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Radars used in War against Hemoparasitic Diseases in Livestock Animals

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ABSTRACT

Parasites can cause infection in both humans and animals. Common parasitic diseases in animals are Babesiosis, Anaplasmosis, Theileriosis, and Trypanosomiasis. *Theileria* is commonly transmitted by *Ixodes* ticks and can be diagnosed by Giemsa stained smear and Indirect Fluorescent Antibody Test. *Anaplasma* is transmitted by different species of ticks including *Dermacentor*, *Rhipicephalus*, *Boophilus*, *Ixodes*, and *Hyalomma*. It can be diagnosed mainly by inoculating the suspected animals' blood in a splenectomized calf and examining the calf's blood after a few weeks. *Babesia* is mainly transmitted by *Rhipicephalus*, *Boophilus*, and *Haemaphysalis*. This disease is diagnosed by various methods like Giemsa stained blood smear, ELISA, and inoculating suspected blood in splenectomized calves.

Introduction:

Parasites can cause infection in both humans and animals by using arthropods as vectors or by blood transfusion [1]. Commonly parasitic diseases of animals include trypanosomiasis, anaplasmosis, babesiosis, and theileriosis and are caused by Trypanosoma, anaplasma, babesia, and theileria respectively [2,3,4]. Clinical signs in acute stages of infection include fever, anorexia, abortion, and a decrease in productivity [5]. Various diagnostic procedures include blood smear tests, Polymerase Chain Reaction, Complement Fixation Test, and Enzyme-Linked Immunosorbent Assay. Serological techniques are more reliable than blood smear tests [6,7].

Theileriosis:

This disease is caused by the genus Theileria of the sub-order piroplasmorina. It is an obligate intracellular parasite that needs a host to complete its life cycle. The most important species include *T. parva*, *T. annulata*, *T. mutans*, *T. velifera* [8,9]. This disease is caused by *Ixodidae* ticks. *Theileria annulata* causes tropical theileriosis and is found in Southern Europe and the Mediterranean coast through the Middle East and North Africa. *T. mutans* and *T. velifera* are mainly found in Africa [10,11,12].

Diagnostic Techniques for Theilaria:

- **Giemsa Stained Smear:**
  When an animal is infected with *T. parva* and *T. annulata*, we will take a smear impression of the lymph node, liver, and spleen and observe it carefully. In acute infections, macro-schizonts will be noticed in the smear. But when an animal is infected with *T. mutans*, schizonts will be transitory and piroplasm is a pathogenic stage [13].
- **Nucleic Acid Based Test:**
  Polymerase Chain Reaction is commonly used in detecting the carrier state of Theilariosis. PCR performed on blood smear needs only erythrocytic merozoites rather than schizonts [13].
- **Indirect Fluorescent Antibody Test:**
  This test is based on schizonts derived from an infected animal and detected a specific amount of antibodies in an animal that is attenuated with schizonts [13]. It is useful in detecting carriers of *T. annulata* but sometimes fails to detect infected individuals because the antibodies last for variable periods of time. This test has limitations in detecting the disease because of problems of cross-reactivity in different *Theilaria* species [13, 14, 15].

Anaplasmosis:

It is commonly known as Gall sickness, and is caused by an intraerythrocytic organism of the genus *Anaplasma* [16,17]. Common species of Anaplasma include; *Anaplasma marginale* which causes clinical anaplasmosis and Anaplasma centrale which causes mild anaplasmosis [18]. Anaplasma is transmitted by Boophilus, Dermacentor, Rhipicephalus, Ixodes, Hyalomma, and Ornithodoros [16,19]. It is commonly found in temperate climate areas and mechanically transmitted by biting flies and mosquitoes. It can also be transmitted by using contaminated syringes and different surgical instruments [16,20]. Young calves are less susceptible than older cattle but splenectomized calves are more susceptible than older ones.

