinded fish meal and deoiled rice bran. Disinfection and sanitation procedures in the poultry farms are unsatisfactory. Stock density of birds in different houses is mostly high. There is a lack of hygienic conditions in these poultry farms. Ventilation of poultry farms and temperature conditions are moderate. Presence of translucent, non-functional and caseated air sacs and deposition of some yellowish material on air sacs and mis-shapened and ruptured ovas and yolk filled in abdominal cavity indicate the presence of an *E.coli* infection (fig. 1, 2 & 3). Presence of slightly swollen intestine and small focal areas of haemorrhages and necrosis in the caeca indicates the presence of Coccidiosis caused by *Eimeria tenella*, which is always accompanied by *E.coli* infection (fig. 4, 5 & 6). Presence of haemorrhagic ulcers in the intestine of birds resulted into Necrotic Enteritis in the birds. Gross lesions characterized by a gray, thickened mucosa confined to jejunum and ileum indicates the presence of *Clostridium perfringens*. Necrotic Enteritis and Coccidiosis often occur simultaneously in a flock (fig. 5 & 6). The findings revealed that among 12 poultry layers of Ajmer region, the prevalence of *E.coli* infection was 99 percent, that of *Clostridium perfringens* was 30 percent, and that of *Eimeria tenella* was 40 percent in deep litter, respectively. The findings revealed that the most prevalent bacterial infection in Ajmer region is the *E.coli* infection. Details can be seen in Fig. 7.

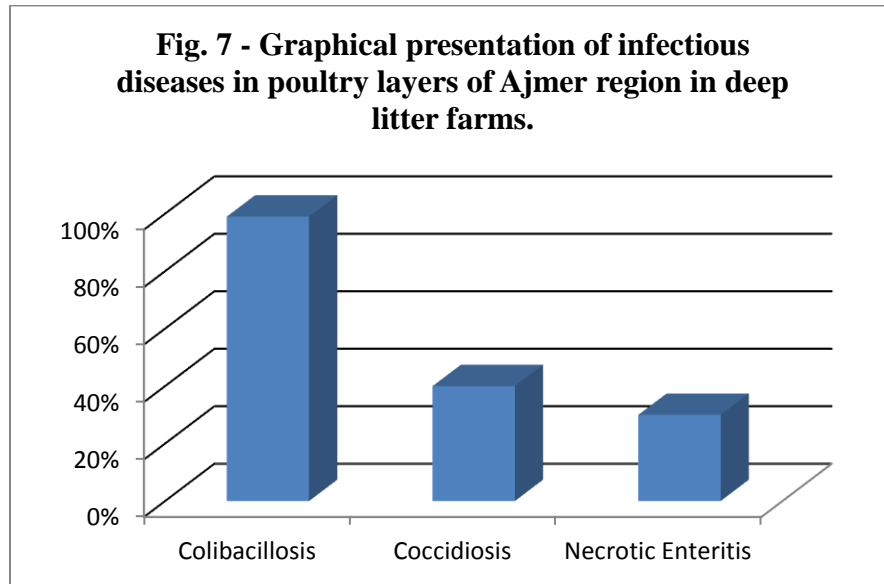
**FIGURES 1-6: Necropsy of diseased birds showing characteristic clinical signs and lesions on affected organs and diagnosis of the related disease**



Arrow heads in Fig. 1 shows the presence of caseated and translucent air sacs along with disposed yellowish material due to an *E.coli* infection. Fig. 2 represents mis-shapened and ruptured ovas of a bunch like ovary

which can be seen from the covering of caseated and translucent air sacs. Fig. 3 represents the yolk filled in the abdomen, which oozes out from the eggs or ovas. Fig. 4 shows the presence of slightly swollen intestine due to Coccidiosis. Fig. 5 and 6 represents necrotic haemorrhages and necrotic foci in caeca leading to ulcers due to simultaneous action of *Eimeria tenella* and *Clostridium perfringens*.

