Anaplasmosis of Cat: A Case Report Study at SAQTVH in CVASU

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Md. Shahin Alam

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Abstract

The case of feline anaplasmosis caused by Anaplasma species in a male cat aged one year is described in this clinical report, with particular attention paid to diagnostic methods, hematological and biochemical changes, treatment modalities, and results. The cat had a three-month history of respiratory discomfort, ocular discharge, anorexia, weight loss, and fluctuating temperature. A clinical examination showed raised body temperature, mucous membrane pallor, and dehydration. There was no improvement from earlier antibiotic treatments. Complete blood count (CBC), biochemical analysis, and microscopic examination using Giemsa-stained blood smears were among the laboratory tests that verified anaplasmosis. Hematological investigation showed a high erythrocyte sedimentation rate (34 mm), neutrophilia (79%), lymphopenia (17%), and mild anemia (PCV 28%, hemoglobin 9.4%). Biochemical results revealed that liver enzymes were within normal limits, but high phosphorus levels (9.2 mg/dl) suggested potential renal involvement.

Treatment included oxytetracycline, imidocarb dipropionate, antihistamines, and supportive therapy with fluids and multivitamins, resulting in significant clinical improvement. Follow-up after two weeks revealed the resolution of clinical signs and a negative Giemsa stain for *Anaplasma sp*. This case underscores the complex interplay between hematological and biochemical alterations in feline anaplasmosis and highlights the limitations of traditional diagnostic methods, emphasizing the need for molecular diagnostics like PCR. Comprehensive diagnostics and timely treatment are essential for favorable outcomes in managing feline anaplasmosis.

***Keywords*:** Anaplasmosis, Giemsa , Oxytetracycline, Imidocarb .

Chapter 1: Introduction

Domestic cats *(Felis catus)* are among numerous mammalian hosts infected by Anaplasma species, which are obligatory intracellular microorganism (blood protozoa) carried by Ixodes species ticks via transstadial transmission (Little, S.R., 2010). *Anaplasma phagocytophilum* and *Anaplasma platys* are the two primary species that infect cats. Ticks are an important vector for these microorganisms, with Ixodes species functioning as the main vector for *A. phagocytophilum* (Carrade et al., 2009). While dogs are more commonly reported cases of anaplasmosis, cats are also becoming increasingly well-known, especially in areas with prevalent tick populations. *Anaplasmosis* in cats may manifest as nonspecific clinical symptoms such as fever, lethargy, inappetence, and other hematogenic abnormalities (Little, S.R., 2010).

Clinical symptoms and laboratory results are used to diagnose anaplasmosis in cats. Complete blood counts (CBC), biochemical testing, and microscopic analysis of blood smears with Giemsa stain are some of the primary diagnostic methods. These diagnostic methods not only aid in confirming the existence of pathogen but also offer important information on the systemic effects of infection, such as organ and hematologic involvement (Harvey, 2003). Different information is provided by each diagnostic technique, which helps with the overall evaluation of the illness.

For the diagnosis of hematologic problems linked to feline anemia, the complete blood count (CBC) is a crucial diagnostic tool (Lappin et al., 2012). A decreased platelet count, or thrombocytopenia, is one of the most prevalent and important findings in afflicted cats (Katavolos et al., 1998). Because *Anaplasma phagocytophilum* and *Anaplasma platys* either kill platelets or sequester them in the spleen, thrombocytopenia is a defining feature of both diseases (Bergman et al., 2015). Cats with the infection may also have mild to moderate anemia in addition to thrombocytopenia (Carrade et al., 2009). The body's inflammatory reaction to the infection may cause hemolysis or decreased erythropoiesis, which can lead to anemia (Hamel et al., 2019). Though non-regenerative anemia can also happen in circumstances of immune-mediated problems or chronic infection, regenerative anemia shows that the bone marrow is actively responding to the reduction in red blood cells (Little, S.R., 2010).

Leukocyte alterations are another typical symptom of anaplasmosis in cats. Particularly in individuals infected with *A. phagocytophilum*, leukopenia and neutropenia are commonly seen during the initial stages of illness. As this neutropenia demonstrates, the bacterium's main target for infection is neutrophils, which are part of the host's immune response. In more severe or prolonged infections, leukocytosis with neutrophilia is a sign that the body is trying to build a stronger immune response to the infection by producing more white blood cells (Schefer et al., 2019).

