International Journal of Veterinary Sciences and Animal Husbandry 2018; 3(2): 16-19

ISSN: 2456-2912
VET 2018; 3(2): 16-19

www.veterinarypaper.com
Received: 12-01-2018
Accepted: 16-02-2018

Walid S Mousa
Department of Animal Medicine and Infectious Diseases, Faculty of Veterinary Medicine, University of Sadat City, Egypt.

Eman-abdeen
Department of Animal Medicine and Infectious Diseases, Faculty of Veterinary Medicine, University of Sadat City, Egypt.

Correspondence
Walid S Mousa
Department of Animal Medicine and Infectious Diseases, Faculty of Veterinary Medicine, University of Sadat City, Egypt.

Review: overview on bovine dermatophytosis

Walid S Mousa and Eman-abdeen

Abstract
Dermatophytosis or known as (Ring worm) is a major contagious fungal disease affecting cattle of worldwide distribution. It invade and digested the keratinized tissues of skin and hair of host causing severe skin damage. Sever economic losses including damage or low grade type of skin besides the reduction of meat and milk production. Moreover, contagiousness of this disease due to its zoontic and public health concern to human throw direct or indirect contact with infected animals or materials. *T. verrucosum* considered a common fungi causing ringworm in cattle which characterized by rapidly spreading among susceptible animals. Longevity of Spores of *T. verrucosum* in different environmental conditions appear to be a big obstacle that prevent its eradication from the environment and difficulty of treatment. Mycological examination as well as Molecular techniques as PCR were used effectively for diagnosis the disease in suspected cases. Recently, new modern alternative methods for treatment were applied as use of some plant extract or essential oils to avoid problems and side effects of traditional antifungal therapy. This review provide update information about some important points in risk factors and new trend in control of bovine dermatophytosis.

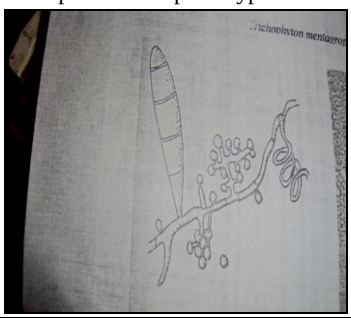
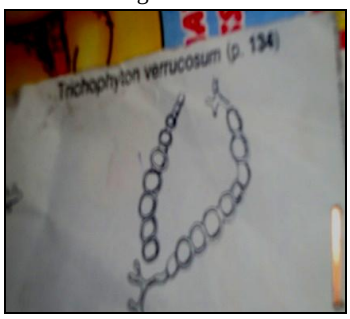
Keywords: ring worm, *T. verrucosum*, skin, PCR, cattle

Introduction
Dermatophytes are a group of fungi that classified according to microconidia shape into three main genera (*Epidermophyton*, *Microsporum* and *Trichophyton*) that affecting superficial layers of skin and hair in animals and man. Almost 40 dermatophyte species were identified (Smith and McGinnis, 2011) [35]. Only, three genera (Trichophyton, Microsporum and Epidermophyton) are known to be pathogenic for human and animals (Weitzman and, Summerbell, (1995) [37]. The high prevalence of dermatophytosis recently may be attributed to intensive use of corticosteroids and poorly hygienic management for animals (Woodfolk, 2005) [38]. Dermatophytes have the ability to invade as well as borrow the skin layers of host, particularly the superficial layers that rich in keratin-content (Fernandes *et al.*, 2001) [20], although deep layers may be occasionally involved in some sever complicated cases. The diseased animals, infected materials and contaminated environment act as the main source and reservoir for infection among susceptible hosts throw direct or indirect contact (Murray *et al.*, 2005) [28]. The disease appear to be more predominant in poorly closed housed animals (Al-Ani *et al.*, 2002) [3], particularly, in worm humid climate countries that allowed and favored spore formation and consequently highly infection (Radostits *et al.*, 2007) [31]. Dermatophytosis mainly affected cattle especially young calves, which have high skin PH and immune system is remain less developed (Radostits *et al.*, 1997) [30], infection to other animals as small ruminants and human has been reported (Ming *et al.*, 2006) [26].

