

An Over View of Dermatophytosis in Rabbits

Abstract:

Dermatophytosis is a fungal infection of the skin caused by dermatophytes-filamentous fungi which have ability to invade the epidermis and keratinized structure derived from it such as hair or nails. Rabbits are one of dermatophytes host; young rabbit below 12 months of age were more frequently affected with the disease. *T. mentagrophytes* is the most common dermatophytes isolated species. The disease can be diagnosed by direct examination, fungal culture, skin biopsy sero and molecular diagnosis methods. This overview will forecast more light of the different aspects of this disease.

Key words:

Dermatophytosis,Rabbit,Clinical feature, Diagnosis.Treatment

Introduction:

Rabbits are calm by nature. They are prone to many bacterial, fungal or parasitic skin diseases if proper care is not taken. Among them dermatophytosis is one of the most common diseases [1]. Dermatophytosis is a superficial cutaneous infection with one or more of the fungal species in the keratinophilic genera *Microsporum*, *Trichophyton*, or *Epidermophyton* [2, 3]. Young or immune compromised rabbits are most susceptible to the disease [4]. Dermatophytosis is a zoonotic disease so it has important implications in public health [5]. Infection with dermatophytosis can be occurred in receptive hosts via arthrospores present on the hair coats of infected animals or in the environment.

Epidemiology:

The possibility of infection of dermatophytosis depends on fungal species, host age, immunocompetence, condition of exposed skin surfaces, host grooming behavior, and nutritional status [6,7]

Young below 12 months of age or immune compromised rabbits are thought to be most susceptible [8]. The susceptibility of very young rabbit to dermatophytes is due to not fully

31 developed immune system, causing a delay in adequate host immunity [9]. However, differences
32 in skin secretions, especially lower levels of fungistatic fatty acids in sebum and lower levels of
33 fungal inhibitory sphingosine, and the fast growth and replacement of hair may also play a role
34 in facilitating infection [9]. The presence of ecto-parasites, especially fleas and *Cheyletiella*
35 mites, can also lead to spread of dermatophytosis [9].

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37 **Risk factors:**

38 1- Young animal

39 2- Overcrowding

40 3- high humidity

41 4- poor sanitation

42 5- malnutrition

43 6- Immunosuppression (including immunosuppressive treatment)

44 7- Injury by ectoparasites or scratches due to pruritus

45 Reported by [10]

46 **Transmission**

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48 Dermatophytosis can be transmitted by direct or indirect contact with infected hair, scales or
49 materials. Infectious microconidia in the environment or on fomites can persist for many months.

50 The pathogenesis of dermatophytosis includes several stages; adhesion, germination, invasion,
51 penetration. Natural defences against dermatophytes depend on both immunological and non-
52 immunological mechanisms so infectious microconidia must first overcome a couple of local
53 defenses to be able to adhere the keratinized tissue, the stratum corneum [11,12].

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55 [11].

56 **Clinical features:**

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59 Clinically, dermatophytes infect the epidermis and adhering structures, including hair follicles
60 and shafts [13, 14]. In rabbits dermatophytic infections may cause alopecia, redness scaly and
61 scurf localized mainly on the face, head, auricles, and dorsal area of the neck [15-17]. This

62 disease can also result in rabbit malnutrition, growth retardation, feed remuneration reduction
63 and even death.

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69 **Fig.1: Alopecia in mouth. (17)**

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Fig.2: Localized skin lesion of dermatophytes on leg (21)



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Fig.3: Numerous canary crusting and large scales were present on the head of rabbits with hair loss.

82 **Etiology:**

83 *T. mentagrophyte* is the most common dermatophytes isolated from rabbits and some
84 researchers consider rabbits as asymptomatic carriers of this organism [18-22]. *M.gypseum* was
85 also isolated from rabbits [23]. *M.canis* was reported by [24]. *T.verrucosum*. *Arthroderma*
86 *benhamiae* were also recorded [25]. Rabbits are reported to be carrier for dermatophytes [26] so
87 isolated *T. mentagrophyte*, *M.gypseum*, *M.nanum* and *M.canis* from healthy rabbits [27]

88 **Diagnosis:**

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90 Skin scraping samples from the rabbit that were suspected to be infected with dermatophytes will
91 be collected on the basis of gross lesion on their body. Hair and scrapings samples were collected
92 with forceps or scalpel just behind the extending margin in the infected area. Samples can be
93 kept in polyethylene bags. [28]

