CASE REPORT

Eosinophilic gastroenteritis in African elephant (*Loxodanta africana*)

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SUMMARY

Elephant conservation in Africa is currently among the important continental agenda due to the current trend of declining elephant population accelerated by human activities such as poaching, and encroachment to their habitat. Amon the implemented efforts to support elephant conservation includes studying anthropogenic and non-anthropogenic factors which are likely to adversely affect the health and population dynamics of African elephants (*Loxodanta africana*) and device mitigation measures. This report describes clinical events observed in a 6 year male elephant that died on the course of clinical interventions at a sanctuary within Mkomazi National Park following three month of illness. The cause of illness was suspected to be unidentified gastrointestinal parasites. Ante mortem and Postmortem examination revealed presence of clinical features suggestive of parasitic worm infestations including dullness, in appetence, anaemia, oedema and eosinophilic infiltration in the intestinal epithelial and sub epithelial tissues. However, eosinophilic infiltration can also occur in absence of parasites and is usually associated with food related hypersensitity reactions. In the later, lesions are usually restricted along the gastrointestinal tract and the condition is described as eosinophilic gastroenteritis. Nonetheless, the description is sometimes based on histo-morphological appearance rather than the aetiology. Interestingly, helminths were not detected by either faecal samples analysis or gross postmortem examinations. Faecal and postmortem results indicates that either the cause of the observed illness was different from the anticipated parasitic infestations or the parasites could actually be present in the animal but could not be detected due to human error in the course of sample handling and or therapeutic interventions. A different and more comprehensive approach should be considered for similar and future cases to facilitate timely and effective clinical interventions.

Key words: Eosinophils, Gastroenteritis, Leukocyte, Parasites, Inflammation

INTRODUCTION

The current trend of continental decline of African elephant (*Loxodonta africana*) accelerated by human activities such as poaching, and encroachment to wildlife habitat (Chase *et al.*, 2016), demands all stakeholders to increase resources and efforts aimed at reinforcing conservation of this largest herbivore found in sub-Saharan Africa (Blanc, 2007). These efforts include increasing our understanding on the existing and emerging challenges which are likely to adversely affect the existing and future Elephant population. In addition to anthropogenic pressure, Elephants are known to be susceptible to a wide range of gastrointestinal helminths including nematodes, cestodes and trematodes (Baines *et al.*, 2015). In severe cases the parasites can cause mortality in young animals and the situation can be worsened with extreme weather condition (Foley *et al.*, 2008.,Obanda *et al.*, 2011). Among the patho-biological changes induced by the parasites include anorexia, haemorrhagic colitis, oedema and inflammatory cells infiltration usually predominated by eosinophils (Vitovec *et al.*, 1984). This report describes eosinophilic colitis in a 6-years old male African Elephant suspected to be associated with gastrointestinal parasites.

CASE HISTORY AND CLINICAL EXAMINATION RESULTS

On the 28th of February, 2012, Mkomazi Rhino Sanctuary Staff found a young male elephant near guard's post at Kisima air strip. The age of the animal was estimated to be seven days and was suspected to be abandoned by an unidentified herd of elephants for circumstances that could not be established. The elephant was nursed at the environment nearby the Rhino sanctuary and was bottle fed with milk replacer and later on he gradually fed on trees until he became fully independent, but remained at the sanctuary premises. In mid-July, 2018, he was observed to show dullness, loss of appetite and scanty faeces with increased frequency of defaecation. The faecal consistency was moderately soft. Faecal and EDTA whole blood samples were collected and submitted for analysis to Tanzania Veterinary Laboratory agency and Merlino Veterinary Clinic respectively; all the facilities are located in Arusha municipality. Part of the collected blood was used for harvesting plasma that was stored at 20 degrees of Celsius below zero (-20 ^{0}C). No helminths or helminths eggs were detected in the faecal samples, whereas blood analysis revealed hematocrit value of 31.3%. Despite the negative results from faecal samples, the animal was provided with oral ivermectin horse paste (0.1mg/Kg) mixed with albendazole (2.5mg/Kg) and artificial milk. The mixiture was provided by a keeper familiar to the animal without restraint. In addition, Catasol® (multivitamin with iron) was given intramuscularly using an automated pole syringe. Following treatment, the animal condition improved slightly until mid-September when ventral subcutaneous oedema was detected. The condition continued to deteriorate and four weeks later, the animal was immobilized for examinations using Etorphine hydrochloride at a dose described previously for a 5-years old African elephants (Stegmann, 1999). Unfortunately, the animal could not tolerate the anaesthesia and efforts to reverse the situation using diprenorphine were unsuccessful and the animal died.

Gross postmortem results and laboratory analysis

The main postmortem examination results includes prominent oedema of the subcutaneous tissues at ventral abdominal area, submandibular region, carpal and tarsal joints. Other findings include ascites, pericardial and omental fat degeneration. There were no other clear gross pathological changes in all body systems examined. Liver, spleen, kidney, cardiac and intestinal samples were collected and preserved in 10% neutral buffered formalin. The formalin fixed samples, frozen plasma were submitted to the Pathology Laboratory, College of Veterinary Medicine and Biomedical Sciences for further investigation

