Juvenile subcutaneous abscessation of sheep caused by \textit{Streptococcus faecium}

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Summary: A clinical syndrome in sheep, which persisted since several years at the Hawatka Breeding Station (Assiut province) and was characterised by subcutaneous abscesses mostly affecting young animals (between 4 months and two years of age), is described. No deaths were observed but the condition appeared to be incurable. It had never been reported elsewhere in Egypt.

The causative pathogen was isolated and identified as \textit{Streptococcus faecium}. To control the disease, the following actions were undertaken and gave very satisfactory results: surgical intervention on diseased animals; hygienic and environmental sanitation measures, disinfection; protection of susceptible animals through vaccination using either a killed formolised vaccine, made from locally isolated strains of \textit{S. faecium} and containing Freund's incomplete adjuvant, or BCG, acting as a non-specific immunopotentiator.

Epidemiological and immunological aspects of these findings are discussed.

INTRODUCTION

A clinical syndrome among a flock of sheep at the Hawatka Breeding Station, Assiut Province was notified in March 1979.

Information given by local veterinary authorities indicated that the flock comprised two thousand head of Ossimi sheep. The health condition of the flock was not bad. There was a history of abscess formation since 1972, when the farm was constructed. Antibiotics and sulpha drugs were applied to all clinical cases, without any response. No deaths were observed in clinically affected animals. Surgical intervention was always tried, but recurrent infection could occur in an animal which had been operated. On slaughtering of clinical cases no lesions were found in any internal organ with the exception of the lung where an abscess similar to those found clinically could be seen.

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Abscesses began to appear in animals aged 4 months to 2 years with an incidence of 90%. In older sheep, the disease was much less prevalent, the rate being 5%. No similar clinical cases were reported in other sheep flocks in the Assiut Province. This clinical syndrome had not been reported previously in any province.

**Description of clinical lesions.**

On inspection of the flock, well circumscribed, tender, encapsulated abscesses (size of an orange) were seen. The most common sites were the ventral side of the fatty tail in females, the scrotum, the upper part of the neck extending to the base of the ear and prescapular regions. Usually, a single abscess was found in an animal. On opening an abscess, a large amount of creamy white pus was discharged.

**P.M. lesions.**

Two affected lambs, one male and one female, were slaughtered and carefully dissected. The skin over the abscess was normal. There were no lesions in any internal organ except an abscess in the lung tissue of the male animal with the same characteristics as those of clinical abscesses and the same kind and amount of pus. All lymph nodes including those in the vicinity of abscesses were normal. In case of scrotal infection, testicles and epididymis were normal.

**MATERIALS AND METHODS**

1. Pus samples were collected aseptically, cultured on different types of media and incubated aerobically, anaerobically and under 5% CO₂ tension at 37°C.

2. Random isolates were injected by different routes and at various doses to mice, guinea pigs and rabbits.

**Experimental work.**

Sheep belonging to various age groups were brought from the same farm, free from clinical infection. Each animal was used for more than one purpose. Subcutaneous infection or scarification were applied at skin sites similar to those of natural infection.

Materials used for infectivity testing were:

1. Pool of isolated strains.
2. Emulsified pus in broth from different animals.
3. Filtrated bacteria-free pus emulsions.
4. Emulsified pus in broth with antibiotics added, incubated for 2 hours at 37°C before application.
Experimental immunization.

The following materials were used as vaccines for active immunization against reinfection or for protection of healthy animals:

1. Polyvalent formalin killed vaccine, made from isolated strains, containing incomplete Freund’s adjuvant.
2. BCG vaccine used for human beings.

Methods of inoculation and dosage.

The doses of the different materials and the method used for each sheep were as follows:

1. 10 ml for intravenous and subcutaneous inoculations of a pool of isolated strains.
2. 5 ml for scarification and subcutaneous inoculation of emulsified pus in normal broth, pus filtered through bacterial filter and emulsified pus with antibiotics added.
3. Infection by skin scarification was performed by using 5 ml of isolated strains, emulsified pus, filtered bacteria-free pus as well as emulsified pus with antibiotics added.
4. BCG was used as follows: one human dose for adult sheep and one child dose for younger animals.