Diagnostic Techniques for Anaplasmosis:

- **Giemsa Stained Blood Smear:**
  We can diagnose the parasite by forming a thin blood smear; for this, we can take blood from the ear vein and tip of the tail vein. As *Anaplasma does* not accumulate in capillaries like babesia so we can also take the sample from the jugular vein [21]. This test is commonly used in the diagnosis of *anaplasma* but it is not very rapid and accurate like other diagnostic techniques.
- **Nucleic Acid Based Test:**
  For this, a DNA test is performed to detect *Anaplasma marginale* DNA in the bloodstream of an infected individual [22]. It can be detected by using a radioactive RNA probe that can detect parasitemia as low as 0.000025% [23] and can also be identified by using a cloned DNA probe [24].
- **Inoculation of suspected blood in splenectomized calf:**
  This is the most expensive but reliable diagnostic method and is used in latent infection. For this, 500ml of the donor's blood is inoculated in a splenectomized calf, and then examine the calf's blood after every 2-3 days by forming a smear. If the donor is infected then the recipient will also get an infection within 4 weeks or up to 8 weeks [25].
- **Complement Fixation Test:**
  In this test, a false-negative Test will occur because the antibody titer is higher in the active phase of the disease and relatively low in carrier animals. False positive tests will occur because of erythrocytic contamination of *A. marginale* antigen and antibodies to blood in the sera of some cattle [12,25].
- **Card Agglutination Test:**
  It is a sensitive test and can give results within minutes. But, non-specific reactions may occur because this test is an agglutination of *A. marginale* [26].

Babesiosis:

Babesiosis is caused by the intra-erythrocytic parasite of the genus *Babesia*. Four major species of *Babesia* are *B. bovis*, *B. bigemina*, *B. divergens*, *B. major* [27,28]. *Babesia bovis* and *Babesia bigemina* are more prevalent in tropical and sub-tropical areas which include Africa [29]. It causes high fever, anorexia, hemoglobinuria, tachycardia, pale mucous membrane, and sometimes, nervous signs due to the presence of parasites in cerebral capillaries [12]. It is commonly transmitted by *Boophilus*, *Haemaphysalis*, and *Rhipicephalus*.

Diagnostic Techniques for Babesiosis:

- **Giemsa Stained Blood Smear:**
  This is a very easy method to detect *babesia* in blood. If an animal is infected with *B. bigemina*, the parasite can easily be diagnosed even at a very low level due to its morphology [12]. But, if an animal is infected with *B. bovis*, death may occur without the detection of parasites in peripheral blood.
- **Inoculation of Suspected blood in splenectomized calves:**
  For the detection of carrier animals, we inoculate the blood of animals in splenectomized calves and then note the tick feeding by microscopical blood examination and transfer of ticks to inoculating individual [30].

Conclusion:

We can diagnose the clinical parasitic infection by using the Giemsa stain but it is not reliable to diagnose the sub-clinical infection. Therefore, to diagnose the sub-clinical infection, we will go for various serological techniques including Polymerase Chain Reaction, Complement Fixation

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Test, Enzyme-Linked Immunosorbent Assay, and Card Agglutination Test.