Giemsa-stained blood smears may be examined under a microscope to directly identify Anaplasma species inside affected cells. Morulae are bacterial clusters that show up in the cytoplasm of neutrophils or platelets, and this technique makes them visible. While morulae are detected among platelets in Anaplasma platys infections, they are usually found within neutrophils in *A. phagocytophilum* infections (Kirtz et al., 2005). The sensitivity of this approach is limited, even if the presence of morulae on a blood smear is strongly suggestive of anaplasmosis. Because morulae aren't always visible, the low bacterial load or temporary bacteremia frequently seen in sick cats might lead to misleading negative results (Cohn et al., 2003). Consequently, Giemsa staining is usually utilized as a supplementary diagnostic technique, whereas molecular diagnostics like polymerase chain reaction (PCR) are utilized for a more conclusive confirmation of infection (Little, S.R., 2010).

Since biochemical tests shed light on organ function and the infection's systemic consequences, they are an important part of the diagnostic workup for feline anemia. In cats with the infection, liver and renal function are the most often detected biochemical abnormalities. High levels of liver enzymes: Elevated alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels may be seen in cats with Anaplasma infections. It is possible that the infection or the body's inflammatory reaction is the cause of this rise, which indicates liver involvement. Diseases spread by ticks frequently affect the liver, and infections with *A. phagocytophilum* are frequently associated with increased liver enzymes (Harvey, 2003). The main objective is to diagnose Anaplasma infection in a cat using hematological, biochemical, and microscopic analysis and assess the impact of Anaplasma infection on the cat's blood profile and organ function by highlighting the diagnostic challenges and limitations in detecting Anaplasma using traditional methods like blood smears.

Chapter 2: Materials and Method

2.1 History and Clinical Examination

A one-year male cat with 4.2kg body weight was presented at S.A. Quadery Teaching Veterinary Hospital (SAQTVH) of Chattogram Veterinary and Animal Sciences University (CVASU) with the history of fluctuation of body temperature for three months, weight loss, anorexia, ocular discharge and open mouth breathing. On clinical examination the cat internal body temperature was 103°F, found dehydration with sunken eyeball, coughing, ocular discharge and paleness of mucous membrane. The accessible lymph nodes were not enlarged. Heart rate and respiration rate were within normal range. Previously, the cat was treated by veterinarian with 4.6 kg body weight with Doxycycline Hydrochloride (20mg/kg body weight two times daily), Prednisolone (0.4mg/kg body weight two times daily), Famotidine (0.8mg/kg body weight two times daily) and vitamin B-complex. And clinical signs were body temperature 105°F, weakness, loss of appetite, paddy area around nose and eye. The veterinarian suggested for CBC test, Total protein: Globulin ratio. Again, before last time presented in SAQTVH, the cat was treated in SAQTVH with 4.3 kg body weight with Amoxicillin (12mg/kg body weight once daily), Dexamethasone (0.2mg/kg body weight once daily), Aminovit plus vet (0.5 ml once daily), Eye drop Invet-D (Moxifloxacin 0.5% and Dexamethasone 0.1% 1 drops 4 times daily) and Cream Fungidal (Miconazole Nitrate 2% apply two times daily). And clinical signs were Temperature 105 F, lacrimation, ocular opacity, anorexia. Except for the signs reported by the owners, clinical examination revealed no other abnormalities.

2.2 Laboratory Diagnosis

2.2.1 Blood smear

Blood smears were made on a degreased microscopic glass, stained using the Giemsa method, and viewed under the Eclipse E-100 microscope.

2.2.2 Biochemical tests

Then separated the serum from supernatant of previously collected blood sample. Biochemical test of blood was revealed blood glucose, total protein, SGPT, SGOT, Calcium, phosphorus and

albumin. Then the biochemical test was performed by Homolyzer 3000 following the protocol of this machine.

2.3 Hematological tests

For hematological test the blood sample which was collected with anticoagulant and gently mixed anticoagulant with collecting vial. Then hematological test was performed by Automatic Hematology Analyzer (Model: EXIGO) machine following the protocol of machine. Hematological test was revealed CBC test.

2.4 Statical Analysis

The data was entered into the MS-Excel and descriptive analysis has conducted.