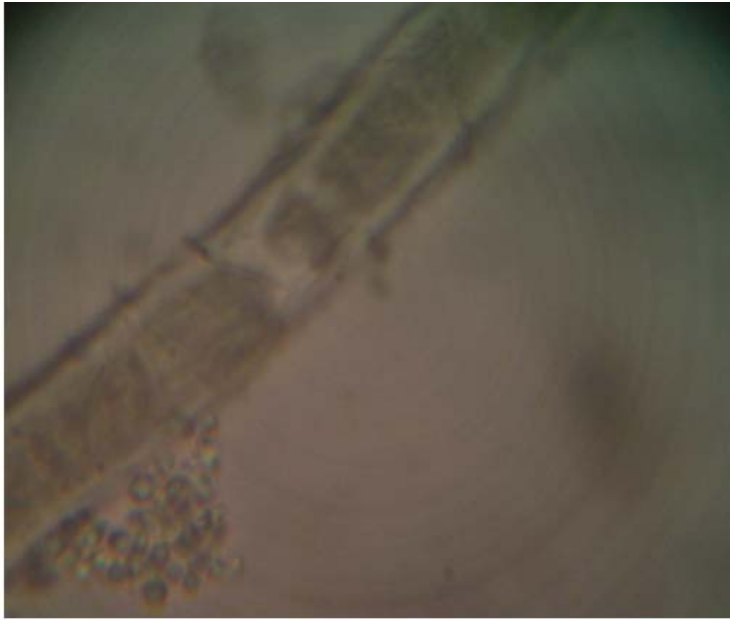


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95 **Fig.4: Skin scraping**

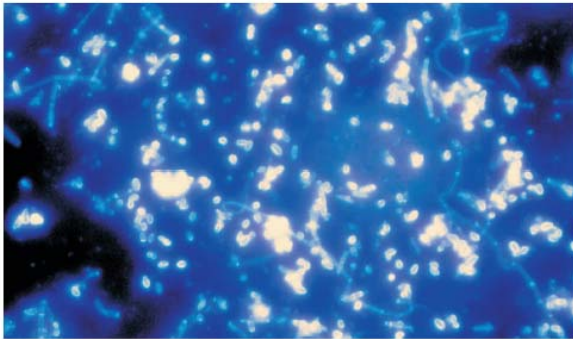
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97 **Direct examination:**

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99 Hairs and scales can be mounted in potassium hydroxide (KOH) of varying concentrations [29-
100 31]. Infected hairs appear pale, wide and filamentous compared with normal hairs when
101 microscopically examined at x4 or x10 magnification. Arthrospores can be visible on high
102 magnification (x40). Positive result of KOH direct test can lead to positive cultures, which are
103 considered as the gold standard. Calcofluor white (a textile brightener) as an alternative to KOH
104 can be used because it binds specifically to the fungal cell wall and fluoresces strongly when
105 viewed under a fluorescence microscope [27].

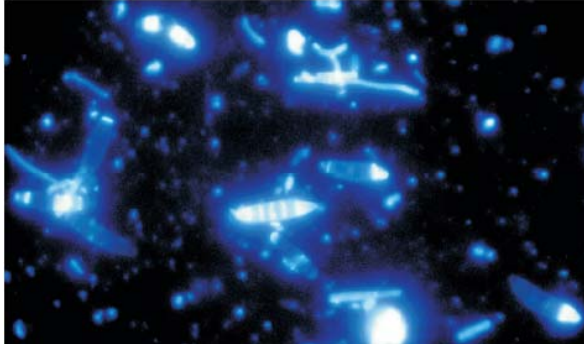
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109 **Fig. 5: Ectothrix arthrospores infection in hair**
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113 **Fig.6: Fluorescent microscopy (calcofluor white stain) of *Trichophyton mentagrophytes***
114 **complex hyphae and conidia isolated from healthy rabbits**
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120 **Fig. 7: Fluorescent microscopy (calcofluor white stain) of *Microsporium gypseum* hyphae**
121 **and macroconidia isolated from healthy rabbits**

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124 **Fungal culture:**

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126 Fungal culture is considered the ‘gold standard’ for diagnosis [32]. Sabouraud’s dextrose agar
127 (SDA) containing cycloheximide, penicillin and streptomycin were used in most diagnostic
128 laboratories. Plates should be incubated at 25°C for 5 weeks. Dermatophytes test media (DTM) is
129 recommended as the best media for isolation of dermatophytes because the presence of the red
130 color indicated positive result, this can help in early identification of highly suspected cultures
131 [33]. The isolates should be examined macroscopically and microscopically after staining with
132 lactophenol cotton blue using wet mount technique [34].

