Diagnosis and Treatment of Bovine, Ovine and Equine Dermatophilosis

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Abstract: To investigate Dermatophilus congolensis infection in cattle, sheep and horses suffering from exudative dermatitis with trials for treatment. Thick scabs and skin scrapings were obtained from 17 beef cattle, 13 sheep and 8 horses. Bacteriological examination revealed D. congolensis infection with morbidity rates of 8.7%, 5.8% and 9.6%, respectively. The infection was associated with tick infestation in 76.5% of the infected cattle and with lice infestation in 23.1% of infected sheep. Treatment of bovine and ovine dermatophilosis using 2 doses of oxytetracycline /LA with one day apart revealed 85.7% and 100% cure rates, respectively, whereas using single dose of oxytetracycline /LA revealed 71.4% and 80% cure rates respectively. Topical application of povidone-iodine and parental injection of oxytetracycline revealed 100% and 66.7% cure rates, respectively for treatment of equine dermatophilosis.

Key words: Cattle, sheep, horse, D. congolensis, dermatophilosis, isolation and treatment

INTRODUCTION

Dermatophilosis is an acute or chronic exudative epidermitis with scab formation, firstly recorded in cattle in Belgian Congo[1] with the name Dermatose contagieuse (Impetigo contagieux). The causative bacterium is aerobic, Gram-positive actinomycte called Dermatophilus congolensis (D. congolensis).

The disease distributed worldwide but mainly recorded in African countries[2,3,4] and to some extent in Europe[5,6], Asia[7,8], Australia[9] and Americans[10].

The most affected domestic animals are cattle[11,12], sheep[13,14], horses[15,16] and goats[17]. The disease had been recorded also in camels[18], buffaloes[19], donkeys[20], cats[21] and wildlife[22,23]. Dermatophilosis leads to great economic losses in African countries[24,25] due to inferior wool and leather quality[26], death and culling[27,28], decrease milk production and increase in somatic cell count[29], decrease in semen quality[30] and the treatment expenses. In addition to its economic importance, the disease plays a role in public health and can be transmitted to humans[31,32].

MATERIALS AND METHODS

Animals and Samples: A total of 38 (out of 503) farm animals with exudative dermatitis of different species, ages and sexes were examined. These included 17 beef cattle (out of 196) from a feed-lot farm in El-Fayoum governorate, 13 sheep (out of 224) from a breeding farm in El-Sharkia and 8 horses (out of 83) belonging to private stables in Giza governorate.

From these animals, heavy scabs were collected in clean sterile tubes for isolation of D. congolensis, in addition to skin scrapings[33] from the marginal parts of skin lesion for parasitological examination and hair and wool from the periphery of the lesion for mycological examination.

Examination of Samples: Bacteriological Examination:
Direct Microscopical Examination[34]: Small pieces were taken from the underside of the scab and softened in few drops of distilled water on a clean microscope slide, a smear was made and stained by Loeffler's methylene blue, Giemsa or Gram's stains.

Culturing Method: According to a previously mentioned method[33], a small amount of scab material was grinded up, placed in a screw capped bottle, moistened with one ml sterilized distilled water and allowed to stand open for 3 and half hours on the bench. Then the opened bottle transferred to candle jar with a candle was burned within the jar to obtain 10-20% CO₂ tension (so the motile zoosporas were chemotactically attracted to the CO₂ enhanced atmosphere and move to the surface of distilled water). After 15 minutes, the bottle was carefully removed and drop taken from the water surface with a bacteriological loop and seeded on Brain heart infusion (BHI, Biolife s.r.l., Italy) agar plates which incubated at 37°C in 20% CO₂ tension for 24 to 48 hours. The suspected colonies were identified[33,34,35] on the basis of their macromorphology on medium and their
micromorphology by taking a part of the colonies on clean slide and stained by Loeffler's methylene blue, or Giemsa or Gram's stain.

**Parasitological and Mycological Examination:** Direct microscopic examination was done for detection of mites in skin scrapings and/or fungal elements of dermatophytes on hair and wool. A small part of the sample (skin scrapings, hair or wool) was placed on a clean glass slide, several drops of KOH solution of different concentrations (5-10-20%) were added, covered with clean coverslip and gently pressed, the slide was gently heated (without boiling) for 10 - 15 seconds. Prepared samples were examined microscopically under low and high power objectives for detection of mites and/or fungal elements.

