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Comparative Efficacy of Different Drug Combination on Experimental Induced Infectious Bronchitis in Cockerels

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A B S T R A C T

For comparing therapeutic efficacy of different drug combinations against experimentally induced Infectious Bronchitis (IB), total 90 healthy cockerels of 20 days age and approximately all having uniform body weight were randomly divided in to six groups of consisting 15 each. The birds of group III treated with V-cofex @ 1 ml/l of drinking water once in day and Goutcare @ 5 ml/100 chicks once in day for 5 days. The birds of group IV received Kufcure plus, Heptocare, Goutcare @ 5 ml each drug/100 chicks once in day, Vitaconvital @ 2 ml/100 chicks once in day, Streescare @ 1gm/ l of drinking water once in day for 5 days. The birds of group V were treated with Imon, CRDX-IR @10 ml each drug/1000 chicks once in day, and Goutcare @ 5 ml/100 chicks once in day for 5 days. The birds of group VI received with Mycosol, Imon, CRDX-IR @10 ml each drug /1000 chicks once in day and Goutcare @ 5 ml/100 chicks once in day for 5 day. The birds of group I served as of apparently healthy and group II infected control without any medication. On the basis of clinical observations and haemato-biochemical change all the drugs combinations were effective to control IB. The birds of group IV showed an overall better recovery while group VI had least recovery effect as compared to other drug combinations.

Introduction

Infectious Bronchitis (IB) is highly contagious viral disease of respiratory and urogenital tract of chickens affecting both broiler and layers (King and Cavanagh, 1991) causing high mortality, poor body weight gain in broilers and decreased egg production in layers. The upper respiratory tract is primary site of IB virus replication followed by viremia and dissemination of virus to other tissues. IBV has different serotypes with antigenic and pathogenic variability in different parts of the worlds (Gelb *et al.*, 1991). The names now normally given to this disease are I.B.N, IB nephritis and NIB. This reflects its inflammatory nature and organ primarily affected (Meulemans and Berg, 1998). Vaccination is only partially successful due to continual emergence of antigenic variants. At many sites, multiple antigenic types are simultaneously present, requiring the application of multiple vaccines. Absence of cross–protection is one of the reasons of failure of vaccination (Ignjatovic and Sapats, 2000). Controlling IB infection is a problem due to wide variations in serotypes and virulence of strains that have developed from

time to time, highly contagious nature, and the evolution of specific tissue tropism and recombinants due to simultaneous infection of multiple virus types and use of live vaccine (Bayry *et al.,* 2005). Outbreaks can occur in vaccinated flocks due to lack of cross-protection against antigenically unrelated serotypes and variant strains of the virus (Gelb *et al.,* 1991: Jia *et al.,* 1995). In spite of vaccination, IBV is still a major cause of respiratory problem in broilers and egg production loss in breeders and layers. Farmers are unable to control it because of failure of vaccination, no cross protection, antigenic variation and due to failure to control the various predisposing factors of disease. There is no treatment for the viral disease and only symptomatic and supportive treatment for controlling the secondary bacterial infection can be given. In view of these facts the present study was planned to evaluate the clinical signs, haemato-biochemical changes in infectious bronchitis and to assess the comparative therapeutic efficacy of different drug combinations in controlling the experimentally induced infectious bronchitis in cockerels.

Materials and Methods

Total 90 healthy cockerels of 20 days age and approximately having uniform body weight were purchased from Instructional poultry farm Nagla, C.V.A.Sc., Pantnagar (G.B.P.U.A.T, Pantnagar). The experimental house was thoroughly cleaned, first with water and then with 1% phenyl solution. All the accessories were flamed twice with blow lamp. All the utensils after washing with water were disinfecting with 1:10000 potassium paramagnet solution. After proper placing of accessories, poultry shed was fumigated (17.5 g potassium permanganate crystal and 35 ml of formaldehyde per 100 cubic feet area) three days before stocking. Birds were reared in cage system under strict hygienic condition. All the birds were randomly divided in to six groups of 15 birds each. Except healthy control group all the birds were challenged with 1 ml of allantoic fluid containing infectious bronchitis virus of 1:512 HA titre (isolated from field case) by intraocular and intranasal route.