Etiology
Dermatophytes are divided into three main types according to habitat, geophilic (soil), anthrophilic (man) and zoophilic (animal). *T. verrucosum* belong to zoophilic type that considered the main frequently fungi responsible for ringworm in cattle (*Abou-Eisha*, 2008; El-Diasty *et al.* 2013) [1], although T. mentagrophytes may also causing such disease in cattle and to less extend M. canis. There are difference between these species in diagnostic culturing and examination as shown in the blow table (1). Moreover, *T. verrucosum* can remain infective in environment for long periods (5-7) years

(Mahmoudabadi and Zarrin, 2008; Singh and Kushwaha, 2010) [24, 34], thus, prevent complete eradication and control of the disease in farm animals. The pathogensis of dermatophytes begins firstly from contact between skin abrasion of host and contaminated environment or infected animal lesion containing arthrocondia, which germination occur in hair follicles then the invasion the cell wall of skin (stratum corneum) with digestion of keratin content and highly formation of hyphea and conidia (ecto or endothrix). The growing hair carrying fungal elements (ecto or endothrix) leading to rapid spreading of infection in form of ring shape lesion covered by scales and crusts that may coalescence together forming large area of alopecia. Moreover skin hyperkertosis may developed (Radostits *et al*. 2007) [30].

Table (1): differences in growth and morphological characters of *T. verrucosum*, *T. mentagrophytes* and M. canis

Points of differences	**M. canis**	***T. mentagrophytes***	***T. verrucosum***
Growth at 37 ^{0}C	No	No	Growth
Microconidia	Few	Abundant	Abundant
Vitamins requirement	None	None	Need Thiamine and inositol
Colony morphology on SDA	Dense cottony	White Powdery or granular surface	White to yellow Glabrous, heaped up and folded
Microscopically	Typical spindle shape macroconidia 	Elongated macroconidia with numerous microconidia and presence of piral hyphae 	Ch by formation of Chlamydospores arranged in chains 

Clinical signs and epidemiology of the disease

Description of typical ringworm lesion that reported in previous studies in Egypt by El-Sherif (1990) and El-Attar (1992) [13] and in other countries (Cam *et al*. 2007; Akbarmehr, 2011) [8, 2], all described the skin lesion of dermatophytosis as a circular or circumscribed plaques of alopecia (1-5 inches), which may gathered to each other forming large irregular area of gryish-whitish colour, thick scabs that usually firmly attached to the skin, particularly distributed in head, neck, face and around eyes as showed in photo (1&2). The presence of lesion on face and around eyes may act as source of new infection throw animal habit of licking and grooming. Other frequent studies supposed the higher incidence of ringworm lesions on the flank and back areas as these sites are more exposed to contamination, injuries and wetness than other body parts (Swai and Sanka, 2012) [36]. The frequency and distribution of infection influenced by host factors (age, stress, transportation and management), geographic area and climate condition (Al-Rubiay *et al*. 2006) [4]. The factors as species, numbers and age of animal besides environmental aspects will serves a significant role in dermatophytes infection and incidence (Nassif and Osman, 2003) [29]. Furthermore, calves of less than one year was more affected age among animals which explained that ill developed immune system not exposed to previous infection (Nassif and Osman, 2003 and Cafarchia *et al*. 2004) [29, 7]. Regarding to the sex factor on dermatophyosis prevalence, males reported to be more affected higher than females, this could be Attributed to, program of farm fatting mainly acting only on males calves of closely contact to each other (Cafarchia *et al*. 2004) [7]. Adult animals of non-symptomatic lesions appear to carry and spread the infection to young calves during early stage of their life (Singh and Kushwaha, 2010) [34].

