Prevalence and sustainable control of *Balantidium coli* infection in pigs of Ranchi, Jahrkahnd, India

R K Bauri*[1], Rajeev Ranjan[2], A R Deb[1] and R Ranjan[3]

1. Department of Veterinary Parasitology, 2. Project Directorate on Foot and Mouth Disease, IVRI Campus, Mukteswar - 263138, Naninital, Uttarakhand. 3. Department of Animal Nutrition, Ranchi Veterinary College, B A University, Ranchi-834006, Jharkhand.
*Corresponding author email- drrkbauri@gmail.com
Received: 11-08-2011, Accepted: 13-09-2011, Published Online: 01-12-2011
doi: 10.5455/vetworld.2012.94-99

Abstract

Pigs had a higher degree of gastrointestinal protozoa infection 93 out of 100 faecal samples. *Balantidium coli* infected pigs were controlled effectively by oxytetracycline (100% on 3rd day of observation) and Metronidazole +Furazolidone combination (100% on 5th day of observation). Initially *B. coli* infected pigs had decreased haemoglobin, pack cell volume and total erythrocyte count values, but these pigs returned towards normal ranges after 7th day of observation. The differential leukocyte count values of *B. coli* infected pigs showed decreased values of neutrophils, and lymphocytes, and increased eosinophils values come towards normal range on 7th day of observation. The average body weight gain in oxytetracycline and metronidazole + furazolidone combination treated Tampworth & Desi piglets showed higher viz.35.25 ± 1.64 kg and 28.08 ± 1.75 kg of body weight respectively than untreated infected control piglets (15.75 ± 2.39). The average body weight gain in Oxytetracycline and metronidazole + furazolidone combination treated desi piglets were higher body weight viz. 36.67±1.07 kg and 32.50±0.96 kg respectively than untreated infected control piglets (22.00±0.88 kg). In both the treatment group, the group treated with Oxytetracycline had significantly higher body weight gain 35.25 ± 1.64 kg and 36.67±1.07 kg in both T & D and desi piglets respectively than metronidazole +furazolidone combination treated T & D and desi piglets (28.08 ± 1.75 kg, 32.50±0.96 kg respectively). The observation on different hematological parameters during *B. coli* infection and their treatment indicated that the harm caused by *B. coli* in pigs could be reduced to a greater extent by suitable therapeutic management. Application of suitable control packages were found to be very encouraging for maintaining optimum health and economical pig production. Oxytetracycline drugs showed higher efficacy than metronidazole + furazolidone combination and it show significantly higher growth in body weight in both T& D and desi piglets.
Key words: Pig, *B. coli*, prevalence, control, Oxytetracycline.

To cite this article :
Bauri RK, Ranjan R, Deb AR and Ranjan R (2012) :Prevalence and sustainable control of *Balantidium coli* infection in pigs of Ranchi, Jahrkahnd, India, *Vet. World* 5 (2): 94-99, doi: 10.5455/vetworld.2012.94-99

Introduction

The common zoonotic gastrointestinal protozoa are *Giardia* spp, *Entamoeba* spp, *Toxoplasma* spp., *Sarcocystis* spp, *Balantidium* spp and *Cryptosporidium* spp which are usually communicable to man and animal and vice-versa. The various domesticated animal suffer from zoonotic disease which are easily transmitted to man (Takanomeron, 1971). These protozoa are highly prevalent in rural and urban population of tropical and subtropical countries (Grewal, 1968 and Rao *et al*, 1975).

The infection is very frequent in swine, prevalence rate 60-90% have been reported in animals in single herd. In man, it is most often found in individuals who were in contact with swine and those exposed to poor environmental hygienic condition. Disease of *B. coli* in man usually affects the mucosa of the large intestine, but it can also invade the liver and the lungs, though it rarely happens (Vidan *et al*.1985; Ladas *et al*., 1989). Keeping in view the above facts, the present was done to know the prevalence and sustain the control of *B. coli* infection in pigs.

Materials and methods

Prevalence of *B. coli* infection in pigs: The

Table-1. Drugs administration schedule against *B. coli* infection in T&D and Desi pigs

Groups	Number of animals	Drugs trial	Day of treatment	Period of observation (days)
Infected and treated	6	Metronidazole 20mg/kg body wt. + Furazolidone 10 mg/kg body wt.(Fazole®) orally daily for 4 consecutive days	4 days	'O' day,3rd day,5th day,7th day,9th day,11th day,15th day then weekly interval up to 90th day.
-do-	-do-	Oxytetracycline @ 10 mg/kg b. wt. orally daily for 4 consecutive days	-do-	-do-
Infected control	-do-	Untreated group (control)	------	-do-
Healthy control	-do-	-do-	------	-do-

prevalence of *Balantidium coli* in pigs estimated by the faecal samples (100) taken directly from the rectum from Institute's farm and field. The individual faecal sample collected in plastic container with tight lid or closed plastic bags were brought to the laboratory for examination. Each faecal sample was examined by direct and indirect method described by Soulsby (1982). Prevalence *B. coli* were identified on the basis of cysts and trophozoites morphological features (Soulsby, 1982; Chatterjee, 1996).