**Drugs Used for Treatment Trial:**

**Systemic Antibiotics:**

- Terramycin® / LA (pfizer, Egypt), each 1 ml. contains 200 mg oxytetracycline.
- Dose used for cattle and sheep: 1 ml. / 10 kg b.wt., by I/M injection, either in a single dose or in 2 doses with one day apart.
- Pan-Terramycin® (pfizer, Egypt), each 1 ml. contains 30 mg oxytetracycline.
- Dose used for horses: 1 ml. / 10 kg b.wt., by I/M injection for 4 days.

**Local Application:**

- Iodophor® (iodine content min. 2.3% w/v) - Medical union pharmaceutical co., Ismailia. Used by topical application as 10% diluents for horses.

**Insecticide:**

- Butox® 50 (Intervet, Egypt), each 100 ml. contain 5 gm Deltamethrin.

For spraying for ticks each 50 ml. diluted in 100 L. water, while for lice each 25 ml. diluted in 100 L. water.

**RESULTS AND DISCUSSION**

Cultivation of thick scabs on BHI medium revealed 24 hours old pin point colonies about 1 mm in diameter with fimbriated borders (Fig. 1) developed into rough yellowish-orange colonies about 2-3 mm in diameter after 3-4 days which were firmly adherent and embedded into the medium. A part of the colony was stained and microscopically examined revealing the presence of Gram +ve cocci arranged in parallel-lines in form of branched septate (both transverse and longitudinal planes) hyphae resulting in a "railroad-track" like appearance (Fig. 2) which is characteristic for *D. congolensis*.

The yellowish-orange color of colonies is in agreement with previously mentioned studies, also a change of colonial color from white to yellow and presence of both grayish-white and yellowish colored colonies were mentioned, whereas others mentioned the colonies color as gray to white.

Direct microscopical examination of stained smears from the underside of the scabs collected from acute cases (2 horses only) was carried out and revealed the same as those smears taken from colonies, but stained smears taken from dried scabs collected from chronic cases (rest of animals) showed low numbers of bacteria and the characteristic appearance of *D. congolensis* was not obvious.

Bacteriological examination revealed *D. congolensis* in 17 out of 196 beef cattle, 13 out of 224 sheep and 8 out of 83 horses with morbidity rates 8.7%, 5.8% and 9.6% respectively.

Similar morbidity rates of bovine dermatophilosis as 5.22%, 11.40% and 7.96% and were recorded, respectively. The morbidity rate of bovine dermatophilosis may exceed 52% of the cattle population. This wide range of animal susceptibility may be attributed to the difference in management, housing or hygienic conditions.

On the other hand, morbidity rates of ovine dermatophilosis were recorded in a range varied from 3% to 45% within affected flocks. The prevalence of ovine dermatophilosis in the present investigation was 5.8% which is approximately similar to that reported in Ethiopia and north Iran and reached 3% and 4.2%, respectively.

Morbidity rates of equine dermatophilosis was recorded in percentages of 21.66%, 9.4%, 24.5% and 0.44%, respectively. In the present work, dermatophilosis could be detected in 9.6% of the investigated horses.

For the confirmation of the diagnosis and exclusion of possible mixed infection, direct microscopical examination of skin scrapings and hair or wool tufts collected from the periphery of the lesions was carried out. Neither mites nor fungal elements could be detected, while mixed infection with the dermatophyte *T. verrucosum* in cattle and horses, in addition to chorioptic mite in sheep were previously recorded.

Clinical picture of bovine dermatophilosis was observed as thick greasy scabs with protruded hair were distributed on the neck (Table 1, Fig. 3), back, sides and ventral abdomen. The ease of removal of scabs varied. In some cases it was painful, difficult to remove and leaves a slightly hemorrhagic surface in underlying skin. In other cases it was easy to remove and the underlying skin appeared normal to some extent. Mostly, the scabby area was accompanied with
Table 1: Distribution of Dermatophilosis lesions on body parts of cattle, sheep and horses.

