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Human Cutaneous Anthrax – A Re-emerging Zoonosis – A Case Study

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Abstract: ***Anthrax is a zoonosis caused by the spore-forming bacterium, Bacillus anthracis. It is primarily a disease of the animals particularly affecting cattle, sheep, goat and other herbivorous livestock. Humans become infected only when they come into contact with infected animals or their products. Cutaneous anthrax is the most common form of the disease, accounting for 95% of cases. Case History: Eight farmers living in close association with the cattle developed lesions suggestive of cutaneous anthrax. Method: Pus samples collected from the suspected lesions were subjected to Gram's stain and culture. Result: B. anthracis was isolated in culture and was confirmed by biochemical tests.***

Keywords: Bacillus anthracis, Zoonosis, Cutaneous anthrax, Gram's stain, Culture

1. Introduction

Anthrax is a zoonosis caused the largest Gram positive, aerobic, spore-bearing bacilli, Bacillus anthracis. It produces endospores, which are highly resistant to heat and desiccation [1,3,4]. It is primarily a disease of animals, particularly affecting cattle, sheep, goat and other herbivorous livestock. It is transmitted to humans incidentally when they come into contact with the infected animals or their products. In humans, infection is usually acquired by the entry of spores through the infected skin (cutaneous anthrax) or rarely through the mucous membrane (gastro-intestinal anthrax) or by the inhalation of spores into the lungs (pulmonary anthrax) [1,3]. Among these, cutaneous anthrax is the most common form of the disease, accounting for 95% of the cases and the disease usually develops on exposed sites.

2. Case History

Cases of cutaneous anthrax were suspected from Thadiputtu, Boddaputtu, Nimmalpadu and Urada villages of Hukumpeta mandal of Visakhapatnam district, Andhra Pradesh state. Eight suspicious cases were referred to skin out-patient department of King George Hospital (KGH), a tertiary care hospital in Visakhapatnam. They were all farmers by occupation and were living in close association with the cattle. One of the patient gave typical history of having had direct contact of skin over his fingers with oral ulcer of the infected animal when he tried to apply the paste of tamarind and turmeric over the oral ulcer of the animal. The infected animal died two days later. The deceased animal was burnt and was eaten by all the suspected cases who presented with cutaneous lesions with eschar (**Fig.1**). Four among them have had already approached the quacks in that remote rural area and took native medicine against the lesions. Two patients received medication over the counter and two of them were not on any sort of treatment. They were all referred to the tertiary care hospital, KGH by the investigating epidemiological team. The lesion initially began as a painless, erythematous papule that eventually ulcerated to form a black coloured, necrotic eschar [3,5].

Figure 1: Cutaneous lesions with eschar

3. Aims and Objectives

To isolate Bacillus anthracis from the specimens of the suspected cases.

4. Materials and Methods

Despite the history of treatment received, pus samples were collected onto two swabs from the suspected lesions. One was used to prepare smear for direct microscopy and the other for culture. The smear was stained by Gram's stain. The sample was cultured on ordinary media, that is, nutrient agar and blood agar and was incubated overnight at 37°C.

5. Results

Gram stained smears revealed few pus cells and Gram positive bacilli arranged singly and in pairs surrounded by a halo (**Fig.2**).

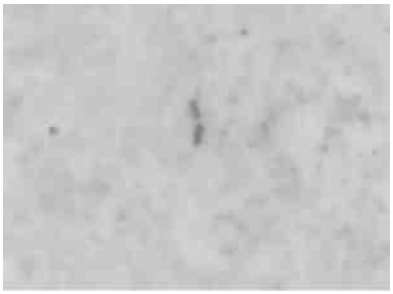

Figure 2: Gram's stain showing Gram positive bacilli in pairs

Culture on Nutrient agar showed typical "cut-glass" or "frosted-glass" appearing colonies in transmitted light amidst golden-yellow colonies of Staphylococcus aureus (**Fig.3**).

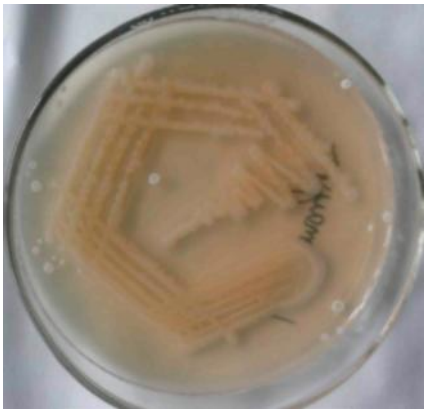

Figure 3: "Frosted-glass" appearance of colonies on Nutrient agar amidst colonies of Staphylococcus aureus

Blood agar showed gray to white, tenacious, rough textured non-hemolytic colonies with typical "Beaten-egg" appearance (**Fig.4**).

Figure 4:"Beaten-egg" appearance of colonies on Blood agar

Colonies of nutrient agar were observed under low power of the microscope. It showed long interlacing chains of bacilli, resembling locks of matted hair – the typical "Medusa-head" appearance (**Fig.5 and Fig.6**).

