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Feline trypanosomosis in a male pseudohermaphrodite cat (*Felis catus*): A rare case

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Abstract
Raju, a phenotypically female, free-ranging, Domestic Shorthair (DSH) cat, presented with alopecia, submandibular lymphadenopathy, and chronic non-resolving skin lesions. Diagnostic tests confirmed *Trypanosoma spp.* infection alongside concurrent dermatophytosis. Treatment with diminazene aceturate, doxycycline, supportive therapy, and topical antifungals led to full clinical recovery. A planned ovariohysterectomy (OVH) revealed the absence of female reproductive structures and the presence of bilateral intra-abdominal and perivulvar testicular tissue, which was histopathologically confirmed as azoospermic testes. These findings were consistent with male pseudohermaphroditism. This case highlights the rarity of feline trypanosomosis and its unique coexistence with a disorder of sexual development (DSD). It underscores the importance of comprehensive clinical, laboratory, and surgical evaluations in atypical presentations. These findings contribute to the limited literature on feline trypanosomosis and disorders of sex differentiation in cats.

Keywords: Feline trypanosomosis, Feline trypanosomaisis, Alopecia, Diminazene aceturate, Trypanosomosis in India, Vector-borne diseases, Male pseudohermaphrodite cat, Disorder of sexual development (DSD), Dermatophytosis

Introduction

Feline trypanosomosis

Trypanosomosis refers to an infection caused by protozoans of the genus *Trypanosoma*, mainly transmitted by hematophagous vectors like Stomoxys, Tabanus, and Triatomine bugs, with carcass ingestion from recently infected animals also suggested as a transmission route [1-4]. Reports of naturally occurring trypanosomosis in felines are scarce in the scientific literature, likely due to the higher resistance of cats compared to other vertebrate hosts. Consequently, trypanosomosis is infrequently observed and diagnosed in felids, making it a rare parasitic infection in this species [5]. Documented cases of feline trypanosomosis in domestic cats include two reports from India [6, 7], one from Canada [5], three from Kuwait [8], and seven from Iraq [9]. Causative organisms have been identified as *Trypanosoma brucei* and *Trypanosoma evansi* [2, 5, 7-9], both of which elicit the same clinical symptoms in cats, severity of which is directly proportional to the parasitaemia. Peripheral blood smear evaluation and immunological tests help in diagnosis. Treatment involves the use of trypanocidal or chemotherapeutic drugs such as Diminazene aceturate.

DSD in cats

Chromosomal composition, gonadal histology, reproductive tract morphology and external genital appearance are the necessary criteria for definitive sex identification [10]. Mammalian sexual development involves three crucial steps: Chromosomal sex differentiation, Gonadal sex differentiation and phenotypic sex differentiation [11]. Aberrations at any stage of these processes can result in abnormal sexual phenotypes, with disruptions at one level often affecting subsequent developmental stages [12]. This creates true hermaphrodites (presence of gonadal tissues of both sexes) or pseudohermaphrodites (gonads of one sex, and alterations in one or more criteria for sex identification) [10].

Cats normally have 38 chromosomes, including sex chromosomes (Queens: 38, XX; Toms: 38, XY) [11]. Male pseudohermaphrodites have a normal male karyotype (38, XY) and testes, but have feminine external reproductive organs/phenotype.
This case discusses alleged male pseudohermaphroditism in a cat infected with trypanosomosis, making it a special, rare occurrence.

Case Discussion
This case revolves around the presence of two uncommon conditions in the same patient, Raju, a phenotypically female, free-ranging, DSH cat, detected at two separate consultations, approximately one month apart. The case discussion is therefore divided into two parts.

Part I: Alopecia
She was presented for her first consultation on 18th November 2024 with bilateral alopecia of the head and neck and swelling in the right premandibular region (Figure 1a). The patient had previously received treatment at multiple veterinary clinics with no resolution of alopecia. On clinical examination, the mucous membranes were pale pink, and submandibular lymphadenopathy was noted. Based on prior experience with similar cases, trypanosomosis was included in the differential diagnoses. To establish a definitive diagnosis, a complete blood panel (CBC, liver function test [LFT], kidney function test [KFT]), peripheral blood smear, lymph node fine needle aspiration (FNA), and skin tape smear were performed.
The blood test reports showed mild microcytic hypochromic anaemia and thrombocytopoenia, alongside other normal parameters (Figure 2a, b). On 19th November 2024, peripheral blood smear results confirmed the presence of *Trypanosoma spp.* (Figure 3). The skin tape smear revealed the presence of dermatophytes, indicative of concurrent dermatophytosis (Figure 4). The lymph node FNA showed presence of *Trypanosoma spp.* and lymphoproliferative disorder (likely owing to the trypanosomosis), (Figure 5, 6).

The following treatment regimen was initiated:-
- Doxycycline (DoxyMust 100mg™; [Sky Ec Pharma]) @ 10 mg/kg bwt PO q24h for 4 weeks.
- Diminazene aceturate (Berenil®; [Samrudh Pharmaceuticals Pvt. Ltd.]) @3.5 mg/kg bwt IM, once weekly for 4 weeks.
- S-adenosylmethionine (SAMe-Liv™; [Ecora Bioceuticals Pvt. Ltd.])-2.5 mL PO q24h for 4 weeks (to support hepatic function).
- Thrombopoietic stimulant (Thromb Beat™; [Venworld]) -2.5 mL PO q24h for 4 weeks (to manage thrombocytopenia and anaemia).
- Subcutaneous Ringer's lactate (15 mL/kg bwt), administered concurrently with ondansetron (0.5 mg/kg PO) at each Berenil® administration.
- Topical miconazole ointment (Micoheal®; [Health Kare Pharma]) BID for 2 weeks for dermatophytosis management.