<table>
<thead>
<tr>
<th>Site of lesions</th>
<th>Cattle (17)</th>
<th>Sheep (13)</th>
<th>Horses (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face and ears</td>
<td></td>
<td>4 (30.8%)</td>
<td>-</td>
</tr>
<tr>
<td>Neck</td>
<td>12 (70.6%)</td>
<td>9 (69.2%)</td>
<td>-</td>
</tr>
<tr>
<td>Back and sides</td>
<td>3 (17.7%)</td>
<td>3 (23.1%)</td>
<td>5 (62.5%)</td>
</tr>
<tr>
<td>Hind quarters</td>
<td>-</td>
<td>-</td>
<td>3 (37.5%)</td>
</tr>
<tr>
<td>Hind legs</td>
<td>-</td>
<td>-</td>
<td>2 (25.0%)</td>
</tr>
<tr>
<td>Ventral abdomen</td>
<td>3 (17.7%)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The distribution of the lesions varied also in previous clinical reports, where lesions were recorded\[43\] on head, neck, back, sides, hindquarters, ventral abdomen, udder and legs, whereas in different study\[7\] lesions were observed on legs, tests and udder and in third study\[19\] lesions observed on back, sides and ramp. Lesions were also seen\[4,49\] to be confined to the inguinal regions and between the front limbs.

There was an association with tick (identified as *Boophilus annulatus*) infestation in 13 (76.5%) out of 17 cases showing the disease, this is in disagreement with records\[18\] of negative correlations between *Boophilus* species and dermatophilosis and that *Amblyomma variegatum* was the most important tick factor involved in the pathogenesis of the disease. In Ethiopia\[31\], the association with ticks was recorded as 45.2%. Infection with *D. congolensis* occurs when the integrity of the skin is impaired, as in long exposure to rain or traumatic injuries resulting from arthropod bites, e.g. from ticks, flies and mosquitoes\[52\]. It had been suggested that, the arthropods also serve as mechanical transmitters of *D. congolensis* into epidermal layers, where germination of zoospores takes place to form multidimensional branching filaments\[53\]. The isolation of the organism from the mouthparts of ticks removed from infected and-apparently non-infected skin of cattle was succeeded\[54\]. The hard tick *Amblyomma variegatum* had been associated with transmission of the disease\[49,55\] as a result of their immunosuppressive effect on the host\[46\]. Nutritional deficiency also predispose to dermatophilosis\[57\], so even in the absence of ticks clinical cases would still occur.

Lesions of ovine dermatophilosis were recorded as moderate sized thick greasy scabs and matted wool distributed over neck (Table 1, Fig. 4), back and sides, in addition to light brown, small sized scabs on the hairy areas of the face and ears. Patches of wool were easily detachable by hand.

Lesions on ears and muzzle area had been recorded\[6,59\], whereas lesions on wooly parts of back, sides and neck and on hairy parts of face and legs had also been recorded\[19\].

In the present study, and in agreement with previous study\[59\], *Damalinia ovis* (sheep biting louse) found on the body of 3 (23.1%) out of 13 animals showing the disease.

Acute form of equine dermatophilosis was seen in 2 of the investigated horses. The lesions observed as thick scabs raised on body surface, elliptical in shape, the scabs with matted hairs (Fig. 5) were hard to be plucked off which was accompanied with pain and revealed elliptical areas of ulcerated skin with bleeding, whereas the undersurface of scabs was concave with thick yellowish pus. The chronic form of the disease was seen in 6 horses as large plaques of matted hairs overlying slightly inflamed skin which tended to be
A history was taken about neglecting the scraping off sweat and water using sweat scraper, so skin wetness occurred for long period and predisposed to infection, this agreed with a record[15] of an association between dermatophilosis and frequent washing in horses.

**Treatment:** After confirmation of the diagnosis using bacteriological examination, 17 beef calves were divided into 3 groups. The first group comprised of 7 calves that were injected by oxytetracycline /LA (20 mg/kg b.wt., I/M, 2 doses, 1 day interval), the second group included 7 calves that were injected by oxytetracycline /LA (20 mg/kg b.wt., I/M, single dose) and third untreated group comprised of 3 calves that left as control.

The diseased sheep were divided also into 3 groups. The first group comprised of 5 animals that were injected by oxytetracycline /LA (2 doses, 1 day interval), the second group included 5 animals that were injected by oxytetracycline /LA (single dose) and third untreated group comprised of 3 animals that were left as control.