Chapter 3: Result

3.1. Microscopic Examination

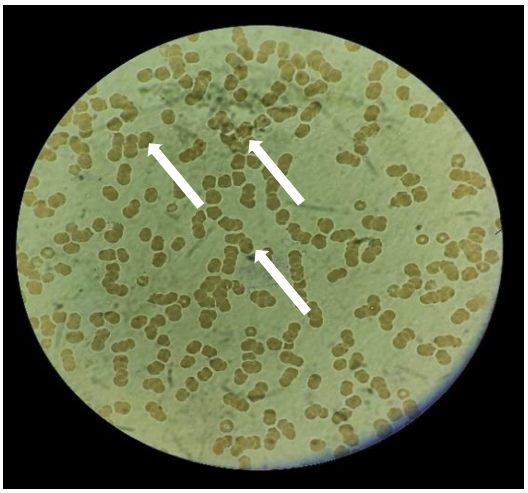

Figure 1: Anaplasma positive

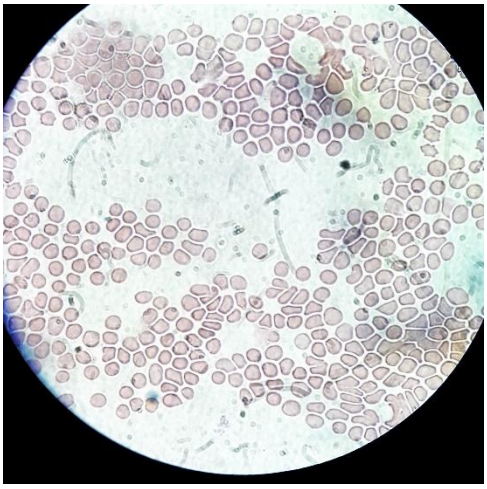

Figure 2: Anaplasma Negative

3.2. Hematological and biochemical analysis of Anaplasma in cat

Hematological parameters	Results	Reference value
Total RBC (mil/cum)	5.76	5-10
Total WBC (thou/cum)	11.8	5.5-19.5
PCV (%)	28	29-45
Hb (%)	9.4	9.8-15.4
ESR (mm)	34	6-25
Neutrophil (%)	79	35-75
Lymphocyte (%)	17	20-55
Monocyte (%)	1	0-5
Basophil (%)	0	0-1
Eosinophil (%)	3	0-4

Biochemical Parameters		
AST (U/L)	37.90	26-43
ALT (U/L)	67.82	6-83
Glucose(mg/dl)	56.84	50-75
Calcium (mg/dl)	10.58	9.0-11.3
Total Protein (g/l)	84.8	58-91
Phosphorus (mg/dl)	9.2	2.6-6.2

Table 1: *Hematological and biochemical analysis of Anaplasma cat where mainly focused on ALT, AST, Glucose, Calcium and Protein level in blood of that queen.*

According to clinical history fluctuation of fever for three months, anorexia, apathy, gradually weight loss, respiratory distress and clinical signs internal body temperature 105 F, bluish mucous membrane, mild dehydration, coughing and ocular discharge. And beside of the previous treatment history like antibiotics and supportive drugs were used but no improvement of health status and clinical signs. All of these indicated for blood protozoa in cat. After obtain microscopic examination of blood it confirmed Anaplasmosis in cat.

The hematological and biochemical examination showed many departures from reference values. The WBC count was rather higher at 11.8 thousand/cum (reference: 5.5-19.5 thousand/cum), while the total RBC count was 5.76 million/cum, which was within the reference range of 5–10 million/cum. At 28% (reference: 29–45%), the PCV was below normal, and the hemoglobin levels were down to 9.4% (reference: 9.8–15.4%). At 34 mm, the ESR was noticeably greater than the standard of 6–25 mm. A higher percentage of neutrophils 79% (reference: 35-75%) and a lower percentage of lymphocytes 17% (reference: 20-55%) were observed. There were no visible basophils, and the percentages of monocytes and eosinophils were within normal limits. Biochemically, total protein, calcium, glucose, and AST and ALT values were all within ranges that were considered normal. On the other hand, phosphorus levels were higher than normal at 9.2 mg/dl (2.6–6.2 mg/dl). According to Table 1, these results point to the hematological and biochemical effects of Anaplasma infection.

After confirmatory diagnosis, the cat was treated with intramuscular injection with long-acting Oxytetracycline (Renamycin LA), maintaining a generic dose of (Oxytetracycline @ 20 mg/kg body weight), one-day interval for 5 days due to chronic infection and injection Babecure (Imidocarb Dipropionate @ 3 mg/kg body weight). Used Pheniramine Maleate @1mg/kg body weight to prevent hypersensitivity. For supportive treatment use Hemovit Vet 0.3 ml intramuscularly one-day intervals for 5 days (Hemovit act as cofactors that enable proper cellular function, energy metabolism, and antioxidant defenses. Mineral components like iron, copper, and cobalt support the production of healthy red blood cells and hemoglobin, which is crucial for oxygen transport. Anti-inflammatory and immune-supporting nutrients help maintain a healthy immune system), Normal saline 20ml/kg for 3 days for dehydration. After one week the cat recovered gradually and after two weeks disappeared all clinical signs and also improved feed intake. One and half month later the cat again admitted to S.A. Quadery Teaching and Training Hospital for regular health check-up and by the demonstration of Giemsa stain Anaplasma was negative.