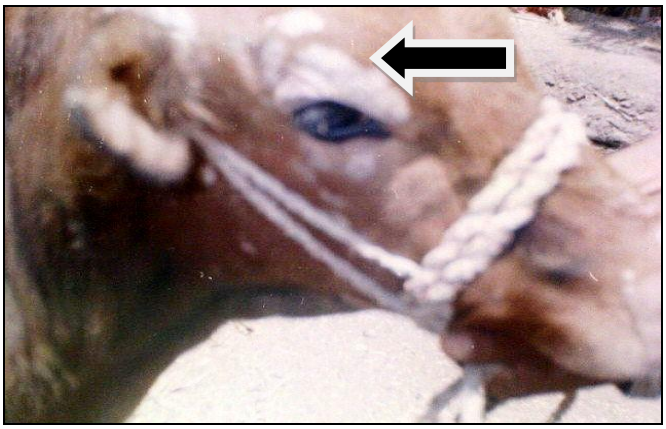


Photo (1): showing cow suffering from ringworm in face and around eyes

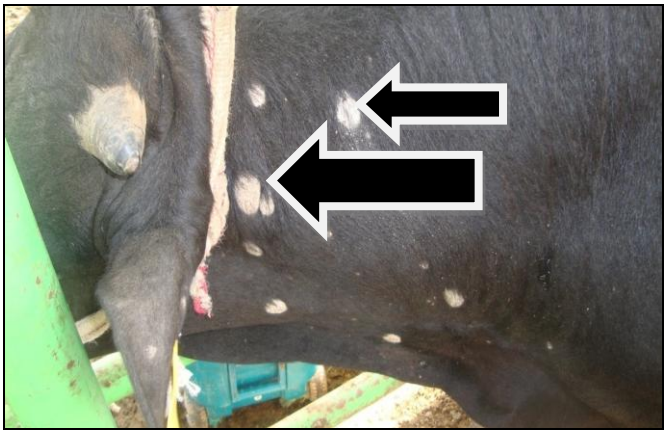


Photo 2: showed ring worm I neck region (gryish-whitish circumscribed lesion, above the skin)

Diagnostic methods for identification

Firstly, diagnosis of ringworm in cattle based on clinical signs, demonstration of *T. verrucosum* by direct microscopic examination and definitive isolation on specific medium (Dalis *et al*. 2014; Swai and Sanka, 2012; Cam *et al*. 2007) [11, 36, 8]. Examination of *T. verrucosum* by 20% KOH was a routine laboratory procedure was classically applied in dermatophytes suspected lesions, briefly 20% KOH (one drop) put on a microscopic slide with 1cm of lesion(skin scraped) was added with gently heating and applied a cover slip. Then, after 2 h, examine the slide for the presence of arthrospores and hyphae (ecto and endothrix) under a light microscope according to (Ellis *et al*. 2007) [14]. Then, laboratory identification through isolation on Sabauroud dextrose agar (SDA) containing chloramphenicol and actidion incubated at 37°C for 3-4 weeks, followed by examination of culture characters including (texture, shape and color), pigment production and microscopical features of spores as described by (Ellis *et al*. 2007; Cowen, 1990) [14, 10]. The main culture characters of *T. verrucosum* showed, very slow growing white, cottony, heaped up, button like with folded and non-pigmented reversed side colonies (Eman-abdeen, 2011; Dalis *et al*. 2014) [16, 11]. In contrast to microscopical picture, *T. verrucosum* apper as septated hyphae and microconidia with presence of chlamydospores which arranged in chain as described by (Forbes *et al*. 2002; Shams-Gahfarokhi *et al*. 2009) [21, 32] with characteristic shape of microcondia which give calvate to pyriform shape (Eman-abdeen, 2011; Swai and Sanka, 2012) [16, 36], or thin wall of cigar shape (Mucoma, 2000) [27]. The phenotypic characteristics of dermatophyte are influenced by environmental, nutritional and chemical factors besides time consuming in traditional method. So, molecular methods to identify dermatophytes become more likely used (Liu *et al*. 2000b) [23]. These techniques as PCR have been efficiently used for identification of dermatophyte species which proved to be more specific, accurate and stable than phenotypic characterization (Gräser *et al*. 2000) [22]. PCR able to detected species-specific DNA polymorphisms in dermatophyte species through characteristic patterns of each species (Faggi *et al*. 2001) [18]. As well as random amplified polymorphic DNA (RAPD), multiplex PCR and Specific nucleotide sequence are used as helpful advanced methods for detection of dermatophytes species and sub-species as well as in epidemiological parameters control (Faggi *et al*. 2001; Dhib *et al*. 2014) [18, 12].

Photo 3: T. verrcusum showing very slow growing, with heaped up, button like appearance folded white colored colony