Vaccines:

1. Two ml of polyvalent vaccine with incomplete Freund’s adjuvant was applied, then boosted after one month with another 5 ml.
2. Two doses of BCG vaccine were given at a one month interval.
3. Challenge was performed by scarification and subcutaneous infection with 5 ml of emulsified pus in normal broth.

RESULTS

Isolated strains were identified as *Streptococcus faecium*. The characters of the isolated organisms are shown in Table I.

The only material that gave typical lesions similar to those of natural infection was the emulsified pus in normal broth when applied either by subcutaneous injection or scarification to non-vaccinated groups or experimentally infected animals. The organism was demonstrated from the site of subcutaneous infection or subcutaneously under the scarified skin.
TABLE I
Identification of a Streptococcus strain

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood agar haemolysis</td>
<td>Alpha</td>
</tr>
<tr>
<td>Morphology of organism</td>
<td>Pairs and short chains</td>
</tr>
<tr>
<td>Group antigen</td>
<td>D</td>
</tr>
<tr>
<td>Resistance</td>
<td></td>
</tr>
<tr>
<td>60°C for 30 minutes</td>
<td>+ve</td>
</tr>
<tr>
<td>6.5% NaCl</td>
<td>+ve</td>
</tr>
<tr>
<td>0.05% Sodium azide</td>
<td>+ve</td>
</tr>
<tr>
<td>Tellurite (growth on MacConkey agar)</td>
<td>-ve</td>
</tr>
<tr>
<td>Susceptibility to Trimethoprim + Sulfamethoxazole</td>
<td>-ve</td>
</tr>
<tr>
<td>Biochemical reactions (sugar fermentation)</td>
<td></td>
</tr>
<tr>
<td>Sorbitol</td>
<td>-ve</td>
</tr>
<tr>
<td>Mannitol</td>
<td>+ve</td>
</tr>
<tr>
<td>Lactose</td>
<td>+ve</td>
</tr>
<tr>
<td>Raffinose</td>
<td>+ve</td>
</tr>
<tr>
<td>Salicin</td>
<td>+ve</td>
</tr>
<tr>
<td>Arabinose</td>
<td>+ve</td>
</tr>
<tr>
<td>Sucrose</td>
<td>+ve</td>
</tr>
<tr>
<td>Dulcitol</td>
<td>-ve</td>
</tr>
<tr>
<td>Antibiotic susceptibility</td>
<td></td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Penicillin</td>
<td>Resistant</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>Resistant</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>Resistant</td>
</tr>
<tr>
<td>Cephalothin</td>
<td>Resistant</td>
</tr>
<tr>
<td>Gentamycin</td>
<td>Resistant</td>
</tr>
<tr>
<td>Trimethoprim + Sulfamethoxazole</td>
<td>Resistant</td>
</tr>
<tr>
<td>Oxytetracycline</td>
<td>Resistant</td>
</tr>
</tbody>
</table>

CONTROL

General control was based on the three types of disease control (Freeman, 1979; Burnet and White, 1975). Removal of the main cause of infection which was the pus either in the infected animals or the contaminated soil was carried out as follows:

1. Surgical intervention to remove abscesses, careful disposal of pus by deep burial in the ground with the addition of an ample supply of quick-lime.
2. **Environmental sanitation**: A layer of 10 cm of contaminated shed’s earth was removed, covered with quick-lime and the shed was left empty for 15 days. This was done in succession to allow shedding of animals. The premises were disinfected using ordinary disinfectants.

3. **Protection of susceptible animals** by immunization was undertaken as follows:

   Sheep at the age of infection, either clinically free or those after surgical intervention, were divided into two groups. One was vaccinated using two doses of polyvalent adjuvanted formalin killed vaccine, the other group was given two doses of BCG vaccine. The older animals were given two doses of BCG vaccine. The flock was placed under strict observation and careful inspection. Clinical cases began to decrease in incidence and abscesses became much smaller in comparison to original cases; within a year of application of vaccines and strict hygienic measures, the incidence dropped to about 2% in the flock.

**DISCUSSION**

Diseases in sheep associated with streptococci do not appear to pose problems of major economic importance (Skinner and Quesnel, 1978). Jamieson (1950), Thal and Moberg (1953) and Palimal *et al.* (1974) stated that *Streptococcus faecalis* caused endocarditis in lambs.

