**Scholars Academic Journal of Biosciences (SAJB)** **ISSN 2321-6883 (Online)**
**Sch. Acad. J. Biosci., 2014; 2(6): 393-397** **ISSN 2347-9515 (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublisher.com

## Case Report

# Lung infection and severe anemia secondary to Balantidiasis in *hamadryas baboons*: A case report

**O. AL-Tayib**
Eng. A.B. Research Chair for Growth Factors and Bone Regeneration, College of Dentistry, King Saud University, Saudi Arabia.

***Corresponding author**
Omar A. Al-Tayib
**Email:** altayibomar@gmail.com

**Abstract:** Within the last decades *hamadryas baboons* have been extensively used as experimental models for a different type of studies in the biomedical research centers. *Balantidium coli* a protozoan parasite is commonly infects human and animals such as primates worldwide. Whoever, investigating zoonotic diseases and common infections of these non-human primates to man has a medical significance. This protozoa is usually occurs in the intestinal and it is well known cause of intestinal infection and dysentery in primates. Whoever, a case of balantidiasis complicated by severe pulmonary infection and resulting in iron deficiency anemia has not, to our knowledge, been described previously in baboons in the literature. We present a case of lung involvement and iron deficiency in baboons from Saudi Arabia. This case underlines that *Balantidium coli* should also be considered as a possible cause of extra-intestinal disorders and considered as part of the differential diagnosis of respiratory disorders in baboons in addition to the dysenteric form.
**Keywords:** *Balantidium coli*; *Hamadryas baboon*; extra-intestinal; lung; Saudi Arabia

## INTRODUCTION

Within the last decades baboons had been used worldwide as animal models in biomedical studies in captive non-human primates (NHPs) colonies. Whoever, many of zoonotic diseases commonly infect primates are communicable to humans, and the risk of transmission of these pathogens is greater than with any other group of laboratory animals, because of the close phylogenetic relationship in between [1]. *Balantidium coli* (*B.coli*), is one of the ciliated protozoan parasites of the family of *Balantidiida*, that is commonly infects humans, NHPs, equines, cattle, swine, dogs, rats and pigs, and has a world-wide distribution [2-3]. Pigs act as carriers and are not often adversely affected by this organism and people in contact with pigs were more likely to be infected [4]. Whoever, in Muslim countries such as Saudi Arabia where domestic pigs are absent due to religious reasons, it seems that the fecal contamination of food and water sources with other animals feces such as baboons, wild boars, camels and/or human-to-human transmission are mainly involved and playing a big rule in the sporadic transmission of this parasitic protozoan disease [5-6-7]. The natural habitat of *B. coli* is the large intestine, it is usually involves the colon of the patients. However, it is a well known cause of intestinal infection and dysentery and causes a variable clinic pictures, including abdominal pain, nausea, losing weight and bloody diarrhea [8]. The treatment of balantidiasis in animals is controlled effectively by using oxytetracycline antibiotic agents with higher efficacy [9]. Nevertheless, zoonotic infections in laboratory baboons as an experimental model have rarely been founding in the *literature* data from Saudi Arabia. In additions, extra-intestinal infections and cases of lung involvement from *B. coli* infections in experimental baboons have rarely been reported. Our study in this paper to our knowledge is the first reported case of respiratory out come and severe iron deficiency secondary to balantidiasis in baboon from Saudi Arabia. Whoever, parasitic infections may be worth considering in patients with cavitary lung involvement who have contact with the baboons' colony.