Her progress was recorded weekly (Figure 1b-1e). Following the final diminazene aceturate injection on 10th December 2024, a post-treatment bloodwork panel, consisting of CBC, LFT, KFT, and peripheral blood smear was conducted. The peripheral smear tested negative for *Trypanosoma spp.* (Figure 7a, b). The doxycycline course was completed on 18th December 2024 as prescribed. The alopecia, thrombocytopenia and anaemia had resolved by 20th December 2024. The leucocytosis observed in the report was attributed to a secondary respiratory infection that she had contracted during the course of treatment from other cats in the cattery where she was housed, which had resolved one month post treatment (Figure 8) with the help of an herbal immunomodulator and phagocytosis enhancer (Immunol®; [The Himalaya Drug Company])-1 mL PO q12h for 4 weeks.

Fig 1: Raju before 1st consultation (a); post 1st shot of Berenil® (b); post second dose of Berenil® (c); before last dose of Berenil® (d); 1 week post the last dose of Berenil® (e); Raju post being released (f)

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TEST REPORT

Pet Name	: Raju	Source	: Critter Care Vet Clinic
Species	: Feline	Name of owner	: Terra Animal Trust
Breed	: DSH	Name of Doctor	: Dr. Ruchi
Sex	: Female	Sample Received on	: 18/11/2024
Age	:	Reported on	: 18/11/2024
Patient ID	: 00518	Lab No	: 202411867

COMPLETE BLOOD COUNT (CAT)

TEST	RESULT	UNITS	REFERENCE RANGE
Haemoglobin	**9.00**	gm%	9.3-15.9
R.B.C. Count	**4.28**	x106/ cu.mm	5.92-9.93
PCV	**24.2**	%	29-48
MCV	56.6	fl	37-61
MCH	21.0	pg	11-21
MCHC	**29.1**	g/dl	30-38
W.B.C. Count	14.2	x103 / cu mm	5.5-19.5
RDW CV	15.3	%	11.5-18.5
Platelet Count	1.63	(lacs / cu mm)	1.5-8.0
DIFFERENTIAL COUNT			
Neutrophils	68	%	35-79
Lymphocytes	25	%	11-52
Eosinophils	04	%	1-15
Monocytes	03	%	0-4
Basophils	00	%	0-1
PERIPHERAL SMEAR			
RBC *(Staining & Microscopy)*	**Microcytic Hypochromic**		
WBC *(Staining &Microscopy)*	Adequate		
Platelets *(Staining &Microscopy)*	Adequate		
PARASITES IN BLOOD	**NOT SEEN**		

Comments:

CBC done on fully Automated Byovet Smart - 3DX.

*********End of Reports*********

Reviewed by: Mr. Yash Dagur
M.Sc. (Microbiology)

Dr Akshay J Shah
M.V.Sc (Path) CVA C.Ac PGCVH

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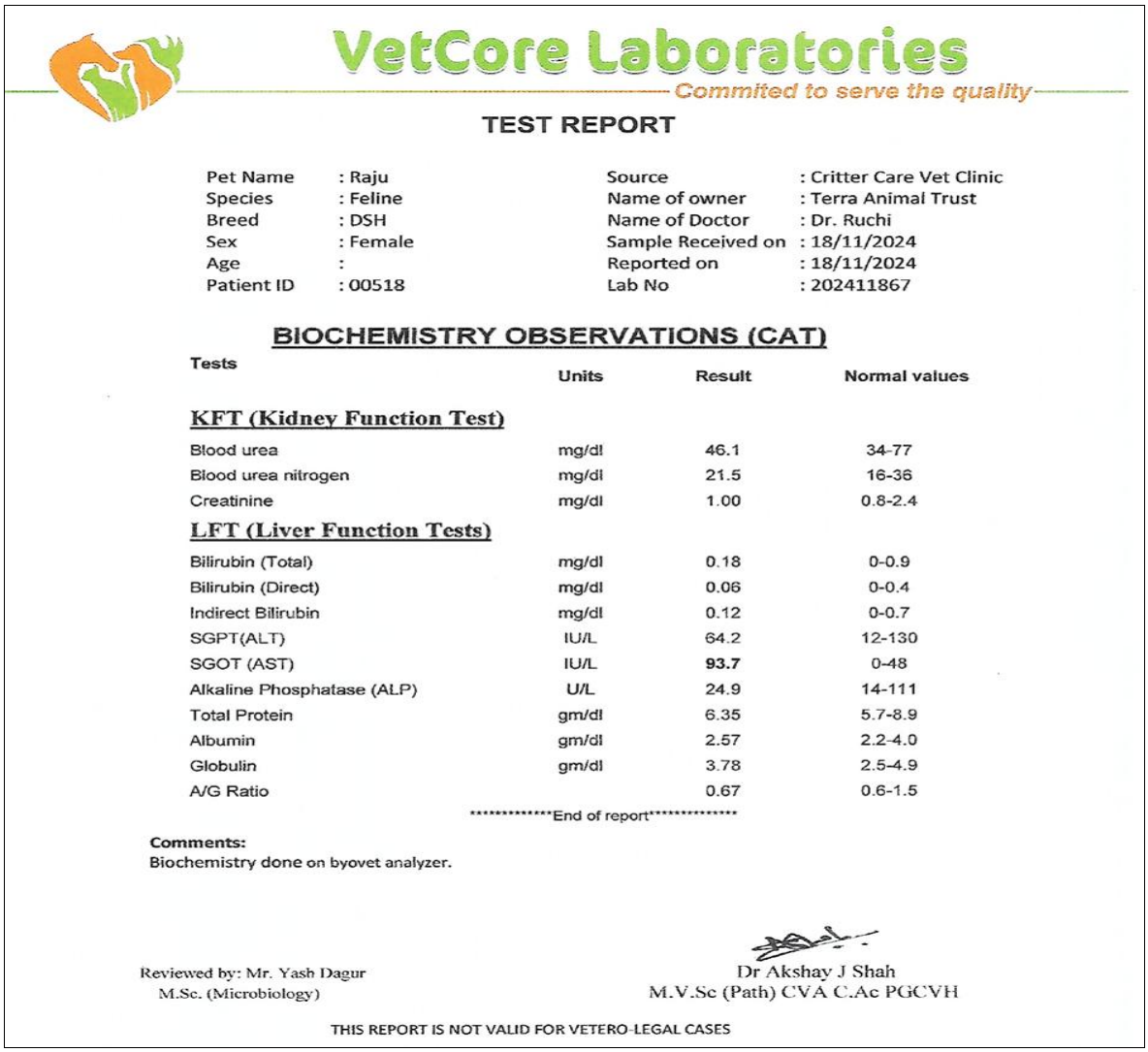
Fig 2a: Raju's CBC reports-microcytic hypochromic anaemia, mild thrombocytopoenia (dated 18th November 2024)