All the birds were offered feed twice a day and water was provided *ad. lib.* Birds were examined daily for clinical appearance and also for analyzing the response of treatment given. Blood with or without anticoagulant was collected through wing vein to study the haematobiochemical changes on day 0, 3rd, 9th, and 12thday after reproduction of disease. Hb (gm/dl), PCV (%), TEC (x10^{6}/cu mm), TLC (x10^{3}/cu mm) and DLC (%) were estimated from the whole blood samples using the method described by Jain (1986) and Natt and Herrick (1952), respectively. ALT, AST, ALP, serum uric acid, BUN and creatinine were estimated spectro photometrically by the method described by Toro and Ackermann (1975), Reitman Frankels (1957) Varley (1975), Balis (1976), Patton and Crouch (1977) and Bowers (1980) respectively.Analysis of data was done as per standard method described by Snedecor and Cochran (1994).

Results and Discussion

All most all the birds (100%) became infected after 3 days of experimental inoculation of virus producing various degrees of clinical signs. It is because of highly contagious nature of virus (Cavanagh and Naqi 2003). Infected birds usually develop signs within 48 hrs (Cook *et al.,* 1991). Mortality in different groups after ranged from 6.6 to 26.6% and it was highest (26.6%) in infected control group. Among treated groups, lowest mortality (6.6%) was found in birds of group IV and V. Birds of group III had 13.36% mortality. Total overall average mortality was

14.62 % and average mortality in among treatment groups was 11.6%. Ignjatovic *et al.*, (2002) reported 5-37 % mortality in nephropathy form of bronchitis.

Chickens in healthy control group did not show any clinical sign and gross lesions. Clinical signs were appeared in all infected groups after 48 hr of experimental inoculation of virus and these varied from mild to moderate. The affected birds appeared dull, depressed and showing coughing, sneezing, ocular nasal discharge, tracheal rales and open mouth breathing. Some birds were revealed swollen and wet eye. Some birds had deposition of urate crystals in the joints especially in the legs. Intensity of clinical sign in all treatment groups was less as compared to infected control group. Similar clinical findings were observed by Shengwang *et al.*, (2009). Clinical signs disappeared faster in treatment groups as compared to infected control group. Fastest recovery was seen in group treated with group IV followed by group V and slow recovery was observed in group VI. The slow recovery in group VI might be due to early use of antibiotics as the use of antibiotics further increase the load on liver for metabolism of antibiotic and increase in the load on kidney for excretion of metabolite of antibiotic which were given only for reducing the risk of secondary bacterial infection.

The best effect of therapy was seen in group treated with Kufcureplus, Gout care, Vitaconvital, Heptocare and stress care might be due to the combinations contains lipotropic agent, liver stimulants, antioxidants, mould inhibitors and toxinbinders in hepatocare and herbal extracts of goutcare might have improved the renal efficiency, nephritic tissue agents would have stimulated the nephritic tissue, rejuvenated damaged cells and helped in normal functioning of kidneys. Diuretics in it would have prevented the accumulation of urates and help in flushing (Chandrakar *et al.*, 2011). Kufcure plus is a poly herbal product that reduces cough and mucous from the respiratory tract and helps in the normal functioning of the lungs. Hb of birds of different groups ranged from 69.06±0.896 to 91.27±0.24 g/l and it was significantly decreased on 3 rd day post infection in different group in comparison to birds of group I (Table 1). On 6th day onwards there was significant increase in Hb concentration in all treatment groups as compared to infected control group. There was significant reduction in Hb value in infected control group. Among treatment groups highest increase in Hb concentration was seen in group IV and lowest increased was noticed in group VI.

Highest decrease was seen in group II as compared to other groups. PCV (%) value ranged from 23.16±0.602 to 33.66±0.882% in different group. It was decreased on 3rd day post infection as compared to group I.

There was significant increase in PCV (%) value from 6th day onwards in all treatment groups as compared to infected control group. Highest increase was seen in group IV while lowest increase was observed in group VI after treatment. TEC ranged from 2.39 ± 0.096 to 3.38±0.011 x10^{6} /cu mm in different group. In all treatment groups there was fall in TEC level, then after following the treatment its values increased and reached about to normal. Highest increased in TEC value was seen in group IV while least increase was notice in group VI. Maximum reduction was seen in group II. Reduction in haematocrit value was due to adverse effect of virus which was also reported by Afanador and Roberts (1994) and Chandrakar *et al.*, (2011). Birds of group IV revealed highest increase in Hb, PCV, and TEC levels. This might be due to the addition of hepatocare and vitaconvital with main symptomatic treatment which counteracted the harmful effect of the virus.