## CASE REPORT

The first case was a *hamadryas baboon* 4-year-old (5.2 kg. body weight) male baboon, was examined for intermittent diarrhea, and abdominal pains. The clinical history revealed that the baboon had a severe watery diarrhea and anorexia that had developed during the previous four days. Supportive therapy was initiated and Amoxicillin (Betamox®) intramuscular injection was used for two days without improvement of the condition. Whoever, abdominal pains, fever, vomiting and more than five liquid stools per day were still present. When baboons in the colony are observed with watery diarrhea, routine management includes antibiotics and/or anti-worms were given;

when there are additional clinical signs of ill-health, considered a possible pathogen in animals with diarrhea a stool examination is recommended. Diarrhea in this baboon was associated with losing of appetite and lethargy. Thereafter, bloody mucous diarrhea was observed. During the physical examination, this baboon was febrile, and had signs of dehydration. Previous health checks, which include blood sampling (~5 ml) for laboratory examinations. In additions, fresh samples of feces had been taken and stored in universal 30ml labeled vials with at least 5g of fecal matter. Samples were stored in 10% formalin until available for laboratory processing. Transport time to the laboratory was 30- 45 min. Laboratory examination of the fecal samples revealed numerous mobile ciliated trophozoites around 50µm long and 35µm broad. These bodies were diagnosed as *Balantidium coli* trophozoites (Fig. 1). Treatment was commenced with intramuscular amoxicillin (Betamox®50mg/2times/daily) and oral metronidazole. The animal's clinical condition appeared to stabilize, but did not improve. However, two days later rapid death occurred and thus post-mortem examination of this animal was performed.

The second case was another *hamadryas baboon*- male (5 years old), this animal had been used experimentally for dental implant surgery procedures and it had also previously been in a good health. The occurrence of severe diarrhea was also associated with loss of appetite, fever and bloody diarrhea. On a routine fecal examination a plenty trophozoites of *B. coli* had been isolated as well. Therapy was instituted with combinations of subcutaneous injection of oxytetracycline and metronidazole (Flagyl®) twice daily/7 days. A 5-day treatment period was associated with a decrease in diarrhea, but the animals' general condition did not improve despite dietary vitamin and fluid supplements. In view of this failure to recover the baboon subsequently underwent euthanasia. Post-mortem examination of case 1 and 2 were selected and all results and other ante-mortem findings were shown in Figure 2.

In case 3; a *hamadryas baboon* 4 years-old female was examined for intermittent bloody diarrhea and abdominal pains. The clinical history revealed that the baboon had a severe watery diarrhea and anorexia that had developed during the previous four days. Thereafter, bloody mucous diarrhea was observed. During the physical examination, this baboon was febrile, and had signs of dehydration. Fresh samples of feces had been taken and stored in universal 30ml labeled vials with at least 5g of fecal matter. Samples were stored in 10% formalin until available for laboratory processing. Laboratory examination of the fecal samples revealed numerous mobile ciliated trophozoites around 50µm long and 35µm broad as well, which identified as *B. coli* trophozoite. Supportive therapy was initiated and a short course of subcutaneous injection of enrofloxacine (Baytril®) and metronidazole twice daily/7 days had been given to this baboon to eradicate the infection. On the following day, a 5-day treatment period was associated with a decrease in diarrhea, whoever, a complete resolution was observed after SC rehydration and one week of treatment with this combination. Also, all the other clinical symptoms disappeared and a fresh fecal sample taken later from the baboon was negative for the intestinal parasites.

These baboons in laboratory tests showed a biologic alterations and showed anemia, dehydration with severe hypoalbuminemia and hyponatremia. The serum outcomes from blood samples of these baboons are shown in Table 1.