Fig. 7 represents the graph showing the prevalence of different infectious diseases percentage-wise in fowls in deep litter farms in Ajmer region.



**Table-1: Prevalence of infectious diseases in the dead layer birds of deep litter farms collected for necropsy.**

Bacterial Diseases	Birds diagnosed (n=12)	Poultry Farms				Overall Prevalence among tested cases (percent)
		A	B	C	D	
Colibacillosis	12	3	3	3	3	99
Coccidiosis	5	2	2	0	1	40
Necrotic Enteritis	4	1	2	1	0	30

n = total number of layers diagnosed for bacterial infections.

Table 1 represents the data regarding the prevalence of different infectious diseases in the dead layer birds of deep litter farms which were sacrificed and diagnosed for the confirmation of a particular disease.

### RECOMMENDATION

Hence, it appears that a rigorous cleaning and disinfecting program is a necessity for the 4 poultry farms of Ajmer. The construction of big poultry farms and the purchase of nutritious feed do nothing if good hygienic measures are not undertaken. It is recommended that proper annual cleaning, acidification and disinfection of drinking water reservoirs should be performed regularly. Appropriate locations for digging or drilling wells should be chosen and periodic bacteriological analysis should be performed both in rain and drought seasons. Water should be chlorinated appropriately. Proper storage and treatment of raw materials of feed with organic



acids in combination with antimicrobial compounds or feed additives such as antibiotics, probiotics or prebiotics can avoid the risk of contamination and reduce pathogens. Innovations for improving bird health in poultry production system with special focus on other non-nutritional environmental factors in poultry farms have to be considered. Good ventilation with recommended floor space in the premises should be provided. Limited number of visitors should enter the poultry farms. Proper cleaning of equipments and premises and proper control of vectors such as insects, wild birds, rodents etc. should be done. It is advised to add coccidiostats in the feed of birds infected with Coccidiosis. As a preventive measure in layers, 500 grams / one ton dose of medicine Amprolium 20 percent in feed should be given right from the first week to the point of 50 percent lay. To control the outbreak, 60 grams Amprolium in 25 lits. of water should be given for one week. For controlling the infection of *Eimeria tenella*, 4 grams of medicine Codrinol in 1 litre of water should be given as treatment, specific for *E. tenella*. It would be wise to use Chloremphenicol 10 percent at the rate of one gram / 5 litre of water along with Amprolium, since the flock is exposed to *E.coli*. The owners of these 4 poultry farmers have to undertake immediately remedial actions on defaulting elements like removal of moist litter immediately, foot-bath at the door, use of ammonia binders in the litter, avoidance of poor ventilation, etc. A strong resolve towards educating the rural farmers (a short training / demonstration camps) for adapting scientific poultry farming is needed to support and inspiring confidence in them and instill in them greater economic stability.

### CONCLUSION

Highest incidence of *E.coli* infection in layers of Ajmer region indicates its presence in drinking water which is considered an indicative of faecal contamination. In conclusion, it appears that pathogenic serotypes of *E.coli* can also be introduced into the poultry flocks through contaminated well water. The high value of alkaline pH in water of the Ajmer region especially in Rasulpura belt enhances the growth of *E.coli*. Also presence of algae in the corners and crevices of channels made of cement renders high alkalinity to the water flowing in it. Presence of this pathogenic coliforms also indicate the presence of contaminated feed. Prevalence of Coccidiosis in the layers indicate towards the over-crowding of fowls and bad sanitation in poultry farms of Ajmer. It seems that this disease might spread due to feed-sacks, some contaminated boots, clothing, free-flying birds, equipments, insects and rodents. The oocysts of *Eimeria tenella* might spread through the used gunny bags or sacks at some other deep litter farms, containing litter or feed for birds when the workers tries to transfer the litter into sacks from the floor of the farms. The presence of *Clostridium perfringens* in the layers is directly related to deficiencies in hygiene and faecal and soil contamination. Poultry farmers in Ajmer region especially of remote and village areas are illiterate and unaware of scientific methods used in poultry industry.

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