Therapeutic management of B. coli infecting T&D (Cross breed of Tamworth and Desi pigs) and desi pigs: For the control of *B. coli* in pigs, 18 naturally infected T& D and 18 desi piglets of almost similar age groups were selected and maintained at piggery unit, Ranchi Veterinary College on normal balanced feeds *ad libitum*. The animals were divided into three groups having six animals each. 1st group was treated with Metronidazole @ 20mg/kg body wt. + Furazolidone @ 10mg/kg b. wt. orally for 4 consecutive days, 2nd group was treated with Oxytetracycline@ 10 mg/kg b. wt orally for 4 consecutive days and 3rd group remained infected with *B.coli* (control). Another healthy group was taken for comparison with these groups and it was kept in 4th group which was uninfected and untreated. Any other erroneous infections were therapeutically managed. The detail therapeutic trials in T & D breed and desi pig were carried out as per the experimental schedules mentioned in the table 1. Observations of treatment were recorded as per the schedule follow:

i) Pre and post treatment Cyst per gram (CPG) twice weekly up to 15th day post treatment (DPT) and, then, fortnightly up to 90 days.
ii) Haematological observations (Hb, PCV, TEC and DLC) on 0 day before treatment and then weekly intervals up to 30 days.
iii) Growth rate at fortnightly interval.

Estimation of cyst per gram (CPG): The CPG of each animal infected with *B. coli* was estimated before and after treatment, twice weekly upto 15th day and, then, fortnightly upto the end of experiment as per Stoll dilution method (1930). The percent efficacies of the drugs were calculated by the formula:

Percent Efficacy = Pre treatments mean CPG - Post treatments mean CPG / Pre treatments mean CPG X 100.

Haematological observations: For assessing different hematological parameters, the blood was collected from anterior vena-cava in small sterile vial having anticoagulant EDTA @ 1-2 mg/ml of blood. The hematological parameter Viz. Hemoglobin (g%), Packed cell volume (%),were examined with the help of automated hematological analyzer (Transasia, Japan), Total Erythrocytes Count (mm^3) method described by Schalm *et. al.* (1975) as well as by using automated cell counter (Transasia, Japan), Differential Leucocytes Count (DLC) method described by Schalm *et. al.* (1975).

Growth rate**:** The growth rate in piglets during infection and simultaneous treatment in different groups were recorded fortnightly upto 90 days. For taking the gross live weight, the pigs hind legs were tied with the help of a nylon rope by attaching the body on the brisket and belly position and, then, hanged to a spring balance already fitted in

Table-2. Average body weight gain (kg) in growing T & D piglets during B. coli infection in different treatment groups

Observation period	Group-I	Group-II	Group-III	Group-IV	C.D.Value
0 day	7.83 ± 1.04	7.83 ± 0.57	7.83 ± 0.33	7.83 ± 0.40	2.09
15th day	10.42 ± 0.85 [a]	10.58 ± 0.75 [a]	10.50 ± 0.41 [a]	8.42 ± 0.40 [b]	2.00
30th day	13.83 ± 1.32 [a]	14.25 ± 0.76 [a]	13.17 ± 0.35 [a]	10.17 ± 0.56 [b]	2.66
45th day	17.58 ± 1.74 [a]	19.33 ± 1.15 [a]	16.08 ±0.84 [a]	11.08 ± 0.75 [b]	3.83
60th day	20.83 ± 2.10 [a]	26.33 ± 1.33 [b]	20.75 ± 0.97 [a]	12.00 ± 0.98 [c]	4.59
75th day	25.25 ± 1.79 [a]	30.17 ± 1.40 [b]	24.67 ± 0.64 [a]	13.67 ± 1.46 [c]	4.49
90th day	28.08 ± 1.75 [a]	35.25 ± 1.64 [b]	27.00 ± 0.18 [a]	15.75 ± 2.39 [c]	5.62