References

[1] Salih DA et al., 2015. Diagnostic approaches for tick borne haemoparasitic dis_eases in livestock. *Journal of Veterinary Medicine and Animal Health* 7(2): 45-56.
[2] Tewari AK et al., 2001. Identification of immunodominant polypeptides common between Babesia bigemina and Theileria annulata. *Indian Journal of Animal Sciences* 71: 679-680.
[3] Singh H et al., 2007a. A PCR assay for detection of Babesia bigemina infec_tion using clotted blood in bovines. *Journal of Applied Animal Research* 32: 201-202.
[4] Singh H et al., 2009. Comparison of indirect fluorescent antibody test (IFAT) and slide enzyme linked immunosorbent assay (SELISA) for diagnosis of Babesia bigemina infection in bovines. *Tropical Animal Health and Production* 41(2): 153-159.
[5] Guan G et al., 2010. Molecular evidence of experimental transmission to sheep by Haemaphysalis qinghaiensis and Haemaphysalis longi_cornis. *Parasitology International* 59: 265-267.
[6] Gale K et al., 1996. Anaplasma marginale: Detection of carrier cattle by PCR-ELISA. *International Journal for Parasitology: Parasites and Wildlife*26:1103–1109.
[7] Zahid IA et al., 2005. Incidence and Treatment of Theileriosis and Babesiosis. Research Institute for Physiology of Animal Reproduction Bhunikey, (Pattoki), District Kasur, Pakistan. *Pakistan Veterinary Journal* 25 (3):137-141.
[8] Radostits OM et al., 2006. Veterinary Medicine. A text book of the Disease of Cattle, horses, sheep, pigs and goats. Tenth Edi. Oxford; New York, Pp 1462-1468.
[9] Brown C, 2008. Tropical theileriosis. In: Foreign animal diseases. 7th Edition; Boca Raton, FL: United States Animal Health Association, Pp 405-9.
[10] Solomon G et al., 1998. Insect Science and its application. *Journal of Ethiopian Veterinary Association* 18 (2, 3): 59-66.
[11] Pipano E and Shkap V 2004. Theileria and Tropical theileriosis. In: Coetzer JA, Tustin RC (eds) Infectious diseases of livestock. Oxford University Press., 1:486-487.
[12] Radostits OM et al., (2006): Veterinary Medicine. A text book of the Disease of Cattle, horses, sheep, pigs and goats. Tenth Edi. Oxford; New York, Pp 1462-1468.
[13] Rowlands GJ et al., 2000. A statistically derived index for classifying East Coast fever reactions in cattle challenged with Theileria parva under experimental conditions. *Parasitology* 120: 371–381.
[14] D'Oliveira C et al., 2006. Detection of Theileria annulata in blood samples of carrier cattle by PCR. *The Journal of Clinical Microbiology* 33: 2665–2669.
[15] Pipano E and Shkap V, 2006. Tropical Veterinary Diseases. Control and Preventions in the Context of the new world order, Vaccination against Tropical Theileriosis, Pp 484-500.
[16] Aiello SE and Mays A 2007. The Merck Veterinary Manual, Bovine Babesiosis, 10th edition, Whitehouse Station, NJ: Merck and Co., Pp. 23–25.
[17] Silke P, 2009. Occurrence of tick borne haemoparasites Kwazulu-Natal and Eastern Cape Provines, South Africa. M.Sc. Thesis (Veterinary Tropical Diseases), F.V. Science, University of Pretoria, South Africa, Pp 6-7.
[18] Kocan KM et al., 2003. Antigens and alternatives for control of anaplasma marginale, Infection in cattle. *Clinical Microbiology Reviews*16: 698-712.
[19] Scott Moses MD, 2011. Infectious Disease book. Vector borne disease, tick borne-diseases. *Protozoan infection unified medical language system* 13-15.
[20] Gerald LS et al., 2000. Anaplasmosis. Kansas State University; AgriculturalExperiment Station and Cooperative Extension Service. Extension Districts, and United States Department of Agriculture Cooperating.
[21] Johnston LA et al., 2000. A comparison of direct fluorescent antibody and Giemsa staining for the post-mortem diagnosis of anaplasmosis. *Australian Veterinary Journal* 56:116–118.
[22] Eriks I et al., 1989. Detection and quantitation of Anaplasma marginale in carrier cattle by using a nucleic acid probe. *European Journal of Clinical Microbiology* 27: 279–284.
[23] Figueroa J et al., 1999. Multiplex PCR for the detection of B. bigemina, B. bovis and A. marginale DNA in bovine blood. *Veterinary Parasitology*50: 69–81.
[24] Gale K et al., 1996. Anaplasma marginale: Detection of carrier cattle by PCR-ELISA. *International Journal for Parasitology: Parasites and Wildlife* 26: 1103–1109.
[25] Bradway DS et al., 2001. Sensitivity and specificity of the complement fixation test for detection of cattle persistently infected with Anaplasma marginale. *The Journal of Veterinary Diagnostic Investigation*13: 79-81.
[26] Kocan KM et al., 2000. Anaplasmosis control: past present and future. *Annals of the New York Academy of Sciences*916: 501-509.
[27] Callow L et al., 1997. Development of effective living vaccines against bovine babesiosis - the longest field trial. *International Journal for Parasitology: Parasites and Wildlife* 7: 747-767.
[28] Zintl A, 2003. Babesia divergens. A bovine blood parasite of Veterinary and Zoonotic importance. *Clinical Microbiology Newsletter*16: 622-636.
[29] Office of International des Epizooties (2005): Theileriosis. Terrestrial Animal Health Code 2005, Chapter 2.3.11.
[30] Jorgensen WK et al., 2004. Use of in vitro culture to isolate Babesia bovis from Theileria buffeli and Anaplasma species. *Veterinary Parasitology* 53: 45–51.