The diseased horses were divided in turn into 3 groups, the first group comprised of 3 animals that were injected by oxytetracycline (1 ml / 10 kg b.wt., by I/M injection for 4 days), the second group comprised of 3 animals that were treated locally by Iodophor (as 10% diluents) daily for 7 days, and then once weekly and third group comprised of 2 animals that were left as control. Clipping of hairs and removal of crusts were done before local application of Iodophor using suitable brush.

Butox® was sprayed once weekly to control infestation with ticks and lice in cattle and sheep during the period of treatment trial.

Results of treatment of dermatophilosis (Table, 2) in cattle, sheep and horses revealed that, using 2 doses of oxytetracycline /LA in cattle and sheep revealed 85.7% and 100% cure rates, respectively, whereas using single dose of oxytetracycline /LA in cattle and sheep revealed 71.4% and 80% cure rates respectively, while using of topical application of Iodophor and oxytetracycline injection in horses revealed 100% and 66.7% cure rates, respectively.

In this study, a comparison between using oxytetracycline /LA for treatment of dermatophilosis in cattle and sheep either by single dose or by 2 doses with one day apart revealed better cure rates by the second method. Different cure rates had been obtained previously[61,62] as 93% and 90% cure rates in different grades of infection, respectively. High efficacy of oxytetracycline /LA for the treatment of bovine dermatophilosis was recorded[63], but slightly better result was obtained by its combination with formalin. However, 4 successive injections did not cure a severe
Table 2: The treatment protocol of Dermatophilosis in cattle, sheep and horse.

<table>
<thead>
<tr>
<th>Animal species</th>
<th>Drug used</th>
<th>No. of animals</th>
<th>No. of cured animals at week no.</th>
<th>Total no. cured (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>Cattle (17)</td>
<td>Ox/LA (2 doses)</td>
<td>7</td>
<td>3 3 0 0</td>
<td>6 (85.7%)</td>
</tr>
<tr>
<td></td>
<td>Ox/LA (single dose)</td>
<td>7</td>
<td>1 4 0 0</td>
<td>5 (71.4%)</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>3</td>
<td>0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>Sheep (13)</td>
<td>Ox/LA (2 doses)</td>
<td>5</td>
<td>3 2 0 0</td>
<td>5 (100%)</td>
</tr>
<tr>
<td></td>
<td>Ox/LA (single dose)</td>
<td>5</td>
<td>2 2 0 0</td>
<td>4 (80%)</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>3</td>
<td>0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>Horses (8)</td>
<td>Oxytetracycline</td>
<td>3</td>
<td>1 1 0 0</td>
<td>2 (66.7%)</td>
</tr>
<tr>
<td></td>
<td>Iodophor</td>
<td>3</td>
<td>0 1 2 0</td>
<td>3 (100%)</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>2</td>
<td>0 0 0 0</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 6: Lesions on hind legs and hindquarters of a horse.

case in a ram\textsuperscript{[64]} and appreciable results in severe cases could not be achieved, but in less severe infections better results were obtained\textsuperscript{[61]}.

Treatment of 3 horses using oxytetracycline result in a relief of 2 of them (66.7%) which agreed with the high antibiotic sensitivity of all field isolates of \textit{D. congoensis} isolated from equine to this antibiotic previously obtained\textsuperscript{[5]}.

In agreement with the previous treatment trials\textsuperscript{[19,48]}, topical treatment of horses with iodophor in the present study was superior and gave better results and higher cure rate (100%) than systemic treatment with oxytetracycline (66% cure rate). Local preparations of 0.2% organic iodine for the resolution of skin lesions was also used in combination with parenteral antibiotic\textsuperscript{[66]}.

The direct contact of povidone iodine with lesions inhibits and destroys \textit{D. congoensis}, whereas in case of using parental treatment, the concentration of antibiotic reaching the skin in some circumstances may be in lower level to be effective on the bacteria. On the other side, other topical treatments had failed\textsuperscript{[67]} because of the thickness of the crusts preventing the drug from coming into direct contact with the infected areas. In conclusion, the success of the treatment of dermatophilosis seems to be affected by many
endogenous and exogenous factors. Such factors may have an influence on the outcome of antibiotic therapy of the disease.

REFERENCES