Figure 5: Typical "Medusa-head" appearance of colony under low-power

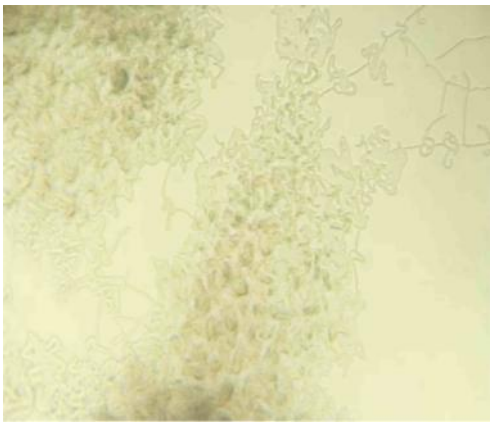

Figure 6: Typical "Medusa-head" appearance under low-power

Smears were prepared from culture and were Gram stained, which revealed Gram-positive bacilli, having square ends and arranged in long chains showing typical "bamboo-stick" appearance surrounded by a halo (**Fig.7).**

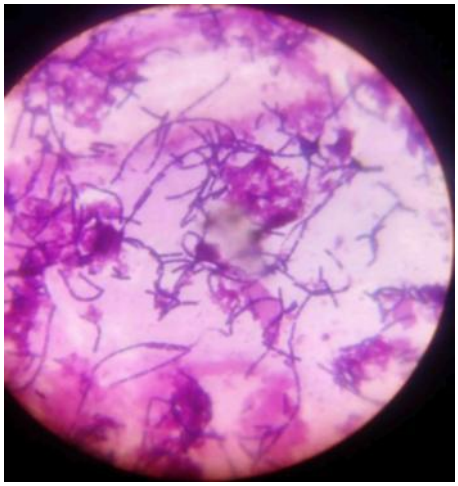

Figure 7: "Bamboo-stick" appearance on Gram's stain from culture

Negative staining was done with India ink which demonstrated capsules surrounding the long chains of bacilli (**Fig.8**)

Figure 8: Negative staining showing capsules surrounding long chains of bacilli

Motility was tested by hanging drop preparation and it showed non-motile bacilli arranged typically in long chains (**Fig.9**).

Figure 9: Non-motile bacilli in hanging drop preparation

Further biochemical tests revealed that the organism is catalase positive (**Fig.10**), ferments glucose, maltose and sucrose with the production of acid only (**Fig.11**) and that it reduce nitrates to nitrites (**Fig.12**).

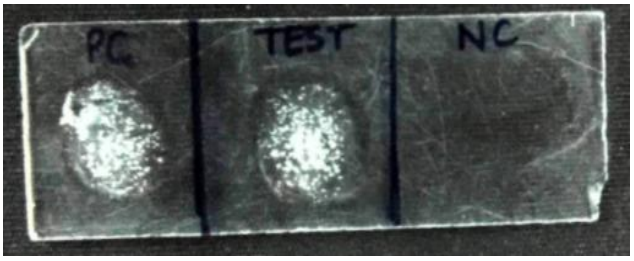

Figure10: Catalase test – positive

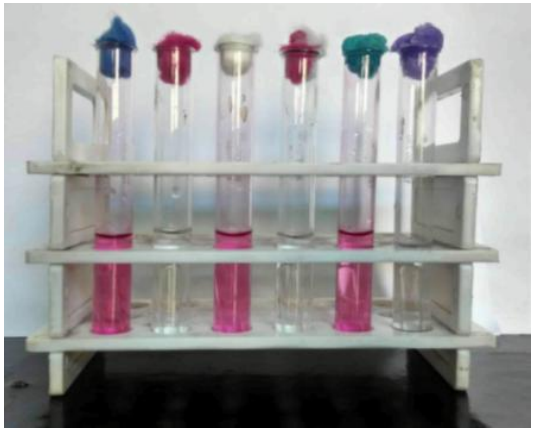

Figure 11: Fermentation of glucose, sucrose and maltose with the production of acid only

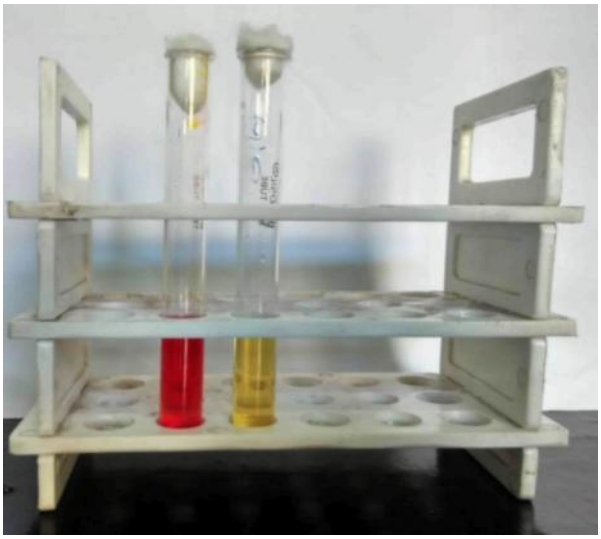

Figure 12: Reduction of nitrates to nitrites By all the above findings, cutaneous anthrax was confirmed

6. Conclusion

History of exposure to animals, characteristic clinical manifestations of black-coloured necrotic eschar and typical microbiological findings of Gram positive, capsulated, non-motile bacilli arranged in bamboo-stick appearance along with the biochemical reactions confirms the diagnosis of cutaneous anthrax.

For public health, it is important that all human contacts be treated appropriately, and that contaminated materials be disposed of in a manner that eliminates further human or animal exposure. It is recommended that contaminated materials be incinerated or disinfected, and that infected carcasses be covered with anhydrous calcium oxide (quicklime) during deep burial[2]. Eradication of human anthrax depends primarily on the ability to control it in domestic animals by effective surveillance and vaccination programs[1].

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