133 In addition to technique steps mentioned above, pigment production on corn meal agar, urease
134 activity on urea agar base, growth at 37°C on SDA.

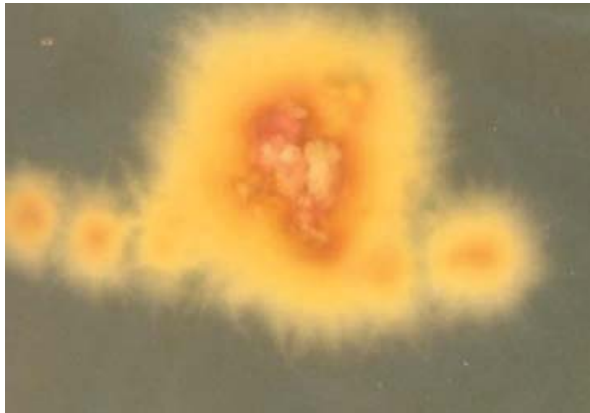
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137 **Fig.8: Culture of *T. mentagrophytes*: surface of colony show powder-like shape, white, loose**
138 **irregular mycelium on the edge.**

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Fig.9: Back side of *Trichophyton mentagrophytes*: pale yellow color



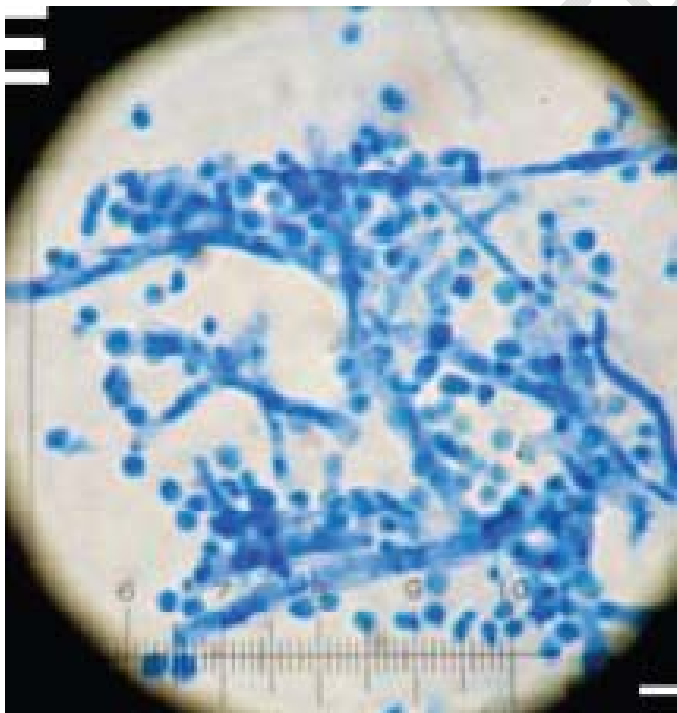
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Fig.10: *Microsporum canis* culture, macroscopic colony



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Fig.11: *Microsporium gypseum* culture, macroscopic colony



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Fig.12: Small conidia (size: 2-3×2-4 μm) and mycelium of *T. mentagrophytes*



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Fig.13: Spiral hyphae of *T.mentoglyphes* var *mentoglyphes* Slide stained with LPCB stain.



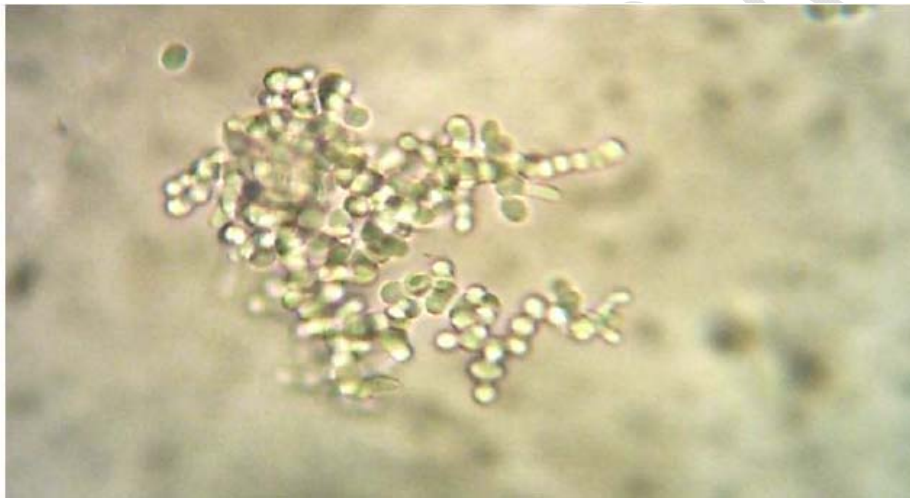
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Fig.14: *Microsporium canis* microscopic observation in lactophenol cotton blue