Table.1 Effect of different drug combination on haematological parameters at different days after experimental challenged of infectious bronchitis in chickens (Mean± S.E)

Parameter	Group	Days of observation				
		0	3	6	9	12
Hb (g/l)	1	90.53±0.54	90.66±0.35	90.90±0.20^{d}	91.13±0.24^{c}	91.27±0.24^{d}
	II	90.83±0.72	87.53±0.61	77.23±0.76^{a}	69.06±0.89^{a}	69.13±0.63^{a}
	III	90.73±1.01	86.00±1.22	84.40±0.63^{bc}	85.06±0.75^{bc}	86.46±0.48^{bc}
	IV	91.16±0.84	87.83±0.81	85.86±0.87^{d}	88.13±0.48^{d}	89.93±0.75^{d}
	V	90.46±0.43	86.83±1.08	84.86±0.59^{cd}	86.40±0.81^{cd}	88.08±0.51^{c}
	VI	89.90±1.12	85.50±0.85	82.76±0.99^{b}	84.00±0.86^{b}	85.12±0.65^{b}
PCV (%)	1	33.66±0.33	33.33±0.33^{c}	32.66±0.66^{c}	33.00±0.57^{c}	33.66±0.88^{d}
	II	33.16±0.44	28.83±0.44	26.83±0.16^{a}	22.83±0.44^{a}	23.16±0.60^{a}
	III	32.83±0.16	30.00±0.57	28.16±0.60^{ab}	29.66±0.66^{bc}	30.33±0.88^{bc}
	IV	33.33±0.33	30.66±0.33^{b}	29.33±0.66^{b}	30.83±0.44^{c}	32.00±0.28^{d}
	V	31.66±0.88	29.33±0.33^{a}	28.66±0.83^{ab}	30.33±0.33^{c}	31.50±0.28^{c}
	VI	31.67±0.33	29.50±0.28	27.50±0.76^{ab}	28.16±0.44^{b}	29.66±0.33^{b}
TEC ($X10^{6}$/µl)	1	3.35±0.04	3.35±0.05^{b}	3.34±0.04^{c}	3.32±0.02^{c}	3.38±0.01^{c}
	II	3.25±0.04	3.15±0.03^{b}	2.68±0.05^{a}	2.42±0.09^{a}	2.39±0.09^{a}
	III	3.24±0.04	3.09±0.03^{b}	2.84±0.04^{ab}	2.92±0.06^{b}	3.01±0.04^{b}
	IV	3.29±0.04	3.08±0.01^{b}	2.96±0.07^{b}	3.03±0.05^{b}	3.23±0.03^{c}
	V	3.22±0.04	2.92±0.05^{a}	2.81±0.05^{ab}	2.95±0.07^{b}	3.05±0.04^{b}
	VI	3.19±0.00	2.91±0.04^{a}	2.75±0.05^{a}	2.85±0.03^{b}	2.92±0.03^{b}
TLC ($X10^{3}$/µl)	1	23.79±0.32	23.81±0.21^{b}	23.78±0.47^{d}	23.61±0.47^{c}	23.97±0.47^{c}
	II	23.34±0.80	13.90±0.41	14.12±0.83^{a}	17.98±0.83^{a}	26.93±0.57^{d}
	III	23.54±0.28	13.12±0.11	18.14±0.55^{b}	19.93±0.55^{b}	21.32±0.45^{a}
	IV	23.54±0.28	13.57±0.50	19.75±0.61^{c}	21.32±0.61^{b}	22.46±0.50^{b}
