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PREVALENCE OF ACTINOMYCOSIS IN CATTLE AND REGIONAL ETIOLOGICAL FEATURES

M.G. Karimov,
Scientific Supervisors
Associate Professor, PhD (Veterinary Sciences)

H. B. Niyozov,
Professor, DVM

B. I. Kokilov,
Doctoral Student, Samarkand State University of Veterinary Medicine,
Animal Husbandry and Biotechnology

Abstract:
This review summarizes the history of actinomycosis research, etiological factors associated with the disease, and its prevalence among cattle. Particular attention is given to the biological characteristics of the pathogen and region-specific risk factors contributing to disease occurrence.

Keywords: Actinomycosis, chronic infection, infiltrative lesion, purulent inflammation, bacterial infection, druse granules, actinomycetes, mycelial structures, granuloma, Actinomyces bovis, Actinomyces israelii, gram-positive, anaerobic.

Introduction

Relevance of the Topic

Bovine actinomycosis is a chronic infectious disease that predominantly affects cows and bulls. The causative agent, Actinomyces bovis, is a gram-positive, anaerobic bacterium capable of initiating progressive granulomatous inflammation. Five species of the genus Actinomyces are referenced in the literature, though A. bovis and occasionally A. israelii are primarily associated with disease in large ruminants.

The disease may occur in enzootic or sporadic forms and is more commonly observed during winter and early spring, when the animals' immune resistance tends to decrease. Transmission typically occurs through lesions in the oral cavity or damaged skin, facilitating bacterial invasion. Although the mandible—particularly its lower portion—and adjacent lymph nodes are most often affected, lesions may also form in other anatomical regions, including the extremities, udder, and lungs.

A hallmark feature of actinomycosis is the development of dense tumor-like masses that gradually form fistulas exuding thick purulent material containing characteristic yellow-gray "druse" granules. In advanced cases, necrotic tissue fragments and blood may also be present. When actinomycotic lesions arise in the pharynx or larynx, animals may experience respiratory

compromise and feeding difficulties. Secondary involvement of putrefactive microflora or extensive tissue damage may lead to fever.

Actinomycosis is documented globally, with increased prevalence reported in Ukraine, Russia, Kazakhstan, and Central Asia. Despite its widespread occurrence, the disease remains challenging to manage due to insufficiently effective therapeutic approaches. Conventional antibiotic therapy and surgical removal of actinomycotic lesions do not consistently eliminate the pathogen. This underscores the urgent need to develop improved and regionally adapted treatment and prevention strategies.

Literature Review

Actinomycosis is a chronic infectious disease in humans and animals characterized by granulomatous inflammation in affected organs and tissues. The etiological agent is a filamentous, fungus-like bacterium of the genus Actinomyces. The pathogen is thermolabile, inactivated within five minutes at 70–80°C, whereas low temperatures may preserve viability for up to 1–2 years. A 3% formalin solution effectively destroys actinomycetes within 5–7 minutes. [1]

Actinomyces bovis is most frequently associated with disease in cattle. Clinically, the condition is characterized by hard mandibular swelling, fistula formation, and purulent discharge. Affected animals often show difficulty chewing, progressive weight loss, and chronic wasting. Diagnosis relies primarily on clinical examination supported by radiographic and laboratory confirmation. Treatment typically includes intravenous sodium iodide and antibiotics such as penicillin or tetracycline. Surgical excision may be required in advanced cases. Preventive measures focus on avoiding coarse, sharp feed materials and preventing oral trauma. [2]

Most actinomycete infections require both surgical debridement and antimicrobial therapy, since granulomatous tissue frequently protects bacteria from chemotherapeutic agents. Although sodium iodide does not possess direct antimicrobial properties, it may stimulate oxidative cellular pathways that contribute indirectly to bacterial inactivation. Importantly, sodium iodide is contraindicated in pregnant cattle. [3]

Given that A. bovis is part of the normal oral microflora of ruminants, control strategies should emphasize avoiding rough-stalk feeds that may injure the oral mucosa. Disease prevalence increases during winter and drought conditions, when low-quality forage becomes the primary feed source. [10,4]

Actinomyces israelii is one of the most frequently identified species in abdominal actinomycosis. Damage to the mucosal epithelium facilitates bacterial invasion. Esophageal actinomycosis is rare, with approximately 20 cases described, often in immunocompromised patients. [5]

Actinomycetes exhibit slow growth, requiring a minimum of 5 days for colonies to appear and up to 15–20 days for full development. Therefore, culture plates should be incubated for at least 10 days before being considered negative. Most species are facultative anaerobes, although some, such as A. meyeri, are strict anaerobes. Isolation can be achieved using chocolate blood agar at 37°C, or enriched media such as brain–heart infusion broth or Brucella Blood Agar supplemented with hemin and vitamin K1. [9]

Therapeutic efficacy has been reported for antibiotics such as streptomycin, neomycin, and enrofloxacin, enabling conservative treatment without surgical intervention.

Recent research indicates increasing interest in alternative therapeutic approaches, particularly phytotherapeutic agents, as some potent synthetic drugs may be unsuitable for weakened domestic animals. Due to widespread vaccination and improved health management, many infectious diseases now present in atypical or chronic forms, making phytopharmacology an attractive complementary option. [7]

Actinomycetes may penetrate the alveoli of the jaw, leading to alveolitis and gingival abscess formation. Subsequent purulent destruction of the alveolar bone permits further infiltration of actinomycetes into the spongy bone matrix. [8]

Conclusion

1. In recent years, actinomycosis has become increasingly prevalent in cattle farms, causing substantial economic losses. Preventing the disease and developing effective treatment strategies therefore remain critical priorities.
2. The scientific significance of this research lies in identifying region-specific risk factors associated with feeding and husbandry practices that contribute to the emergence of actinomycosis in livestock.
3. The occurrence of the disease is largely attributed to management deficiencies such as overcrowding, the use of moldy or poor-quality feed, and dietary imbalances in proteins, carbohydrates, vitamins, and minerals.

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