It was clear from the case history, field observations, the site of clinical lesions, P.M. and experimental work that the infection was a local skin one with subsequent spread to the subcutaneous tissue. The sites of lesions were those very liable to be in contact and friction with soil contaminated with pus; lung lesions were attributed to infection via open nostrils. The control measures undertaken — proper elimination of pus, breaking connection between the source of infection and the susceptible host by environmental sanitation and raising the general immune status of the flock by immunization — were found highly effective. The vaccine was prepared from isolated strains so as to be adequate in protecting animals at risk (Buxton and Fraser, 1977). Moreover, incomplete Freund’s adjuvant helped to enhance the immune response (Fudenberg *et al.*, 1976).

BCG is an immunopotentiator which provides non-specific resistance in a wide variety of diseases (Clark *et al.*, 1976; Barakat *et al.*, 1981).

Enterococci are opportunistic pathogens of low invasiveness under normal conditions (Mackie and McCartney, 1978), requiring contributing factors or predisposing causes to evoke a disease syndrome.

Under such conditions pus materials acted as an inflammatory mediator leading to a decreased natural resistance of the skin, predisposing for the invasiveness of *Streptococcus faecium* to develop clinically detectable lesions.
Raised susceptibility to infection of younger animals was due to low effective immunity in streptococcal diseases (Buxton and Fraser, 1977). In lambs infection may occur after birth; as shown experimentally, it took about three months before clinical manifestation and this justified the beginning of clinical abscesses in lambs at the age of four months. The disease being always present in the flock, flock immunity in older animals played a great role in reducing the probability of susceptible animals (Tizard, 1977).

This paper draws attention to a clinical syndrome with abscess formation and isolation of *Strept. faecium* which, to the best of our knowledge, has not been described previously.

Other pyogenic organisms were isolated from a clinical syndrome described as « thin ewe syndrome » by Renshaw *et al.* (1978).

This necessitates careful investigations of any pyogenic case to clarify its main cause and adopt the proper method for controlling and eradicating the disease.

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ABCÈS SOUS-CUTANÉS CHEZ DE JEUNES OVINS, CAUSÉS PAR *STREPTOCOCCUS FAECIUM*. — A.A. Barakat, E. Afifi, M.O. Rokaia, A. Ghaffar el S.M. Nashid.

Résumé : Les auteurs décrivent un syndrome clinique, caractérisé par des abcès sous-cutanés affectant surtout les jeunes animaux (4 mois à 2 ans), qui persistait depuis plusieurs années à la station d'élevage ovin de Hawatka (province d'Assiout). L'affection, sans être mortelle, paraissait incurable. Elle n'avait jamais été signalée ailleurs en Égypte.

Après isolement et identification de l'agent causal, Streptococcus faecium, les moyens suivants ont été employés pour combattre la maladie : intervention chirurgicale sur les animaux atteints; mesures d'hygiène et d'assainissement du milieu, désinfection; protection des animaux réceptifs en les vaccinant, soit à l'aide d'un vaccin inactivé formolé, contenant l'adjuvant incomplet de Freund, préparé à partir des souches isolées de S. faecium, soit à l'aide du BCG, agissant comme stimulant non spécifique de l'immunité. Les résultats de cette action ont été très satisfaisants.

Les aspects épidémiologiques et immunologiques de cette observation sont discutés.

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Resumen: Describen los autores un sindrome clínico, que se caracteriza por abcesos subcutáneos, afectando sobre todo a los animales jóvenes (4 meses a dos años), que persistía desde hacía varios años en la estación de ganadería ovina de Hawatka (provincia de Assiout). La afectión, sin que fuera mortal, parecía incurable. No se la había registrado en otras partes de Egipto.

Tras aislamiento e identificación del agente causal, Streptococcus faecium, se emplearon los siguientes medios para combati la enfermedad: intervención quirúrgica en los animales afectados; medidas de higiene y de saneamiento del medio, desinfección; protección de los animales receptibles vacunándolos, bien sea con una vacuna inactivada formolada con el adyuvante incompleto de Freund, preparada a partir de cepas aisladas de S. faecium, o bien con BCG, que interviene como estimulante no específico de la inmunidad. Fueron muy satisfactorios los resultados de esta acción.

Se discuten los aspectos epidemiológicos e inmunológicos de esta observación.

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REFERENCES