	V	23.10±0.52	13.80±0.72	17.50±0.29^{b}	20.32±0.29^{b}	21.39±0.32^{ab}
	VI	22.16±0.25	12.92±0.57	17.01±0.23^{b}	19.64±0.23^{ab}	21.68±0.29^{ab}
Lymphocyte (%)	1	57.00±0.57	57.33±1.20^{a}	57.66±0.33^{a}	58.00±0.57^{a}	58.00±1.00^{ab}
	II	56.66±0.66	61.00±0.57^{b}	62.33±1.45^{b}	61.66±0.88^{c}	60.33±0.33^{c}
	III	56.33±1.20	60.33±0.33^{ab}	60.33±0.88^{ab}	59.66±0.88^{abc}	58.66±0.66^{abc}
	IV	57.33±0.33	59.66±1.20^{ab}	59.66±0.66^{ab}	57.66±0.33^{a}	56.66±0.3^{a}
	V	57.66±1.20	60.00±1.00^{ab}	60.33±0.88^{ab}	58.66±0.66^{ab}	57.33±0.88^{ab}
	VI	57.33±2.18	59.66±0.88^{ab}	60.66±1.33^{ab}	60.66±0.33^{bc}	59.33±33^{bc}
Heterophils (%)	1	27.33±0.66	27.33±0.88^{b}	28.00±1.15^{b}	29.00±1.52	27.00±0.57
	II	27.67±1.21	27.33±0.33^{b}	25.67±0.66^{bc}	25.66±0.88	27.00±0.57
	III	27.00±0.57	24.67±0.33^{a}	23.66±0.66^{ab}	24.66±0.33	26.33±0.33
	IV	27.33±0.33	24.33±0.33^{a}	25.33±0.88^{ab}	25.66±0.33	26.66±0.33
	V	27.33±0.33	25.33±0.88^{ab}	23.67±0.33^{ab}	25.33±0.88	26.33±0.88
	VI	27.66±0.88	26.33±0.88^{ab}	23.00±0.57^{a}	24.33±0.66	25.67±0.33
Monocyte (%)	1	8.00±057	7.67±0.33^{b}	8.01±0.57^{ab}	7.33±1.20	7.67±0.88
	II	7.32±0366	6.33±0.66	5.67±0.88^{a}	6.34±0.66	6.66±0.88
	III	8.01±0.57	6.66±0.33	7.33±0.66^{ab}	7.32±0.88	8.00±0.57
	IV	7.35±0.33	7.66±1.20	6.33±0.33^{ab}	7.33±0.33	7.66±0.33
	V	8.00±1.15	6.67±0.33	7.33±0.88^{ab}	7.67±0.33	8.33±0.33
	VI	8.34±0.88	6.34±0.33	8.34±0.88^{b}	8.33±0.33	7.67±0.33
Eosinophil + Basophils (%)	1	7.66±1.45	7.67±0.33^{ab}	6.35±1.2	5.67±0.88^{a}	7.31±1.20
	II	8.33±0.33	5.33±0.88^{a}	6.33±0.33	6.01±1.15^{ab}	6.67±1.45
	III	8.66±1.33	8.33±0.33^{b}	8.67±0.88	8.33±0.88^{b}	6.66±088
	IV	8.00±1.00	8.32±1.4^{b}	8.66±0.66	9.34±0.33^{c}	9.00±0.57
	V	7.00±0.01	8.00±0.57^{b}	8.67±0.88	8.31±0.33^{bc}	8.30±0.57
	VI	6.66±2.18	7.66±0.33^{ab}	8.01±0.57	6.66±0.66^{ab}	7.34±0.33