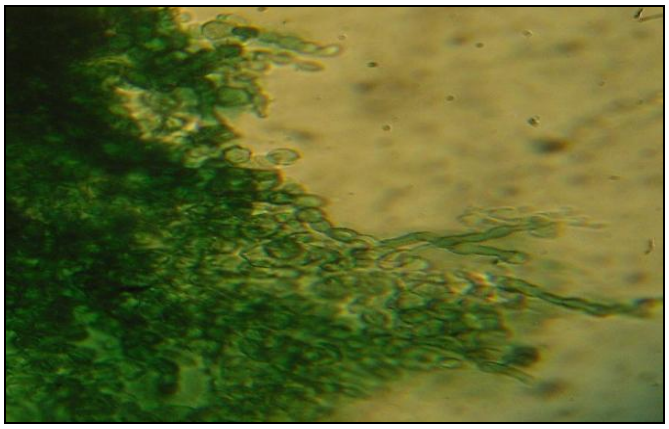


Photo 4: showing typical chains of chlamydoconidia of *T. verrucosum*

Treatment and Control

The disease is self-limiting and spontaneous recovery usually occur in mild cases, although, some topical iodine and sulpher preparation are applied for treatment of severely affected lesions. Remove the scales and crusts before applying of ointment preparation is recommended. The systemic antifungal therapy that used for dermatophytes infection may left some residues problems or toxic effect on animals or human body (Araujo *et al*. 2009) [6]. The high cost of treatment, economic losses, long course of treatment and its public health importance activated more concern for development of natural plant extract of antifungal activity that effective and less toxic. Such natural plants include garlic, lemon grass, datura, acacia, a triplex, ginger, black seed, neem, basil, eucalyptus, alfalfa and basil (Aly and Bafiel, 2008) [5]. The properties of these plants should be safe, economic and easily applied under field conditions (Shelef, 1983) [33]. Extraction of a new compounds from plants have been recently used for treatment of some infectious diseases (Fardos, 2009) [19]. For example, Clove oil proved highly effective antifungal activity against Dermatophytes species *in vitro* and can used as a topical spray and ointment for treatment of dermatophytes in cattle and guinea-pigs as reported by (Eman-abdeen and El-Diasty, 2015 and chee and Lee *et al*, 2007) [17, 9] respectively. A new trend for control of animal ring worm through immunization of young calves by live *T. verrucosum* strain which gave a good protection against ringworm as early reported by (Eman-abdeen, 2011; Mikaili *et al.* 2012) [16, 25].

Conclusion

This review spot high lights on bovine dermatophytosis and the main etiology as well as the descriptive clinical lesion. Also provide a considerable knowledge about the laboratory methods and advanced tools for rapid diagnosis of dermatophytosis. As well as it discuss the new trend in control of this disease by compounds from medical plants.

But, more research should be investigated the interaction of these compounds and the evaluated its activity and pharmacological properties with comparing with traditional drugs.

References

1. Abou-Eisha AM, Sobih MA, Hanaa MF, Heba SE. Dermatophytes in animals and their zoonotic importance in Suez Canal area. SCVMJ, 2008, XIII(2).
2. Akbarmehr J. The prevalence of cattle ringworm in native dairy farms of Sarab city (East Azarbayjan