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TEST REPORT

Pet Name	: Raju	Source	: Critter Care Vet Clinic
Species	: Feline	Name of owner	: Terra Animal Trust
Breed	: DSH	Name of Doctor	: Dr. Ruchi
Sex	: Female	Sample Received on	: 18/11/2024
Age	:	Reported on	: 18/11/2024
Patient ID	: 00518	Lab No	: 202411867

BIOCHEMISTRY OBSERVATIONS (CAT)

Tests	Units	Result	Normal values
KFT (Kidney Function Test)			
Blood urea	mg/dl	46.1	34-77
Blood urea nitrogen	mg/dl	21.5	16-36
Creatinine	mg/dl	1.00	0.8-2.4
LFT (Liver Function Tests)			
Bilirubin (Total)	mg/dl	0.18	0-0.9
Bilirubin (Direct)	mg/dl	0.06	0-0.4
Indirect Bilirubin	mg/dl	0.12	0-0.7
SGPT(ALT)	IU/L	64.2	12-130
SGOT (AST)	IU/L	**93.7**	0-48
Alkaline Phosphatase (ALP)	U/L	24.9	14-111
Total Protein	gm/dl	6.35	5.7-8.9
Albumin	gm/dl	2.57	2.2-4.0
Globulin	gm/dl	3.78	2.5-4.9
A/G Ratio		0.67	0.6-1.5

**********End of report**********

Comments:
Biochemistry done on byovet analyzer.

Reviewed by: Mr. Yash Dagur
M.Sc. (Microbiology)

Dr Akshay J Shah
M.V.Sc (Path) CVA C.Ac PGCVH

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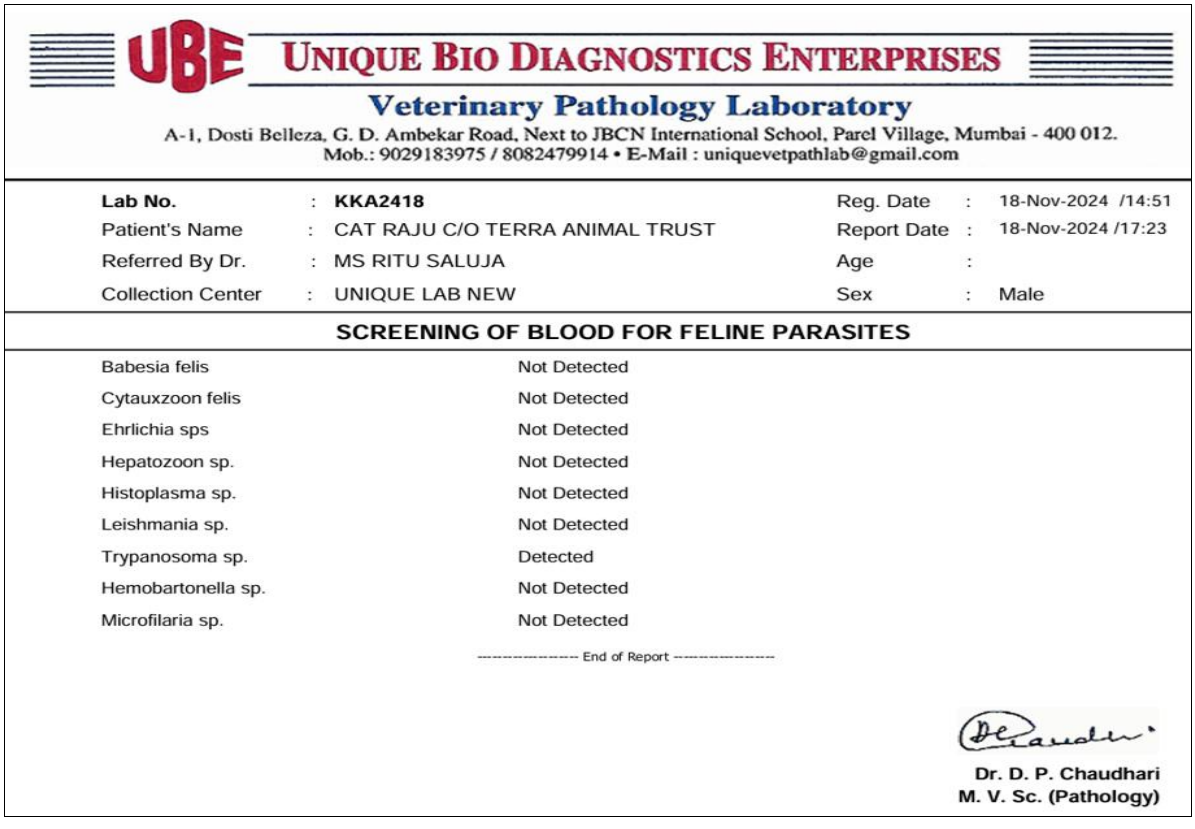
Fig 2b: Raju's LFT and KFT-slightly increased liver enzyme values (dated 18th November 2024)



UBE UNIQUE BIO DIAGNOSTICS ENTERPRISES

Veterinary Pathology Laboratory

A-1, Dosti Belleza, G. D. Ambekar Road, Next to JBCN International School, Parel Village, Mumbai - 400 012.
Mob.: 9029183975 / 8082479914 • E-Mail : uniquevetpathlab@gmail.com

