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Cervicofacial Actinomycosis and Mandibular Osteomyelitis

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Cervicofacial actinomycosis

Actinomycosis is a chronic disease characterized by abscess formation, draining sinus tracts, fistulae, and tissue fibrosis. Cervicofacial infection is the most common manifestation of the disease, accounting for nearly 50% of presentations [1–4]. Other forms of actinomycosis involving the central nervous system, lung and thoracic wall, and abdominal and pelvic organs are less common.

Microbiology

Cervicofacial actinomycosis is caused by organisms belonging to the order Actinomycetales, family Actinomycetaceae, genus *Actinomyces* [1]. Of note, both *Mycobacteria* and *Nocardia* species are classified in the same order and may be difficult to distinguish clinically or histologically from *Actinomyces* species [1]. At least 14 *Actinomyces* species have been described. Disease in humans is primarily caused by *A israelii*. *A bovis* is known to cause ''lumpy jaw'' disease in cattle but has never been cultured in humans [5]. Less common causes of human disease include *A odontolyticus, A naeslundii, A meyeri, A viscosus, A gerencseriae, A pyogenes*, *A georgiae*, and *A graevenitzii* [6–8]. Other implicated organisms include *Propionibacterium propionicus* (formerly *Arachnia propionicus*) and the coryneform bacteria *A neuii, A radingae*, and *A turicensis* [8,9].

Actinomyces are slow growing, non–spore-forming, gram-positive rods which are either strict or facultative anaerobes. Their morphology by Gram stain is variable, ranging from diphtheroidal to mycelial (Fig. 1). The name ''actinomycosis'' literally translates to ''ray fungus'' and reflects

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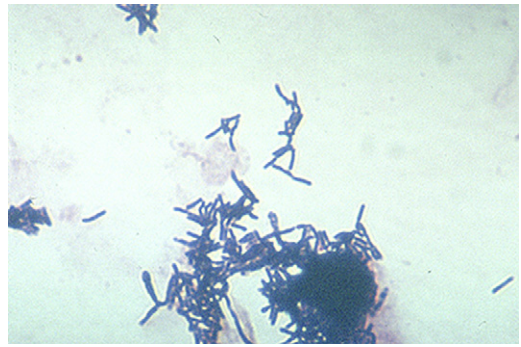

Fig. 1. Gram stain of a broth culture of *Actinomyces israelii*. Variable morphologies of these gram-positive organisms are visible, ranging from diphtheroidal to coccoid filaments. (*Courtesy of* Diane L. Roscoe, MD, Vancouver, British Columbia, Canada.)

its filamentous, fungal-like appearance [10]. Actinomyces, however, are true bacteria with filaments much narrower than fungal hyphae. Although actinomycotic filaments readily fragment into bacillary forms, tubular hyphae of molds never fragment and exhibit distinct branching patterns. Another distinguishing feature is reproduction, which occurs by bacterial fission and never by spores or budding [1].

Actinomyces are fastidious organisms that require culturing in enriched brain-heart infusion media. Incubation at 37°C with 6% to 10% carbon dioxide provides optimal growth conditions. Given their slow-growing nature, it is recommended that cultures be observed for at least 14 to 21 days to allow adequate detection [8].

Actinomyces almost invariably is isolated as part of polymicrobial flora, which commonly includes *Actinobacillus actinomycetemcomitans, Eikenella corrodens*, and species of *Fusobacterium, Bacteroides, Capnocytophaga, Staphylococcus, Streptococcus*, and *Enterococcus* [4,8,11,12]. In one study of more than 650 cases of actinomycosis, no *Actinomyces* species was isolated in pure culture in any single case. *A actinomycetemcomitans* and *Haemophilus aphrophilus* were most commonly identified with Actinomyces in this study [7].

Epidemiology

Actinomycosis was originally described in 1878 by Israel and Wolfe [13,14], who initially isolated the organism in culture and defined its anaerobic nature [8]. Actinomyces are not found in nature, and humans are, in fact, the only natural reservoir for the species causative of cervicofacial disease [8]. It is a rare condition, with most major medical centers reporting an average of one case per year [5]. Actinomycosis has a worldwide distribution with no predilection for age, race, season, or occupation [7]. For reasons that are unclear, a male predominance of 1.5 to 3:1 is reported in many series [2]. Predisposing factors include dental extractions, caries,