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Fig.15: *Microsporium gypseum* microscopic observation in lactophenol cotton blue



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Fig.16: Lactophenol cotton blue mount shows chains of chlamydospore of *Trichophyton verrucosum* culture incubated at 37°C.



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179 **Fig.17: Growth of *T.mentagrophytes* on urea agar after 4 days showing hydrolysis of the**
180 **urea.**

181 **Molecular diagnosis:**

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183 Diagnosis with conventional methods is time-consuming because it might take up to 4 weeks or
184 longer to give the final results [35]. Furthermore, morphological identification may be confusing
185 due to polymorphism of dermatophytes [36]. During the last decade, a wide variety of molecular
186 techniques has become available as possible alternatives for routine identification of fungi in
187 clinical microbiology laboratories [37, 38]. *T. mentagrophytes* isolated from nine rabbits and
188 three farm staff were identified by using amplification of CHS-1 gene and ITS+ sequence. The
189 results of sequences of CHS-1 and ITS from different DNA samples revealed that they were
190 identical [21].

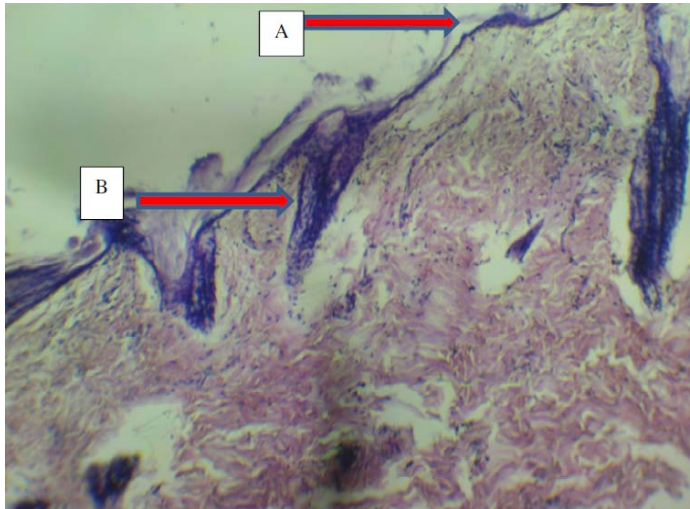
191 **Serodiagnosis:**

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193 Indirect ELISA tests were developed to detect specific IgG in rabbits infected with *T.*
194 *mentagrophytes*, found that (ELISA-rabbits test) is highly sensitive (96.0 %) and highly specific
195 (94.1 %) [39].

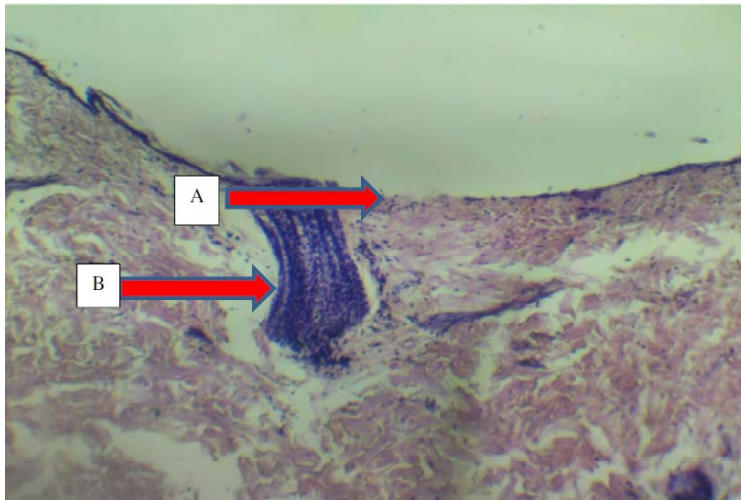
196 **Skin biopsy:**

197 Skin biopsy from rabbit infected with *T. mentagrophytes* showed pathological changes with
198 adherence of fungus to keratinocytes, through the stratum granulosum of the epidermis. In this
199 period of infection there was a hyperkeratosis , thickening of epidermis with hair follicle
200 plugging in addition to keratinized squamous epithelial lining with underlying moderate
201 periappendageal tissue and perivascular chronic inflammatory cells infiltration (lymphocytes)