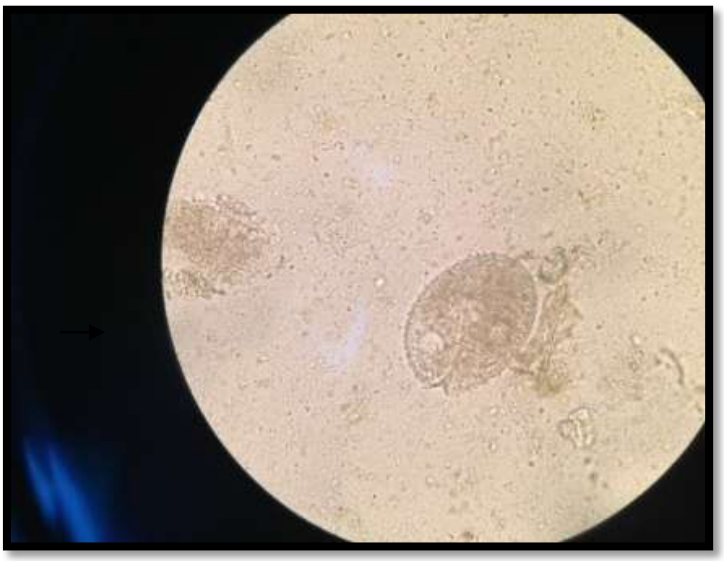

**Fig. 1***: Balantidium coli* (*B. coli*) the ciliated trophozoite in stool samples detected by microscopically examination (black arrow).


**Fig. 2:** Two of the three experimental baboons infected by *B. coli*, after anesthetized with receiving an over dose of ketamine and xylazine**.** (**A**, **B**) A large part of the right upper lobe of the lung of 1st baboon was necrotic and infected producing an abscess; the reminder of the lobe was affected pneumonia. The responsible organisms were *B. coli* trophozoites. (**C**, **D**) lungs of the 2nd baboons showed pulmonary hemorrhagic, inflammatory mass in the lung was thought to be likely secondary to colonic balantidiasis.

**Table 1: Changes of blood hematological and biochemical indices of *Hamadryas baboons* during *Balantidium coli* (*B. coli)* infection.**

| NO. | Parameters[2] | *B1 | **B2 | ***B3 |
|---|---|---|---|---|
| **1** | **PCV** | 22 | 23 | 27 |
| **2** | **Hb** | 5 | 4 | 5 |
| **1** | **Iron(u/l)** | 4 | 6 | 4 |
| **2** | **ALB (g/dl)** | 21 | 18 | 16 |
| **3** | **AST (u/l)** | 138 | 142 | 129 |
| **4** | **ALT (u/l)** | 69 | 77 | 67 |
| **5** | **Na (mm/l)** | 128 | 123 | 114 |

[2] **PCV**, packed cell volume; **Hb**, haemoglobin; **ALB**, albumin;
**AST**, aspartate aminotransferase; **ALT**, alanine aminotransferase;
* Baboon no.1; *Baboon no. 2; Baboon no.

**DISCUSSION**

Due to the medical and economic impact of this protozoon on public health issue, *B. coli* have been known for more than a century as zoonotic agents of human [10]. This protozoan parasite is usually associated with intestinal, and infects the caecum and colon of the patients causing diarrhea, and other gastrointestinal Symptoms, the disease caused by *B. coli* infection is called balantidiasis, and the transmission is direct/indirect and commonly occurs through contaminated water and/or food [11]. Whoever, in invasive cases, this protozoan parasite can invades the mucosa of the colon and extra-intestinal infections can occur, producing a local generalized peritonitis with perforations [12]. Balantidiasis involving extra-intestinal organs and causing clinical signs has rarely been reported. Whoever, in human medicine there have been several reports in the literature among the possible pathways of *B. coli* infection spreading from the site of colonic ulceration to the lungs, causing a pulmonary disease, when balantidia perforation the colon of the