The values having at least one common superscript do not differ significantly ($p<0.05$) in column.

Table.2 Effect of different drug combination on biochemical parameters at different days after Experimental challenged of infectious bronchitis in chickens (Mean± S.E)

Parameter	Group	Days of observation				
		0	3	6	9	12
BUN (mg/dl)	1	0.66±0.08	0.64±0.73^{a}	0.63±0.08^{a}	0.63±0.04^{a}	0.62±0.05^{a}
	II	0.69±0.06	1.33±0.06	1.59±0.04^{c}	**1.75**±0.04^{d}	1.79±0.03^{d}
	III	0.76±0.05	1.36±0.052	1.29±0.01^{b}	1.23±0.01^{bc}	0.93±0.05^{bc}
	IV	0.69±0.11	1.35±0.047	1.26±0.01^{b}	1.15±0.02^{b}	0.75±0.08^{ab}
	V	0.68±0.07	1.33±0.056	1.27±0.02^{b}	1.20±0.01^{bc}	0.84±0.05^{bc}
	VI	0.68±0.05	1.35±0.03	1.31±0.02^{b}	1.27±0.01^{c}	0.98±0.05^{c}
Creatinine (mg/dl)	1	1.33±0.03	1.32±0.04^{b}	1.29±0.03^{a}	1.30±0.02^{a}	1.32±0.03^{a}
	II	1.29±0.06	3.78±0.42	6.87±0.74^{c}	7.35±0.45^{d}	7.44±0.42^{b}
	III	1.34±0.06	3.81±0.49^{b}	3.29±0.39^{b}	2.51±0.34^{c}	1.85±0.28^{a}
	IV	1.32±0.02	3.49±0.23^{b}	2.86±0.22^{b}	2.06±0.16^{bc}	1.36±0.13^{a}
	V	1.28±0.01	3.84±0.08^{b}	3.19±0.14^{b}	2.36±0.11^{c}	1.72±0.16^{a}
	VI	1.38±0.04	3.81±0.43^{b}	3.39±0.45^{b}	2.79±0.422^{c}	2.11±0.35^{a}
Uric acid (mg/dl)	1	1.36±0.06	1.36±0.06^{a}	1.34±0.05^{a}	1.34±0.04^{a}	1.32±0.03^{a}
	II	1.40±0.03	4.00±0.29	6.54±0.55^{c}	6.68±0.50^{c}	7.01±0.32^{d}
	III	1.35±0.03	3.90±0.32	3.39±0.21^{b}	2.70±0.16^{b}	1.98±0.17^{bc}
	IV	1.34±0.03	3.80±0.32	3.21±0.25^{b}	2.32±0.22^{b}	1.38±0.19^{ab}
	V	1.34±0.02	3.61±0.20	3.23±0.13^{b}	2.47±0.121^{b}	1.60±0.09^{abc}
	VI	1.28±0.05	3.87±0.35	3.41±0.26^{b}	2.76±0.22^{b}	2.09±0.21^{c}
AST (IU/l)	1	227.06±5.8	225.07±3.6^{a}	223.18±3.1^{a}	221.04±1.7^{a}	233.32±0.6^{a}
	II	228.20±8.2	249.75±9.3^{b}	273. 43±11.3^{c}	292.78±10.0^{d}	322.32±17.2^{b}
	III	233.61±4.3	251.30±5.0^{b}	249.57±4.5^{b}	247.37±4.5^{bc}	239.03±2.5^{a}
	IV	225.96±7.9	250.20±6.3^{b}	241.57±6.06^{ab}	234.21±4.2^{ab}	227.22±3.1^{a}
	V	239.40±4.5	256.47±2.6^{b}	251.39±3.8^{a}	244.57±3.2^{bc}	237.12±2.4^{a}
	VI	227.25±3.4	251.00±5.4^{b}	259.81±3.6^{bc}	256.67±3.5^{c}	245.52±3.4^{a}
ALT (IU/l)	1	32.25±2.13	33.72±2.39^{a}	33.55±1.87^{a}	34.67±2.15^{a}	33.57±2.06^{a}
	II	41.32±1.09	64.39±1.26^{b}	67.37±1.04^{c}	58.72±1.15^{c}	50.64±0.64^{c}
	III	35.21±3.33	60.95±1.17^{b}	52.99±1.83^{b}	45.82±1.42^{b}	42.60±0.61^{b}
	IV	35.48±2.24	61.17±0.70^{b}	51.49±1.22^{b}	42.60±0.89^{b}	36.33±2.51^{a}
	V	32.54±1.78	63.62±0.88^{b}	52.25±0.89^{b}	45.28±0.90^{b}	37.77±0.94^{a}
	VI	34.81±1.06	63.92±0.52^{b}	55.66±0.92^{b}	47.92±1.10^{b}	43.30±0.67^{c}
ALP (IU/l)	1	185.19±2.2	184.43±2.2^{a}	184.63±2.3^{a}	185.34±2.47^{a}	185.69±2.53^{a}
	II	184.17±2.8	252.13±8.0^{b}	294.18±14.2^{c}	397.10±6.88^{d}	409.86±5.82^{d}
	III	188.95±1.3	262.03±1.3^{b}	256.34±1.23^{b}	242.44±4.09^{b}	226.24±3.22^{c}
	IV	185.84±1.7	255.90±2.9^{b}	249.73±2.28^{b}	229.98±1.06^{b}	208.72±3.46^{b}
	V	186.18±0.8	259.46±0.7^{b}	253.19±0.64^{b}	235.95±2.27^{b}	225.01±2.11^{c}
	VI	189.78±2.4	263.76±5.4^{b}	262.28±4.53^{b}	259.33±8.76^{c}	237.45±8.23^{c}

The values having at least one common superscript do not differ significantly ($p<0.05$) in column.