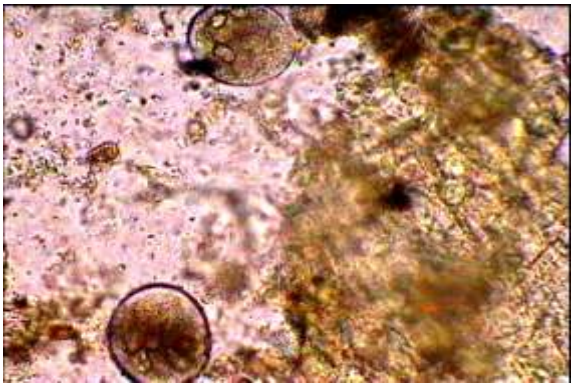
Group-I Fazole treated, Group-II Oxytetracycline treated, Group-III Healthy control, Group-IV Infected control
Figures having same superscripts did not differ significantly (P< 0.05)

the ceiling of the animals shed (Kumari, 2001).

Statistical analysis of the data collected during the study of different parameters was done by using standard formulae and methods described by Snedecor and Cochran (1994).

Results and Discussion

Prevalence of B. coli infection in pigs**:** Over all prevalence of *Balantidium coli* infection in pig both T & D breed as well as desi pigs were found 93% (Chakraborthy *et al.,* 2001, Heitman *et al.* 2002, Senler *et al.* 2003 Sturdee, 2003) by examining 100 faecal samples from T & D breed as well as desi pig. T & D breed of pig showed less prevalence while desi pigs showed high prevalence of incidence of *B.* coli. This desi pigs showed higher degree of gastrointestinal protozoal infection mainly *B. coli* because of poor managemental conditions adopted in most of the organized and non organized farm.



Control of *B. coli* infection in pigs**:** The growing piglets having naturally acquired *B. coli* infection were selected for their control so that considerable economic losses could be minimized to some extent. The therapeutic efficacies of Metronidazole + Furazolidone (Fazole®) and Oxytetracycline against naturally *B. coli* infected T&D and desi piglets were assessed. The first group which comprised of T & D and desi growing piglets having natural *B. coli* infection was treated with Metronidazole + Furazolidone (Fazole®) and 2nd group of infected piglets treated with Oxytetracycline. Animals of both the treated groups were completely free from parasites on 5th day of treatment and 3rd day of treatment respectively. The results indicated that both the drugs were found to be highly effective against *B. coli* infection. If the results of *B. coli* treatment of pigs were compared with the earlier findings, it was evident that the present investigation was in general agreement with the reports of Patnaik *et al* ,1965; Mwamba *et al.*, 1977; Palanivel, 2005 and Sengar *et al.*, 2006. The perusal of literature indicated that only limited references were available for the control of *B. coli* in pigs. Hence, there is a need to carry out similar trials of control of *B. coli* on large population of pigs of different age group under different farm condition for confirming the results of the present study. All the growing piglets of both the treated groups were examined time to time at regular interval after first treatment and the natural re-infections acquired on 30th days were treated with respective drugs to control the infection as per the schedule showed in table 1.

Haematological observation during B. coli infection and their treatment: Haematological profiles of growing desi and T & D piglets during *B. coli* infection and their treatment was carried

Table-3. Analysis of variance of Average body weight gain in growing T & D piglets during B. coli infection in different treatment groups

Observation period	Mean square		F Value
	Between groups d.f.(3)	Error d.f.(20)	
0 day	00	3.02	NS
15th day	6.54	2.76	2.37*
30th day	20.45	4.89	4.18*
45th day	75.59	10.10	4.49**
60th day	210.73	14.53	14.51**
75th day	291.09	13.87	20.99**
90th day	389.76	21.75	17.92**

Table-4. Average body weight gain (kg) in growing desi piglets during B. coli infection in different treatment groups

Observation period	Group-I	Group-II	Group-III	Group-IV	C.D.Value
0 day	11.42 ± 1.66 [a]	11.42±1.61 [a]	11.42±0.93 [a]	11.42±1.22 [a]	4.48
15th day	16.17±1.28 [a]	16.33±0.96 [a]	16.25±0.33 [a]	12.92±1.06 [b]	3.14
30th day	18.50±1.10 [a]	20.83±0.98 [a]	18.17±0.28 [a]	14.17±0.98 [b]	2.89
45th day	21.67±1.12 [a]	25.33±1.15 [b]	21.58±0.66 [a]	16.25±1.06 [c]	3.28
60th day	25.33±1.22 [a]	29.33±1.15 [b]	25.00±0.94	18.17±1.07 [c]	3.55
75th day	29.00±0.85 [a]	32.67±1.10 [b]	28.92±0.85 [a]	20.33±0.76 [c]	2.90
90th day	32.50±0.96 [a]	36.67±1.07 [b]	31.71±0.80 [a]	22.00±0.88 [c]	3.02