202 In 8-10 days of induced infection there is keratinized squamous epithelial lining with focal area
203 of surface erosion and underlying moderate periappendageal tissue chronic inflammatory cells
204 infiltration (lymphocytes)



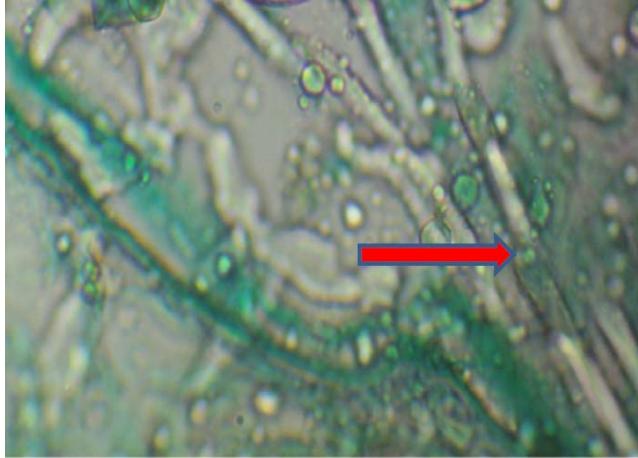
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206 **Fig.18: The bland looking (A) Hyperkeratosis , thickening of epidermis with (B) hair**
207 **follicle plugging in 4-5 days (stained with H&E,10 X)**
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210 **Fig.19: The bland looking with A- surface erosion and B- lymphocytes infiltration in**
211 **8-10 days (stained with H&E,10 X)**
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213 haematoxylin and eosin staining (H&E) may or may not identify dermatophytes and special
214 stains such as periodic acid Schiff (PAS) and Grocott methenamine silver (GMS) are needed The
215 epidermis infiltrated with variable fungal septate hyphae in size in the surface of the squamous
216 epithelium [40].

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220 **Fig.20: Proliferation of septate hyphae of *T. mentagrophytes* in epidermis in 8-10 days**
221 **(stained with PAS,40X).**

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223 **Treatment:**

224 Optimal therapy of dermatophytosis requires a combination of topical antifungal therapy,
225 concurrent systemic antifungal therapy and environmental decontamination. The treatment
226 should be continued until two consecutive negative cultures (at weekly or bi-weekly intervals)
227 are obtained [41]. Topical treatments speed resolution of clinical lesions and may help prevent
228 zoonotic contagion. Systemic therapies that have prolonged residual activity in the skin and hair
229 provide the most effective treatments.

230 **Topical Therapy:**

- 231 1. nystatin ointment for treatment of rabbit experimentally infected with *T. mentagrophytes* for 3
232 weeks [42].
233 2. Clotrimazole is well-documented antifungal agent for treatment of rabbits [43].
234 3. 0.12g of terbinafine 1% cream, for 28 days [44].

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236 **Systemic Therapy:**

- 237 1. Griseofulvin 25–30 mg/kg during 5–6 weeks. Avoid its use in pregnant animals [45,46].
238 2. Itraconazole 5-10 mg/kg daily, for 1 month [47].

239 **Environmental decontamination:**

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241 Enilconazole emulsifiable concentrate will be sprayed onto the walls and ceiling of rabbit house
242 (50 mg per m²) twice weekly for 23 weeks. Treated farm showed reduction of number of
243 clinically infected rabbits [48].

244 **Vaccination:**

245 It is a dried culture of an attenuated strain of *T.mentagrophytes*. It has a high immunogenic
246 activity for dermatophytosis in rabbits. The vaccine is non- reactogenic and is injected
247 intramuscularly. The vaccine has been recommended for practical use in USSR [49].

248
249 **Conclusion:**

250 Dermatophytoses are the most common fungal infections in rabbits. Many studies were done
251 considering different aspects of the disease (eg. epidemiology, clinical presentation and
252 diagnosis, treatment, prevention, and control).As many rabbits share the environment with
253 owners as companion animal so they become a source of infection to human this can lead to
254 public health problem.

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