The details of experimental protocol

Group	Details of experimental protocol
I	Healthy control
II	Infected control- not treated with any medicine.
III	Treated with V-cofex[1]@ 1 ml/l of drinking water, Goutcare[2] @ 5 ml/100 chicks. All these drugs were given once daily for 5 days.
IV	Treated with Kufcure plus[2] @ 5 ml/100 chicks, Vitaconvital[1]@ 2 ml/100 chicks once in day for 5 days, Heptocare[1]@ 5 ml/100 chicks, Streescare[1]@ 1 gm/l of drinking water and Gout care[2] @ 5 ml/100 chicks. All these drugs were given once daily for 5 days.
V	Treated with Imon[3] @ 10 ml/1000 chicks, CRDX-IR[1]-10 ml/1000 chicks, and Goutcare[2]@ 5 ml/100. The treatment is given once in a day for 5 days.
VI	Treated with Mycosol[4], Imon[3] @ 10 ml/1000 chicks, CRDX-IR[1]-10 ml/1000 chicks, and Goutcare[2]@ 5 ml/100. The treatment is given once in a day for 5 days.

1. Varsha multitech, Bangalore, 2. Indocon Pharmaceuticals, Karnal Haryana, 3. Nutribio- solution (P) Ltd. Thane, 4. Golden Streak, Hyderabad

Total leukocyte count (TLC) value was significantly reduced on 3rd days post infection and significantly increase in TLC value from 6th day onwards in all treated groups. In group II, there was significant increase in TLC value till 12th day post infection leading to leukocytosis. In all treatment groups initially there was fall in TLC level than after following the treatment TLC value were increased goes towards normal but not leukocytosis. A similar finding was observed by Hofstad (1984). In all treatment groups firstly there was increase in lymphocyte count then following the treatment, lymphocyte count was decreased and goes towards normal. There were non-significant change in hetrophils and monocytes count from 6th day among all the groups. There was significant rise in BUN and Creatinine level in group II as compared to treated groups due to nephropathy nature of IB virus. Maximum reduction was noticed in group IV, treated with Kufcure plus, Gout cure, Vitaconvital, Heptocare and stress care on 12th day post treatment. Serum uric acid was increased on 3rd day post infection in all infected group as compared to healthy control group. Highest increase was seen in group II and highest decrease was recorded in group IV on 12th day post infection. As the infectious bronchitis virus is nephropathogenic in nature, it damages the renal system.

Due to damage of the kidney, renal functions get altered so the level of BUN, serum creatinine and serum uric acid were increased in blood. Similar findings also reported by Afanador and Roberts (1994) and Chang (1999). It might be due to the effect of ingredient of Gout care as it is nephroprotectant. The lipotropic agents, liver stimulant, antioxidant, toxic binders in hepatocare and herbal extracts of Goutcare might have improve renal efficiency, stimulated nephritic tissue, rejuvenated the damaged cells and helped in normal functioning of kidneys. Diuretic in it might have helped in flushing. So the group treated with liver protectants and kidney repairing agents was able to maintain normal functioning of the body. Boerick (2007) and Chandrashekhar *et al.,* (2011) also reported similar effect of heptocare and goutcare. In all treatment groups initially there was rise in AST, ALT and ALP level following treatment, these enzymatic level was decreased reaching towards normal range. Plasma enzymatic changes recorded in this study indicated significant increase in ALT, AST and ALP levels in infected control birds during the course of disease whereas treated groups revealed significant decrease in the level of these enzymes. Similar findings also reported by Chandrakar *et al.,* (2011). It has been well documented that AST, ALT and ALP are found in liver and ALP was also found in kidney (Kaneko, 1997). So increase in these enzyme levels is an indicator of liver and kidney impairments. Birds of group IV group returned to normal very quickly as compared to other treatment groups. In group VI, as the antibiotic given in early phase of disease, so it had taken more time to return to normal condition (Table 2).

In conclusion, all the drugs combinations were effective to control the infectious bronchitis in cockerels but the birds treated with Kufcure plus, Gout care, Vitaconvital, Heptocare and stress care showed better effect as compared to other combination. Kufcure plus improve the functioning of respiratory system by reducing the inflammation, dilate all the respiratory passage and control all types of cough. Goutcare improves the renal efficiency. It stimulates nephritic tissues, rejuvenates damage cells and help in normal functioning of kidneys. It acts like a diuretics and helps in flushing. Stress care helps in reducing the heat stress, regulates proper metabolism and stimulates proper growth of

birds. Vitaconvital is multivitamin which stimulates various body functions thus improves proper growth of birds. Heptocare helps in detoxification, increase appetite, and improves the hepatic efficiency and support the growth of body. Birds of this group gaves best results in terms of low mortality and reduced severity of disease. Clinico-biochemical alterations in this group were mildest and birds quickly returned to normal. This study indicates that although infectious bronchitis is highly contagious disease, very difficult to prevent and control, but following the effective supportive and symptomatic treatment, we can minimize the economic losses due to this disease under field conditions.

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