out to monitor the health status of infected and treated animals. The observation on hematological parameters also indicated that *B. coli* may cause significant decrease in the values of Hb, PCV, and TEC value. *B. coli* potentially to invade tissue, it penetrates the mucosa with cellular infiltration in the area of the developing ulcers. Abscess formation may extend up to muscular layer also (Garcia, 2001). Penetration of *B. coli* cause damage of mucosal cells leading to cause balantidial dysentery but it occurs in severe cases. But in chronic cases it may cause reduction of Hb, PCV and TEC value. After treatment these values were found to return almost the normal ranges this might have been taken place due to elimination of the G.I. parasites by the drugs. The marked reduction in Hb, PCV and TEC value in *B. coli* infection in pigs were also suppose to have occurred due to the suppressive effect of toxic substances secreted or excreted by *B. coli*.

The presents findings also indicated that eosinophils cell are increased and other cell are decreased before treatment which was found to return almost towards the normal ranges on different days of post treatment observations. Eosinophils are thought to be function mainly defense against certain types of infectious agent. Eosinophils express receptor for a class of antibody called IgE and are able to bind avidity to IgE coated particles. They are particularly effective at destroying infectious agents that stimulate the production of IgE, such as helminths parasites. In fact, helminths may relatively resistant to the lysosomal enzyme of neutrophils and macrophages, but are often killed by the specialized granule protein of eosinophils. Eosinophils are also abundant at the site of immediate hypersensitivity (allergic reaction). The growth and differentiation of eosinophils are stimulated by a helper T cell derived cytokine called IL5 and T-cell activation contributes to eosinophils accumulation at sites of parasitic infection and allergic reaction (Abbas *et al*,1998).

Since, there was lack of literature mentioning the reasons for variation in hematological parameters during *B. coli* infections and their treatment with chemical drugs in pigs. However, the effects of G.I. parasitism and therapeutic management on the hematological parameters were studied and reported by Das and Prasad (2004) in goats the possible reason for the reduction in hematological constituents might due to blood loss caused by the parasites and at the same time toxic substances released by the

Table-5. Analysis of variance of Average body weight gain in growing desi piglets during B. coli infection in different treatment groups

Observation period	Mean square		F Value
	Between groups d.f.(3)	Error d.f.(20)	
0 day	0.00	13.87	0.00^{NS}
15th day	16.69	6.81	2.45*
30th day	45.94	5.78	7.96**
45th day	83.90	7.44	11.28**
60th day	128.82	8.70	14.81**
75th day	164.20	5.79	28.34**
90th day	231.09	6.28	36.79**

parasites would have caused the suppressive effects on haemopoesis as these parameters were observed to have returned at about normal ranges when the parasites effects were removed by the treatment with suitable drugs.

Body Weight gain in growing piglets**:** For assessing, the economic impact of *B.coli* infection and their control in pigs. The gross weight (kg) gain in growing piglets during *B. coli* infection and their treatment were estimated by recording the b. wt. gain in growing T & D and desi piglets for about a period of 90 days (table 2, 3, 4 and 5). The total gross weight gain by Metronidazole + Furazolidone treated group and Oxytetracycline treated T & D pigs were 168.5 kg and 211.5 kg respectively while it was162 kg in healthy group. The total gross weight gain by Metronidazole + Furazolidone treated group and Oxytetracycline treated desi pigs were 195kg and 220 kg respectively while it was 119.3 kg in healthy group.

The present findings indicated that growth of Tetracycline treated group animals was more in respect to Metronidazole + Furazolidone treated group. More growth rates in Oxytetracycline therapy was not clearly known but it may be due to broad spectrum activity of Oxytetracycline which checks the other microbes present in gastrointestinal tract resulting into increased feed intake, feed utilization and increased absorption of nutrients. (Horvath *et al*, 1954; Castillo *et al*., 2003; Michalova *et al*., 2004).

Acknowledgement

The authors are grateful to the Dean, Ranchi Veterinary College and the Vice-Chancellor of BAU, Ranchi for necessary facilities and funds.