Chapter 4: Discussion

The confirmatory diagnosis of anaplasmosis reflects a significant effect on the blood profiles of cats, according to the hematological and biochemical results shown in the result section. An impactful hematological crisis was about a 28% decrease in pact cell volume (PCV), which is below the standard range of 29–45% and it indicates the moderate anemia. Due to illnesses that trigger a systemic inflammatory response, hemolysis or decreased erythropoiesis may be the cause of this (Adazeck et al., 2013). In granulocytic anaplasmosis, the bacteria preferentially infect neutrophils, resulting in increased neutrophil production and decreased lymphocytes. The neutrophilia (79%) and lymphopenia (17%) found in this instance are consistent with usual immunological responses (Kirtz et al., 2005). Increased neutrophil counts are frequently linked to bacterial infections, especially in more severe or persistent instances. The existence of an inflammatory condition is also indicated by the elevated erythrocyte sedimentation rate (ESR) of 34 mm (reference: 6–25 mm) (Hamel et al., 2019). A high ESR indicates the systemic impact of the infection and is a non-specific indicator of inflammation (Bergman et al., 2015).

The biochemical examination revealed that the phosphorus levels were 9.2 mg/dl, which was far higher than the typical standard range of 2.6-6.2 mg/dl. Potential renal failure, a side consequence of infections like anaplasmosis, is one of the many conditions that elevated phosphorus can signal (Norman et al., 2017). The normal levels of the liver enzymes ALT and AST, however, indicate that the liver was not substantially impacted in this instance (Gorna et al., 2014)

Lastly, Anaplasma morulae was discovered by the Giemsa-stained blood smear study, yielding a conclusive diagnosis. It is crucial to remember that this method's sensitivity is restricted since, depending on the bacterial load present during inspection, morulae may not always be apparent (Litmann et al., 2009). Thus, in situations when microscopy results are not definitive, alternative diagnostic technique according to (Cohn et al., 2003). Overall, the report's findings highlight the intricate relationship between haematological anomalies and biochemical changes in the pathophysiology of feline anaplasmosis, underscoring the significance of comprehensive diagnostic testing in these situations.

Chapter 4: Conclusion

As a result of a continuing inflammatory response, the paper indicates that feline anaplasmosis causes severe haematological and biochemical alterations, such as anemia, neutrophilia, and high erythrocyte sedimentation rates. Despite the apparent lack of impact on liver function, elevated phosphorus levels suggest possible renal involvement. The presence of Anaplasma organisms was verified by blood smear analysis; however, due to the technique's low sensitivity, PCR appears to be a more reliable diagnostic procedure. All things considered, the case emphasized the intricate relationship between infection and blood abnormalities, highlighting the significance of thorough diagnostics in the treatment of anaplasmosis.

Chapter 6: Limitation

The report's limitations include reliance on microscopic examination, which has low sensitivity for detecting Anaplasma organisms due to fluctuating microorganisms loads. Additionally, the absence of advanced diagnostic tools like PCR reduces the accuracy of infection confirmation. A larger sample size and more detailed biochemical analyses could provide a clearer understanding of anaplasmosis in cats.

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Biography of Author

Md. Shahin Alam, son of Md. Abdul Matin and Samortha khatun, was born in the village Daripara at Ullahpara upazila, Sirajganj. The author spent his childhood in the village. Mr. Alam completed his secondary and higher secondary education at Ullapara Adarsha High School and Akbar Ali Govt. College, graduating in 2014 and 2016, respectively. The author is currently pursuing his Doctor of Veterinary Medicine (DVM) degree at Chattogram Veterinary and Animal Sciences University, with his graduation expected in December 2024.

Shahin has been actively involved in veterinary research throughout his academic career. His research work includes a comparative analysis of the socio-economic status of farmers and its effects on poultry farming practices in the Chattogram District, particularly focusing on vaccination, disease management, and zoonotic risks such as avian influenza. Now, Alam has successfully conducted this research with anaplasmosis in a cat, a case report's main insight is to observe the clinical state of cat. By this study, the author is pulling the end of his interesting DVM journey.

Shahin looks forward to receiving opinions from readers on this research paper, valuing constructive feedback that may lead to future advancements in veterinary science. He also hopes for everyone’s blessings and well wishes as he continues to explore new frontiers in research and veterinary medicine.