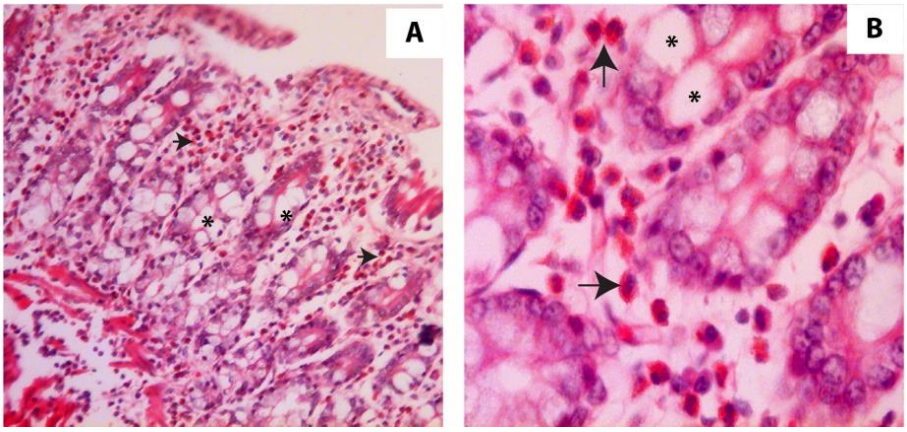

Figure 1 A and B. Haematoxylin and eosin stained intestinal tissue. Marked Eosinophilic infiltration (arrow head), presence of abundant mucous epithelia cells (asterisks) (image magnification 100x and 400x respectively

Histopathology and plasma protein analysis

Plasma protein and albumin were determined using commercial reagent kits for albumin (BLT00001, Erba), and protein (BLT00054, Erba) as described by the manufacturer, whereas tissue samples were processed and stained using haematoxylin and eosin (H&E) for microscopic examinations. Plasma protein and albumin levels were 9.8 g/dl and 3.2g/dl respectively. Histopathological analysis revealed infiltration of eosinophils in different intestinal layers. The intestinal tissue was identified as the colon based on the abundance of mucous secreting cells (Figure 1A-B). Quantification of eosinophils that were identified by their multilobulated nuclei and pink to red cytoplasmic granules, revealed the presence of more than 50 Eosinophils per 200x microscopic field.

DISCUSSION

African elephants below 7 years are considered as young animals for reasons that on average, most African elephants below 7 years are sexually immature (Evans *et al.,* 2013). This age group is susceptible to extreme weather conditions and wide range of parasitic infestations that can become fatal to the affected animals (Baines *et al.,* 2015.,Foley *et al.,* 2008). In this report, clinical history and subsequent laboratory results of a young African elephant suspected of having eosinophilic inflammatory condition affecting the gastrointestinal tract is presented.

Eosinophilic gastroenteritis is a condition described as inflammatory conditions affecting any part of the gastrointestinal tract although is more commonly seen in the stomach and intestines. The condition is characterized by four criteria including presence of gastrointestinal disorders, eosinophilic infiltration of more than 50 cells per magnified microscopic field, exclusion of parasitic diseases and absence of systemic involvement (Ingle and Hinge, 2013).

The aetiology of the condition is unknown, but is considered to be food induced hypersensitivity reactions. There are no documented evidences of wild animal species demonstrating these features of eosinophilic gastroenteritis. However, a case of eosinophilic gastroenteritis with parasites involvement in young elephant has been previously reported (Vitovec *et al.,* 1984). The histopathological features observed by Vitovec *et al*; (1984) and later Obanda *et al*; (2011) are closely similar to what is described in this report with the exception of parasite recovery during gross and histopathological examinations. The reasons for this difference could be related to the timing of postmortem where in this case, postmortem was conducted within a short period after the animal was dewormed or could be that the microscopic presence of the parasites were missed due to the fact that only a small piece of gastrointestinal tract was submitted for histopathological analysis.

Interestingly, clinical manifestations in this case were also closely similar to the reported parasitic gastroenteritis by Vitovec et al., (1984), including the presence of anorexia, oedema and enteritis. However, no worms were detected in the examined faecal samples although the complete absence of faecal helminths or eggs cannot be a sufficient reason to rule out the presence of helminths. In fact wild animals are known to harbor a number of helminths without having any clinical significance unless the balanced relation between the host and parasites is disturbed (Baines *et al.,* 2015.,Foley *et al.,* 2008). It is therefore likely that, 100% negative results obtained from faecal samples could be related to human errors during the course of sample handling.

On the other hand, oedema and anaemia associated with gastrointestinal parasites are not uncommon and can occur as a result of direct damage to intestinal epithelia causing leakages of proteins and blood. These features were all observed previously in young elephants infested with helminths (Vitovec *et al.,* 1984). It is important to note that hypoproteinemia can also occur as a result of in appetence and insufficient feeding (Obanda *et al.,* 2011). Furthermore, oedema can also occur as a result of fluid leakages associated with increased hydrostatic pressure during inflammatory reactions (Scallan *et al.,* 2010). The latter is most likely to be the cause since both plasma protein and albumin levels obtained in this case did not significantly deviate from those obtained elsewhere from

healthy elephants (Allen *et al.*, 1985.,Brown and White, 1980). Furthermore, degeneration of omental and cardiac fat highlights the chronic nature of the disease and it is likely that, the intervention came late on the course of illness.

Alternatively, since the treatment was provided based on clinical signs, it is also possible that the underlying cause was different, persisted and continued to affect the animal up to the time of its demise. Finally, based on Ingle and Hinge (2013) criteria, the failure to detect parasitic involvement cannot qualify the case to be purely food induced hypersensitivity reactions which lead to gastrointestinal eosinophilia considering .

the fact that only a small section of the gastrointestinal tract was submitted for histopathological analysis. Likewise, the possibility of both parasitic involvement and hypersensitivity reactions cannot be ruled out due to the presence of extra-intestinal lesions such oedema in different locations.

In order to have a clear understanding of similar cases in future and facilitate timely and effective interventions, a more comprehensive approach should be considered including analysis of the possibility for acute food related allergic reactions.

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