Lab No.	:	**KKA2418**	Reg. Date	:	18-Nov-2024 /14:51
Patient's Name	:	CAT RAJU C/O TERRA ANIMAL TRUST	Report Date	:	18-Nov-2024 /17:23
Referred By Dr.	:	MS RITU SALUJA	Age	:	
Collection Center	:	UNIQUE LAB NEW	Sex	:	Male

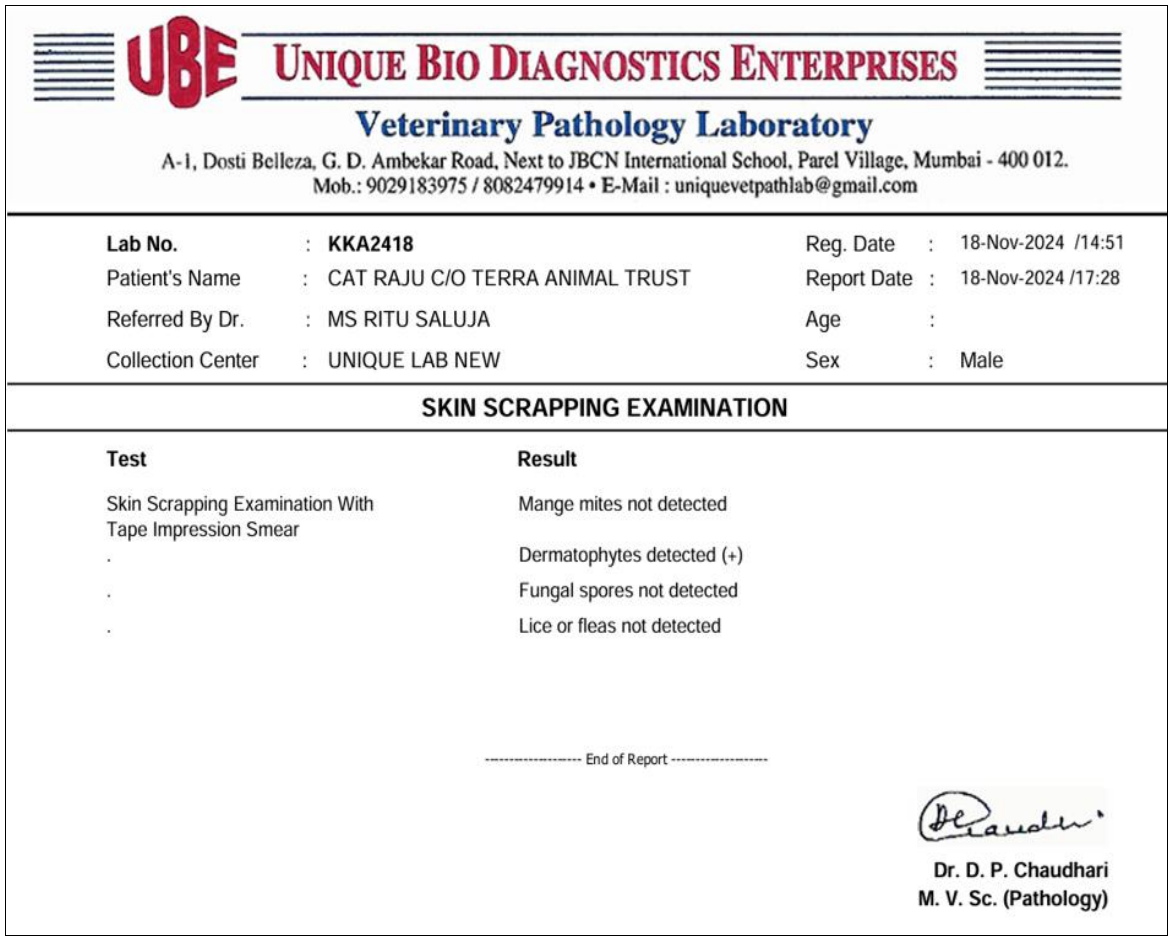
SCREENING OF BLOOD FOR FELINE PARASITES

Babesia felis	Not Detected
Cytauxzoon felis	Not Detected
Ehrlichia sps	Not Detected
Hepatozoon sp.	Not Detected
Histoplasma sp.	Not Detected
Leishmania sp.	Not Detected
Trypanosoma sp.	Detected
Hemobartonella sp.	Not Detected
Microfilaria sp.	Not Detected

---------- End of Report ----------

Dr. D. P. Chaudhari
M. V. Sc. (Pathology)

Fig 3: Raju's peripheral blood smear reports-positive for *Trypanosoma spp.* (dated 18th November 2024)



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Veterinary Pathology Laboratory

A-1, Dosti Belleza, G. D. Ambekar Road, Next to JBCN International School, Parel Village, Mumbai - 400 012.
Mob.: 9029183975 / 8082479914 • E-Mail : uniquevetpathlab@gmail.com

Lab No.	:	**KKA2418**	Reg. Date	:	18-Nov-2024 /14:51
Patient's Name	:	CAT RAJU C/O TERRA ANIMAL TRUST	Report Date	:	18-Nov-2024 /17:28
Referred By Dr.	:	MS RITU SALUJA	Age	:	
Collection Center	:	UNIQUE LAB NEW	Sex	:	Male