Conflict of interest

Authors declare that they have no conflict of interest

References

1. Abbas, A.K., Lichtman, A.K., and Pober, J.S. (1998).Celluler and moleculer technology.3rd edition.pp-27.
2. Castillo, J.D. (2003). Short-term effects of in-feed supplementation of tetracyclines for disease control on feed intake pattern and growth in weaned pigs. Livestock Production Science , 76 (1 - 2) : 115.
3. Chakraborty, A. and Goswami, P.K. (2001). Parasites of non human primates of Assam State zoo. *J. Vet. Parasitol*., 15 (2): 121-124.
4. Chatterjee, K.D. (1996). Parasitology in relation to clinical medicine,Twelth edn.,Kolkata
5. Das, M. and Prasad, K.D.(2004). Haematolpgical observation in G.I. nematode infected and anthelmintic treated goats. *J. Res, BAU*.16 (2): 329-331.
6. Garcia ,L.S.(2001). *Diagnostic of medical parasitology.4th ed.pp-55.*
7. Grewal, M.S. (1968). J. *Ass.Physns. India*,16 : 319-314.
8. Heitman, T.L., Frederick, L.M., Viste, J.R., Guselle, N.J., Morgan, U.M., Thompson, R.C.A. and. Olson ,M.E. (2002). Prevalence of *Giardia* and *Cryptosporidium* and characterization of *Cryptosporidium* spp. isolated from wildlife, human, and agricultural sources in the North Saskatchewan River Basin in Alberta, Canada. *Can. J. Microbiol*. 48(6): 530-541.
9. Horvath, D. J. and Noot,G. W. V.(1954). Effect of Three Levels of a New Antibiotic, Tetracycline, in a Swine Ration. *J. Anim Sci.* 13 : 899-903.
10. Kumari, S.(2001).Studies on the incidence and

therapeutic control of gastrointestinal parasites and their impact on the economics of pig production. M.V.Sc. Thesis.B.A.U.,Ranchi. India pp.1-79.
11. Ladas, S.D., S. Savva, A. Frydas, A. Kaloviduris, J. Hatzioannou, S. Raptis (1989). Invasive balantidiasis presented as chronic colitis and lung involvement.Dig Dis Sci 34 ; 1621-1623.
12. Michalova, E., Novotna, P. and Schlegelova, J. (2004). Tetracyclines in veterinary medicine and bacterial resistance to them. *Vet. Med. – Czech,* 49 (3) : 79–100.
13. Mwamba T, Pandey VS (1977). Effect of Terramycin in balantidiosis of pigs. *Ann. Rech. Vet.*; 8 (2): 167-169.
14. Palanivel, K.M.,Thangathurai, R. and Nedunchellian, S. (2005). Epizootology of *B. coli* infection in ruminants. *Indian Vet.* J., 82: 682-683.
15. Patnaik,K.B.(1965)(1965).Clinical symptoms and treatment of balantidial infection in cattle and buffaloes. *Indian Vet.J.* 42 : 624-632
16. Rao, C. K., Biswas, H.and Gupta, S. R. (1975) *J. Com. Dis*.,7 : 1-14.
17. Schalm, O. W.;Jain, N. C. and Carrol, F. J. (1975). Veterinary haematology,3rd Edn.Lea and Febiger,Philadelphia,pp.1-778.
18. Sengar.Y.S. and Singh,V.,(2006).Comperative therapeutic efficacy of Tetracycline HCl and Metronidazole plus Furazolidone against *B.coli* infection in buffalo calves. *J. Vet. parasitol.*,20 (1) : 89-91.
19. Senlar, N.G. Gul, A. and Deger, S. (2003). Prevalence of endoparasites in dogs and their importance on human health in and around VAN.*Indian Vet.J.*,80 : 832-833.
20. Snedecor, G. W. and Cochran, W.G. (1994).Statistical methods, 7th edn. Oxford and IBH Publishuing Co., New Delhi.
21. Soulsby, E. J. L. (1982) Helminths, Arthropods and Protozoa of Domesticated Animals.7th edn. (ELBS) Bailiere Toindal , London,p.809.
22. Stoll, N. R. (1930).Investigation on the control of hookworm disease. An effective method of counting hook worm eggs in the faeces. *Am.J.Hyg*., 3 : 59-60.
23. Sturdee, A.P., Bodley-Tickell. A.T., Archer A. and Chalmers, R.M. (2003). Long-term study of *Cryptosporidium* prevalence on a lowland farm in the United Kingdom..*Vet.Parasitol*, 116(2): 97-113.
24. Takano-meron,J.(1971).Giardiasis.In; Pathology of protozoal and helmintic diseases, (R.A. Marcial.Rajas ,ed.) pp.115-123 Williams and Wilkines Baltimore Maryland.
25. Vidan, J. R.,A. Frauca, B. Martiinez, F. Borda (1985).Parasitosis hepatica por *Balantidium coli.Med Clin* (Barc) 85 : 299-300.

* * * * * * * *