patient and spread through the peritoneal cavity via circulatory or lymphatic systems to lung [13]. Furthermore, *B. coli* may across the diaphragm and stabilized of the nasopharynx. Whoever, lung infections with *B. coli* had been reported in patients with an association with pigs or pig manure, resulting from aspiration of fluid from the oral cavity [14]. In addition to that, several studies had been reported that, this organism will perforate the large intestine and affect the lungs with immunocompromised patients, however, these dividuals appear to be less resistant to balantidiasis [15-8]; or probably pulmonary infection may follow inhalation or ingestion of the manure [13-16]. Moreover, *B. coli* can also involve the urinary system through the blood stream and caused an inflammatory reaction in the urine. Whoever, urinary balantidiasis had been reported from old woman from Iran cystitis associated with *B. coli* trophozoites in bladder mucosa. Furthermore, two different studies reported that *B. coli* trophozoites were repeatedly found in the urine sediment [17-18]. Although, genitourinary sites of infection in humans, including uterine infection, vaginitis, and cystitis, are thought to occur via direct spread from the anal area or secondary to rectovaginal fistulas created from infection with *B. coli* [14]. More recently, involvement of bone by *B. coli* had been reported, and it case osteomyelitis of the spine [19]. A very rare previous report about the presence of extra-intestinal balantidial infections have been published in the literature at autopsy in animals with *B. coli* in fecal samples of baboons. Whoever, *B. coli* was found in the gastric lymph ducts and in the sub mucosa of the abomasum at autopsy of barbarian sheep from Korea and balantidia, however, were not found in the animal's stool [20]. In this case, there was no history of environmental stress, ration change or concurrent disease 5 months ago. The slightly increase and decrease caused by balantidiasis in blood chemistry values may be due to pathological lesions, bloody diarrhea, severe hemorrhage, or digestive disturbances [21]. Whoever, in these baboons, hematological values showed severe anemia, hypo-albuminemia, hyponatremia, and increases in serum (ALT) and (AST), and these findings was confirmed with the serum changes due to this disease in primate which had been reported earlier by Miller [22].

In human medicine previous studies examined *B. coli* infection in lungs by using*:* Chest radiographs (X-rays) and/or computerized tomography (CT) scans of the thorax which showed deterioration and confirms the diagnosis [14-16]. However, these are not available always in the animal theaters. Tissues of infected animals euthanized when moribund and tissue samples postmortem; may shed little light on the pathogenesis of balantidiasis in animals during times before death. The diagnostic techniques of *B.coli* infection in both humans and animal is based on microscopic detection of active trophozoites and/or cysts in fecal samples and/or rectal biopsy [6-23]. Whoever, in the cases of pulmonary balantidiasis, examination of bronchoalveolar lavage may be useful [15]. In the current case, diagnosis of intestinal disease was established as a consequence of clinical signs and the results of laboratory examinations. Whoever, Chest X-rays and/or CT scan is not available, and thus autopsy revealed lesions in the lungs. A possible mechanism for lung infection, most likely occurred secondary to colonic balantidiasis, and the organism likely travelled across the diaphragm into the pleural space causing this lung infection. Whoever, iron deficiency anemia occurs secondary to putative gastrointestinal bleeding and/or due to poor *appetite*. Thus, further studies are needed to elucidate the mode of action for this parasite among *hamadryas baboons*' population.

Baboons had been used worldwide as animal models in biomedical studies in captive NHPs colony. Whoever, complicated lung diseases caused by *B. coli* may vary from asymptomatic to acute respiratory distress and causes significant confounders in primate's colonies and public health. Thus, unsafe handling of animals, personal hygiene and contact with laboratory animals should not be underestimated. Whoever, further investigation is required to clarify the possible role of the presence of baboons as reservoirs for different types of human pathogens and/or the prevalence of various zoonotic diseases in Saudi Arabia.

## CONCLUSION

In conclusion the results of this report, demonstrated that multiple zoonotic infections from experimental animal units are prevalent in some localities in Saudi Arabia. Whoever, due to the clinical importance of these infections for man and animals, more attention should be given to zoonotic risk of laboratory animals in public health management activities. Critical health care management, new diagnostic methods, knowledge of disease pathogenesis and surveillance of zoonotic diseases are essential to individuals who work closely with baboon models. Although, extra-routine examinations techniques to determine the prevalence of the various species of intestinal protozoa including tomography scans and X-rays showed lung and/or extra-intestinal lesions for *B. coli* infection are also such needed.

## REFERENCES

1. Tardif SD, Mansfield KG, Ratnam R, Ross CN, Ziegler TE. 2011. The Marmoset as a Model of Aging and Age-Related Diseases. ILAR J, 2011; 52: 54-65.
2. Taylor MA, Coop RL, Wall RL; Veterinary Parasitology. 3rd edition, Blackwell, Ames, 2007: 874.
3. Headley S, Kummala E, Sukura A; *Balantidium coli*-Infection in a Finnish Horse. Vet Parasitol, 2008; 158:129–132.