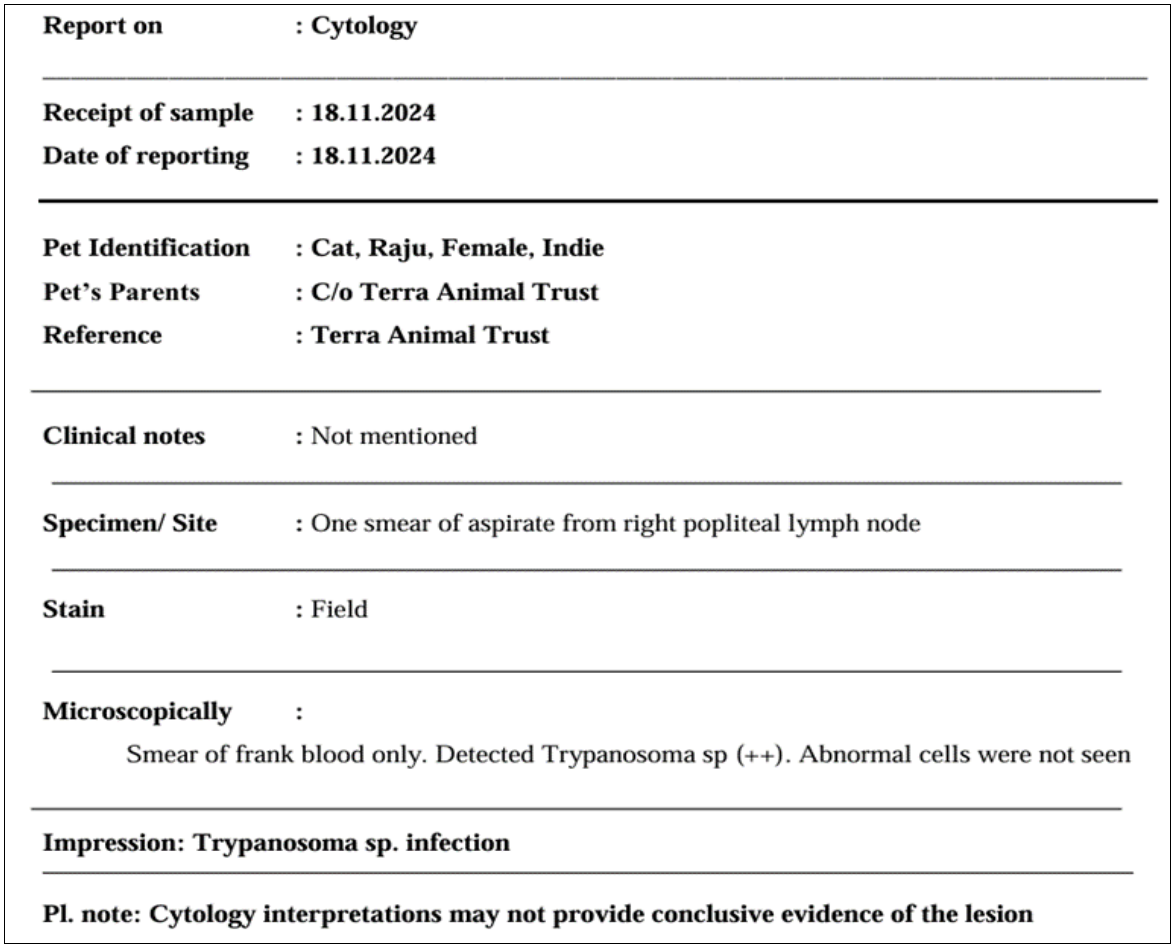
SKIN SCRAPPING EXAMINATION

Test	Result
Skin Scrapping Examination With Tape Impression Smear	Mange mites not detected
.	Dermatophytes detected (+)
.	Fungal spores not detected
.	Lice or fleas not detected

---------- End of Report ----------

Dr. D. P. Chaudhari
M. V. Sc. (Pathology)

Fig 4: Raju's tape smear reports-positive for dermatophytosis (Dated 18th November 2024)



Report on : **Cytology**

Receipt of sample : **18.11.2024**
Date of reporting : **18.11.2024**

Pet Identification : **Cat, Raju, Female, Indie**
Pet's Parents : **C/o Terra Animal Trust**
Reference : **Terra Animal Trust**

Clinical notes : Not mentioned

Specimen/ Site : One smear of aspirate from right popliteal lymph node

Stain : Field

Microscopically :

Smear of frank blood only. Detected Trypanosoma sp (++). Abnormal cells were not seen

Impression: Trypanosoma sp. infection

Pl. note: Cytology interpretations may not provide conclusive evidence of the lesion

Fig 5: Raju's right popliteal lymph node FNA-positive for *Trypanosoma spp.* (dated 18th November 2024)

Receipt of sample : **18.11.2024**
Date of reporting : **18.11.2024**

Pet Identification : **Cat, Raju, Female, Indie**
Pet's Parents : **C/o Terra Animal Trust**
Reference : **Terra Animal Trust**

Clinical notes : Not mentioned

Specimen/ Site : One smear of aspirate from left popliteal lymph node

Stain : Field

Microscopically :

1. Detected Trypanosoma sp (+). Abnormal cells were not seen
2. Plenty of round and oval; small and medium sized cells of lymphocytic series. Occasional larger cells were present. Nuclei showed regular contours and dark chromatin. A few nuclei showed granular chromatin; nucleoli were infrequently discernible. Occasional cells with irregular nuclear contours and / or unilateral cytoplasmic extensions were seen. Occasional abnormal mitoses were noted. Cytoplasm was scant, basophilic. Occasional cells showed eccentrically placed nucleus.

Impression: 1. Trypanosoma sp. Infection
2. Lymphoproliferative disorder

Pl. note: The cytology interpretations may not provide conclusive evidence of the lesion.

Fig 6: Raju's left popliteal lymph node FNA-positive for *Trypanosoma spp.* (dated 18th November 2024)

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TEST REPORT

Pet Name	: Raju	Source	: Critter Care Vet Clinic
Species	: Feline	Name of owner	: Terra Animal Trust
Breed	: Indie	Name of Doctor	: Dr. Ruchi L.
Sex	: Male	Sample Received on	: 10/12/2024
Age	:	Reported on	: 10/12/2024
Patient ID	: 00287	Lab No	: 202412509

BLOOD PERIPHERAL SMEAR REPORT

OBSERVATIONS

PARAMETERS	RESULT
Platelets *(Staining & Microscopy)*	4.87Lacs/cu mm Adequate.
Hemoprotozoan parasite	Not Seen.