Province) in Iran. Afr. J Microbiol. Res. 2011; 5(11)1268-1271.
3. Al-Ani FK, Younes FA, Al-Rawashdeh OF. Ringworm Infection in Cattle and Horses in Jordan. Acta. Vet. Brno. 2002; 71:55-60.
4. Al-Rubiay KK. Dermatoepidemiology: A household survey among two urban areas in Basra city, Iraq. Int J Dermatol. 2006; 4:1-4.
5. Aly MM, Bafiel S. Screening for antimicrobial activity of some medicinal plants in Saudi Arabia. World conference on medical and aromatic, 2008.
6. Araujo CR, Miranda KC, Fernandes OFL, Soares AJ, Silva MR. *In vitro* susceptibility testing of dermatophytes isolated in Goiania, Brazil, against five antifungal agents by broth microdilution method. Rev. Inst. Med. trop. S. Paulo. 2009; 51:9-12.
7. Cafarchia C, Romito D, Sasanelli M, Lia R, Capelli G, Otranto D. The epidemiology of canine and feline dermatophytoses in southern Italy. Mycoses. 2004; 47(11-12):508-13.
8. Cam Y, Gümüssoy KS, Kibar M, Apaydin N, an Atalay. Efficacy of ethylenediamine dihydriodise for the treatment of ringworm in young cattle. Vet. Rec. 2007; 160:408-410.
9. Chee HY, Min Hee Lee MH. Antifungal Activity of Clove Essential Oil and its Volatile Vapour against Dermatophytic Fungi. Mycobiology. 2007; 35(4):241-243.
10. Cowen P. Microscopy of skin scrapings for dermatophyte diagnosis. Aust. Fam. Physician. 1990; 19(5):685-690.
11. Dalis JS, Kazeem HM, Kwaga JKP, Kwanashie CN. An outbreak of ringworm caused by Trichophyton verrucosum in a group of calves in Vom, Nigeria. Afr. J Microbiol. Res. 2014; 8(8):783-787.
12. Dhib I, Fathallah A, Yaacoub A, Hadj Slama F, Said MB, Zemni R. Multiplex PCR assay for the detection of common dermatophyte nail infections. Mycoses. 2014; 57(1):19-26.
13. El-Attar AA. Characters of zoophilic dermatophytes commonly attacking man in Suez Canal and Sinai districts. Ph.D. Thesis (Microbiology), Fac. Vet. Med. Suez Canal Univ, 1992.
14. Ellis D, Davis S, Alexiou H, Handke R, Bartley R. Description of medical Fungi. Mycology Unit, Women's and Children's Hospital, North Adelaide, 2007.
15. Eman ME, Ahmed MA, Nagwa O, Salwa FM, Samaa IE, Hanaa MA *et al*. Antifungal activity of zinc oxide nanoparticles against dermatophytic lesions of cattle. Romanian j biophys, Bucharest. 2013; 23(3):191-202.
16. Eman-abdeen E. Studies on the evaluation of the Immune response to Some Fungal Vaccines. Ph.D. Thesis (Microbiology), Fac. Vet. Med. Minufiya University, 2011.
17. Eman-abdeen E, El-Diasty EM. Antifungal Activity of Clove Oil on Dermatophytes and Other Fungi. International Journal of Advanced Research. 2015; 3(12):1299-1305.
18. Faggi E, Pini G, Campisi E, Bertellini C, Difonzo E, Mancianti F. Application of PCR to distinguish common species of dermatophytes. J Clin. Microbiol. 2001; 39:3382-3385.
19. Fardos MB. Antifungal activity of some medicinal plants used in Jeddah, Saudi Arabia. Mycopath. 2009; 7(1):51-57.
20. Fernandes NC, Akiti T, Barreiros MG. Dermatophytoses in children: Study of 137 cases. Revista do Instituto de Medicina Tropical de Sao Paulo. 2001; 43:83-85.
21. Forbes BA, Sahm DF, Weissfeld AS. Laboratory Methods in Basic Mycology. In Bailey and Scott's Diagnostic Microbiology 11th edition, Mosby Inc, 11830 west line Industrial Drive St. Louis, Missouri 63146, US a, 2002.
22. Gräser Y, Kuijpers AF, Presber W, de Hoog GS. Molecular taxonomy of the *Trichophyton rubrum* complex. J Clin. Microbiol. 2000; 38:3329-3336.
23. Liu D, Coloe S, Baird R, Pederson J. Rapid mini-preparation of fungal DNA for PCR. J Clin. Microbiol. 2000; 38:471.
24. Mahmoudabadi AA, Zarrin M. Isolation of dermatophytes and related keratinophilic fungi from the two public parks in Ahvaz. Jundishapur J Microbiol. 2008; 1(20): 20-23.
25. Mikaili A, Chalabi M, Ghashghaie A, Mostafaie A. Immunization against bovine dermatophytosis with live *Trichophyton verrucosum*. Afr. J Microbiol. Res. 2012; 6(23):4950-4953.
26. Ming PX, Ti YLXm Bulmer GS. Outbreak of Trichophyton verrucosum in China transmitted from cows to humans. Mycopatho-logia. 2006; 161:225-228.
27. Mucoma FS. Dermatophytes: Their Taxonomy, Ecology and Pathogenicity. Department of Biological Sciences, University of Botsuana, Gaborone, 2000, 1-10.
28. Murray PR, Rosenthal KS, Pfaller MA. Superficial and cutaneous mycosis. In: *Medical Microbiology*, 5th edition. Philadelphia, USA, 2005, 745-751.
29. Nassif MM, Osman SA. An outbreak of dermatophytosis in goat kids. Assiut Vet. Med. J, 2003; 49(99):142-155.
30. Radostits OM, Blood DC, Gay CC. Veterinary Medicine, 10th Ed, Bailliere Tindall, London, 1997.
31. Radostits OM, Done SH. Veterinary medicine: a textbook of the diseases of cattle, sheep, pigs, goats, and horses. Elsevier Saunders, Oxford, UK, 2007.
32. Shams-Gahfarokhi M, Mosleh TF, Ranjbar BS, Razzaghi AM. An epidemiological survey on cattle ringworm in major dairy farms of Mashad city, Eastern Iran. Iran. J Microbiol. 2009; 1(3):31-36.
33. Shelef LA. Antimicrobial effects of spices. J. Food Safety. 1983; 6:29-44
34. Singh I, Kushwaha RKS. Dermatophytes and related fungi in soils of parks and agricultural fields of Uttar Pradesh. Indian Journal of Dermatology. 2010; 53:306-308.
35. Smith MB, McGinnis MR. Dermatophytosis in Tropical Infectious Diseases (Third Edition), 2011.
36. Swai ES, Sanka PN. Bovine dermatophytosis caused by trichophyton verrucousum: A case report. Vet. Wod. 2012; 5(5):297-3.
37. Weitzman I, Summerbell RC. The dermatophytes. Clin Microbiol Rev. 1995; 8:240-25.
38. Woodfolk JA. Allergy and dermatophytes. Clin. Microbiol. 2005; Rev. 18(1):30-43.