4. Parija SC, Giri S; Emerging protozoal pathogens in India: How prepared are we to face the threat. Trop Parasitol, 2012; 2: 13–19.
5. Cox F; Human balantidiasis in Iran: are camel's reservoir hosts. Trends Parasitol, 2005; 21: 553.
6. Solaymani MS, Petri WA; Zoonotic implications of the swine-transmitted protozoal infections. Vet Parasitol, 2006; 140: 189–203.
7. Al-Tayib OA, Abdoun KA; *Balantidium coli* infection in hamadryas baboon (*Papio hamadryas*) in Saudi Arabia. J Anim Plant Sci, 2013; 23: 940–943.
8. Yazar S, Altuntas F, Sahin I, Atambay M; Dysentery caused by *Balantidium coli* in a patient with non-Hodgkin's lymphoma from Turkey. World J Gastroenterol, 2004; 10:458-459.
9. Bauri RK, Ranjan R, Deb AR, Ranjan R; Prevalence and sustainable control of *Balantidium coli* infection in pigs of Ranchi, Jahrkahnd, India. Vet World, 2012; 5: 94–99.
10. Malmsten PH; Infusorien als Intestinal-Thiere beim Menschen. Arch Pathol Anat Physiol Klin. Med, 1857; 12: 302–309.
11. Giarratana F, Muscolino D, Taviano G, Ziino G; *Balantidium coli* in Pigs Regularly Slaughtered at Abattoirs of the Province of Messina: Hygienic Observations. Open Journal of Veterinary Medicine, 2012; 2: 77–80.
12. Schuster FL, Ramirez-Avila L; Current World Status of *Balantidium coli*. Clin Microbiol Rev, 2008; 626–638.
13. Vasilakopolou A, Dimarongona K, Samakovli A, Papadimitris K, Avlami A; *Balantidium coli* pneumonia in an immunocompromised patient. Scand J Infect Dis, 2003; 35:144–6.
14. Sharma S, Harding G; Necrotizing lung infection caused by the protozoan *Balantidium coli*. Can J Infect Dis, 2003; 14:163–166.
15. Anargyrou K, Petrikkos GL, Suller MT; Pulmonary *Balantidium coli* infection in a leukemic patient. Am J Hematol, 2003; 73: 180–183.
16. Koopowitz A, Smith P, van Rensburg N, Rudman A; *Balantidium coli*-induced pulmonary haemorrhage with iron Deficiency. S Afr Med J, 2010; 100: 534–536.
17. Umesh S; *Balantidium coli* on urine microscopy. Natl Med J India, 2007; 20:270.
18. Maino A, Garigali G, Grande R, Messa P, Fogazzi GB; Urinary Balantidiasis: Diagnostic at a Glance by Urine Sediment Examination. J Nephrology, 2010; 23: 732–737.
19. *Dhawan S, Jain D, Mehta V; Balantidium coli: an unrecognized cause of vertebral osteomyelitis and myelopathy. J Neurosurgery Spine, 2013; 18: 310–313.*
20. Cho HS, Shin SS, Park NY; Balantidiasis in the gastric lymph nodes of Barbary sheep (*Ammo tragus lervia*): an incidental finding. J Vet Sci., 2006; 7: 207–209.
21. Khan A, Khan MS, Avais M, Ijaz M, Ali M, Abbas T; Prevalence, hematology, and treatment of balantidiasis among donkeys in and around Lahore, Pakistan. Vet Parasitol, 2013; 196: 203–205.
22. Miller G; Blood changes in Balantidium coli infected chimpanzee. Department of Veterinary Pathology, the Armed Force Institute of Pathology, Bethesda, U.S.A, Case-IV-N, 2003; 21–98.
23. Solaymani MS, Rezaian M, Hooshyar H, Molavi G, Babaei Z, Anwar M; Intestinal protozoa in wild boars (*Sus scrofa*) in western Iran. J Wild life Dis, 2004; 40: 801–803.