**********End of report**********

Reviewed by: Mr. Yash Dagur
M.Sc. (Microbiology)

Dr Akshay J Shah
M.V.Sc (Path) CVA C.Ac PGCVH

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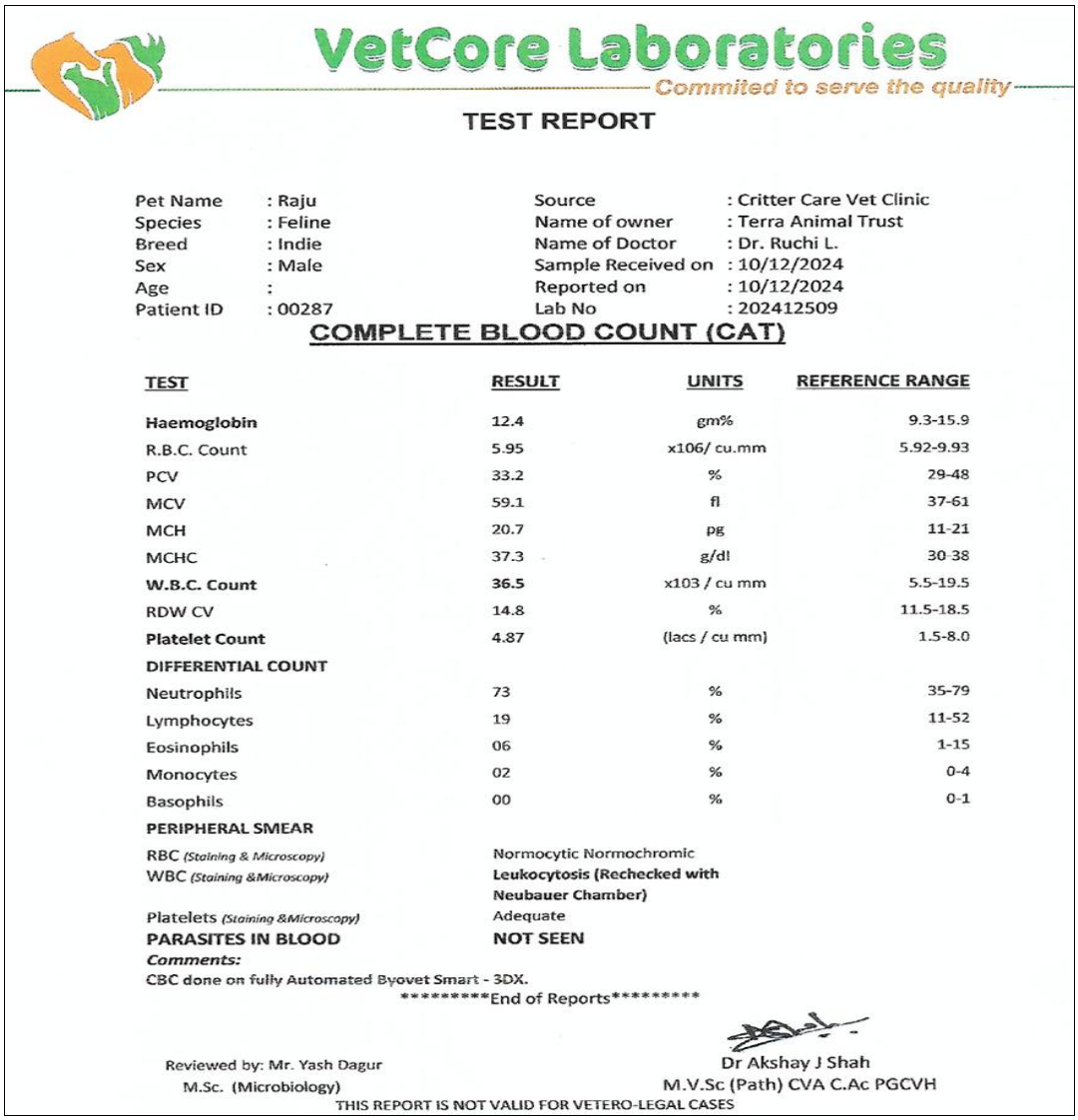
Fig 7a: Raju's peripheral reports-adequate thrombocytes and negative for hemoprotozoans (Dated 10th December 2024)



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TEST REPORT

Pet Name	: Raju	Source	: Critter Care Vet Clinic
Species	: Feline	Name of owner	: Terra Animal Trust
Breed	: Indie	Name of Doctor	: Dr. Ruchi L.
Sex	: Male	Sample Received on	: 10/12/2024
Age	:	Reported on	: 10/12/2024
Patient ID	: 00287	Lab No	: 202412509

COMPLETE BLOOD COUNT (CAT)

TEST	RESULT	UNITS	REFERENCE RANGE
Haemoglobin	12.4	gm%	9.3-15.9
R.B.C. Count	5.95	x106/ cu.mm	5.92-9.93
PCV	33.2	%	29-48
MCV	59.1	fl	37-61
MCH	20.7	pg	11-21
MCHC	37.3	g/dl	30-38
W.B.C. Count	**36.5**	x103 / cu mm	5.5-19.5
RDW CV	14.8	%	11.5-18.5
Platelet Count	4.87	(lacs / cu mm)	1.5-8.0
DIFFERENTIAL COUNT			
Neutrophils	73	%	35-79
Lymphocytes	19	%	11-52
Eosinophils	06	%	1-15
Monocytes	02	%	0-4
Basophils	00	%	0-1
PERIPHERAL SMEAR			
RBC *(Staining & Microscopy)*	Normocytic Normochromic		
WBC *(Staining &Microscopy)*	**Leukocytosis (Rechecked with Neubauer Chamber)**		
Platelets *(Staining &Microscopy)*	Adequate		
PARASITES IN BLOOD	**NOT SEEN**		

Comments:

CBC done on fully Automated Byovet Smart - 3DX.

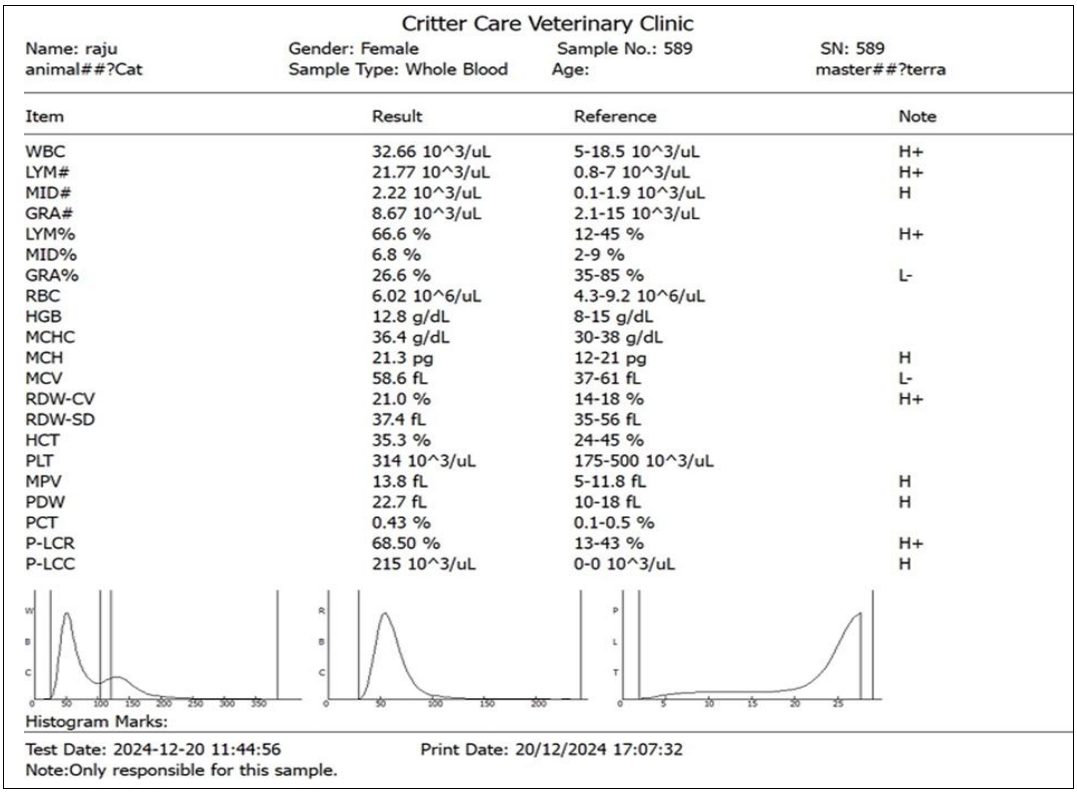
*********End of Reports*********

Reviewed by: Mr. Yash Dagur
M.Sc. (Microbiology)

Dr Akshay J Shah
M.V.Sc (Path) CVA C.Ac PGCVH

THIS REPORT IS NOT VALID FOR VETERO-LEGAL CASES

Fig 7b: Raju's CBC reports-adequate thrombocytes, leucocytosis (dated 10th December 2024)



Critter Care Veterinary Clinic

Name: raju	Gender: Female	Sample No.: 589	SN: 589
animal##?Cat	Sample Type: Whole Blood	Age:	master##?terra

Item	Result	Reference	Note
WBC	32.66 10^3/uL	5-18.5 10^3/uL	H+
LYM#	21.77 10^3/uL	0.8-7 10^3/uL	H+
MID#	2.22 10^3/uL	0.1-1.9 10^3/uL	H
GRA#	8.67 10^3/uL	2.1-15 10^3/uL	
LYM%	66.6 %	12-45 %	H+
MID%	6.8 %	2-9 %	
GRA%	26.6 %	35-85 %	L-
RBC	6.02 10^6/uL	4.3-9.2 10^6/uL	
HGB	12.8 g/dL	8-15 g/dL	
MCHC	36.4 g/dL	30-38 g/dL	
MCH	21.3 pg	12-21 pg	H
MCV	58.6 fL	37-61 fL	L-
RDW-CV	21.0 %	14-18 %	H+
RDW-SD	37.4 fL	35-56 fL	
HCT	35.3 %	24-45 %	
PLT	314 10^3/uL	175-500 10^3/uL	
MPV	13.8 fL	5-11.8 fL	H
PDW	22.7 fL	10-18 fL	H
PCT	0.43 %	0.1-0.5 %	
P-LCR	68.50 %	13-43 %	H+
P-LCC	215 10^3/uL	0-0 10^3/uL	H

Histogram Marks:

Test Date: 2024-12-20 11:44:56 Print Date: 20/12/2024 17:07:32

Note:Only responsible for this sample.

Fig 8: Raju's CBC reports-leucocytosis (Dated 20th December 2024)

Part II: Ovariohysterectomy

Raju was scheduled for a routine ovariohysterectomy (OVH) on 24th December 2024 prior to release into her original environment.

Following standard preoperative preparation, a ventral midline celiotomy was performed with an incision placed one inch caudal to the umbilicus. However, no uterine horns were identified, even after extending the incision.

Further abdominal exploration revealed a small, nodular, slightly oblong structure, morphologically resembling a testis, located at the expected anatomical position of the left ovary (Figure 9a). This structure was attached to a cord-like structure resembling the spermatic cord, which was ligated using chromic catgut (3-0 TRUGUT®; Healthium Medtech Limited) and excised.

Further intra-abdominal and intra-pelvic exploration did not reveal any additional testicular or female reproductive structures. However, on palpation of the right lateral perivulvar region, a firm, nodular structure was identified. A small incision over the area exposed a second identical structure, which was subsequently ligated and excised (Figure 9b). The excised gonadal structures were fixed in 10% neutral buffered formalin (NBF) and submitted for histopathological evaluation. Histopathology results dated 26th December 2024 confirmed the presence of azoospermic testicular tissue (Figure 10), supporting the diagnosis of male pseudohermaphroditism.

In this case, due to financial constraints, additional diagnostics such as *Trypanosoma spp.* PCR, hormonal assays, and genotype sequencing were not performed.

Fig 9: Gonadal structure located intra-abdominally (a); Gonadal structure located at the right lateral aspect of the vulva (b)

UNIQUE BIO DIAGNOSTICS ENTERPRISES

Veterinary Pathology Laboratory

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Mob.: 9029183975 / 8082479914 • E-Mail : uniquevetpathlab@gmail.com • Website : www.uniquevetpathlabs.com

Report on : **Histopathology**

Receipt of sample : **24.12.2024**
Date of reporting : **26.12.2024**

Animal ID : **Cat – Raju, Indie, Male**
Pet's Parents : **C/o Ritu Saluja**
Reference : **Terra Animal Trust**

Grossly :

Two small testicles (each measuring approximately 1.0 cm x 1.5 cm) were submitted post orchidectomy and scrotal ablation. Tunica albuginea was intact and the testicular surface was even. Cut sections showed even white surface. The epididymis was intact.

Microscopically :

Architectural pattern of the seminiferous tubules, rete testes, efferent ducts and testicular structures was well preserved. The seminiferous tubules showed a single spermatogonial layer, spermatogenesis was not evident. A few tubules showed minimally degenerative lining epithelium. Basement membrane of the tubules was moderately thickened. Interstitial tissue was meagre. The epididymis was devoid of sperms.

Impression: Azoospermic testis

(Slide & paraffin blocks enclosed: Preserve them for future reference)

Dr. D. P. Chaudhari
M.V. Sc. (Pathology)

Fig 10: Histopathology report for the excised gonadal structures-azoospermic testis (dated 26th December 2024)

Discussion

Feline trypanosomosis

Trypanosomosis, also known as Surra, is widespread throughout the tropical and subtropical regions of North America, Southeast Asia, as well as Central and South America [13, 14].

It is primarily transmitted via hematophagous vectors such as Stomoxys, Tabanus, and Triatomine bugs. Ingestion of carcasses from recently infected animals has also been recently suggested as a mode of transmission [1-4].

Clinical manifestations include acute febrile episodes, hyperthermia, anorexia, anaemia, lethargy, chronic wasting, lymphadenopathy, and neurological signs such as encephalitis, seizures, and ataxia [8, 15-18].

Trypanosomosis is found frequently in wild and domesticated animals such as deers, elephants, and domestic animals such as cattle and buffalo [19]. Amongst wild felids, few instances of deaths in tigers have been published in India [20,21], however, amongst domestic felids, documented cases of naturally occurring feline trypanosomosis include a total of only 13 reports across the globe, out of which, two reports are from India [6, 7]. To date, there is no definitive pathophysiological explanation for the infrequent occurrence of trypanosomosis in felids. It has however been hypothesized that their stronger immune systems aid in shielding them from the infection, however, no evidence has yet been published.

Detection of trypanosomes in Giemsa-stained thick and thin peripheral blood smears (collected from the ear vein), PCR, ELISA, immunofluorescent tests, or cerebrospinal fluid (CSF) analysis for patients with central nervous system involvement aid in diagnosis [3, 15].

The treatment protocol includes the use of trypanocidal or chemotherapeutic agents, such as dimidium bromide, potassium antimony tartrate, suramin, melarsamine, quinapyramine, homidium, diminazene aceturate, and isometamidium, with the latter six also exhibiting prophylactic potential [3, 22, 23], usually administered intramuscularly to avoid injection site/vascular wall necrosis [3].

The zoonotic potential of Trypanosomosis has been reported in South Asian countries, including India, with signs ranging from lethargy, headache, chronic fever, to death [24-26]. Atypical human trypanosomosis (aHT) due to *Trypanosoma evansi* is a newly emerging disease in India. Card agglutination test for trypanosomosis (CATT) revealed that 5.2% (9/173) of the individuals tested positive in West Bengal, whereas 4.5% (81/1806) of individuals tested positive in Maharashtra [27]. It is hence a notifiable disease and needs to be documented as and when found, especially in improbable circumstances.

Disorders of sexual development

Chromosomal sex is determined at the time of fertilization, when the zygote obtains a normal number of autosomal chromosomes and either two X chromosomes or an X and a Y chromosome [12]. Both XX and XY zygotes initially develop into sexually indifferent embryos. At this stage, the embryonic phenotype resembles the female form more closely.

Toward the end of this indifferent phase, the genital ridge (the precursor to the gonad) emerges. Removal of the genital ridge at this point results in the development of a female phenotype in both XX and XY embryos. This underscores the fact that while ovarian signals are not inherently required for female phenotypic development, testicular signals are required to drive male phenotypic development.

Gonadal sex development marks the conclusion of the embryonic indifferent stage, where the gonads become genetically committed to differentiating as either ovaries or testes [12]. Phenotypic sex development encompasses the formation of the remaining sexual characteristics and depends on the presence or absence of testicular secretions [12]. Changes in any of the steps of sexual development cause disorders of sexual development.

Male pseudohermaphrodites have a normal male karyotype (38, XY) and testes but have defects in either Mullerian duct regression or in androgen-dependent masculinization [12], thereby falling under the category of phenotypic abnormalities. Androgen receptor defects causing failure of androgen dependent masculinization (also known as testicular feminization) has been documented in dogs [28] and cats, the degree of which depends on the degree of loss of function in the androgen receptors [11].

Conclusion

Accurate diagnostics are essential in the clinical management of animals presenting with atypical or nonspecific signs. Establishing a definitive etiological diagnosis not only facilitates targeted and effective treatment for the affected individual(s), but also contributes to the broader scientific understanding of disease processes. This, in turn, enhances the collective veterinary knowledge base and supports the global advancement of evidence-based medical practices.

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Conflict of Interest

The authors declare no conflicts of interest.

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