SCIENTIFIC CORRESPONDENCE

Corynebacterium macginleyi: a conjunctiva specific pathogen

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Abstract

***Background*—Although non-diphtherial corynebacteria are ubiquitous in nature and commonly colonise the skin and mucous membranes of humans, they rarely account for clinical infection.**

***Methods and results*—10 patients with unilateral conjunctivitis are described in which *Corynebacterium macginleyi* was isolated. This species has only recently been reported to be exclusively isolated form ocular surfaces. *C macginleyi* was uniformly susceptible to topical antibiotics commonly used in ophthalmology.**

***Conclusion*—Despite the fact that the pathogenicity of *C macginleyi* is not yet assured, this micro-organism should be recognised as a potential cause of bacterial superinfections. Appropriate antibiotic therapy leads to its elimination and resolution of the conjunctivitis.**

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Bacterial conjunctivitis makes up a small percentage of all conjunctividitis, accounting for less than 10% of all clinically apparent cases.

Although usually self limited, certain bacterial reagents occasionally cause a severe conjunctivitis. Pathogenic organisms include *Haemophilus* species, *Staphylococcus aureus*, *Streptococcus pneumoniae*, and, increasingly, Gram negative rods—for example, in contact lens wearers. The rapidity of onset and severity of conjunctival inflammation and discharge suggest the possible causative organism. Mild to moderate cases usually present with slow onset of changes and are often the result of infections with *Staphylococcus aureus*, *Branhamella lacunata*, or *Proteus* species. In more severe cases *Haemophilus* species as well as *Streptococcus pneumoniae* have been isolated. An explosive onset of severe purulent conjunctivitis can be caused by *Neisseria* species.

The family of coryneform bacteria includes organisms from the genus *Corynebacterium* and *Propionibacterium* and other genera less commonly cultivated. Diphtheroids, named because of their morphological similarities to *C diphtheria*, are defined as a group of Gram positive pleomorphic rods in the coryneform family.[1] Although they were previously regarded as non-pathogenic organisms, diphtheroids are recognised as the cause of serious systemic and ocular disease.[2–4]

We report on 10 cases of *C macginleyi* conjunctivitis. *C macginleyi* was only recently identified as a specific pathogen in ocular tissues.[5–7] Since then, 18 cases have been reported in the literature.[8] Whether *C macginleyi* can cause endophthalmitis or bacterial keratitis is unknown; however, it should be considered in differential diagnosis in bacterial infections of the ocular surfaces.

Patients and microbiological analysis

We examined the conjunctival smears of 181 patients with clinically diagnosed bacterial conjunctivitis. Part of the conjunctival smear material was used for light microscopy. For enrichment of the micro-organisms patients' material was cultured on Columbia agar supplemented with 5% sheep blood, on chocolate agar, both in air with 3% carbon dioxide. For detection of Gram negative rods we used Endo agar cultured in ambient air. Anaerobic cultures were on Schaedler's blood-agar in oxygen-free, carbon dioxide enriched atmosphere. Thioglycolate broth was used as fluid enrichment medium. The aerobic cultures were inspected for the first time after overnight incubation. Total incubation time for all media was 48 hours. Biochemical identification was performed using the commercial API-Coryne system (bioMerieux Marcy l'Etoile France). A prolonged incubation time was not necessary. For evaluation of results we used the data given by Funke *et al*,[7 8] and the API-Coryne database 2.0. Susceptibility tests were performed according to the standards for agar diffusion tests published by DIN, on Müller-Hinton agar supplemented with 5% sheep blood, incubated in air.[9]

Results

A total of 181 patients with the clinical diagnosis of bacterial infection of the conjunctiva were examined. In 107 cases cultures yielded one or more micro-organisms. We found pathogenic bacteria in following frequency: 18.7% *Staphylococcus aureus*, 12.1 % *C macginleyi*, 10.3% *Streptococcus pneumoniae*, 8.4% *Haemophilus influenzae*.

We found the pathogenic species *Arcanobacterium haemolyticum*, *Branhamella catharrhalis*,

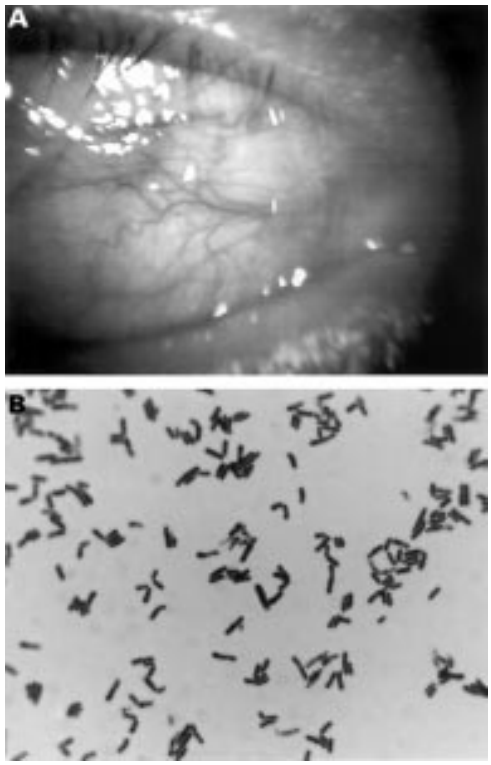

Figure 1 (A) Corynebacterium macginleyi conjunctivitis—clinical appearance. (B) Corynebacterium macginleyi—microscopic appearance (original magnification ×1000, Gram stain).

Neisseria meningitidis, *Pseudomonas aeruginosa*, cultivated in one case each.

Bacteria of apparently low pathogenic characteristics had been isolated as follows: 40.1% *Staphylococcus epidermidis*, 13.1% *Staphylococcus epidermidis* group.

Besides these, *Acinetobacter* spp and *Enterobacteriaceae* have been found and, rarely, *Micrococcus* species, non-haemolytic *Streptococcus* species, and *Aeromonas hydrophila*.

C macginleyi was isolated in a total of 10 patients from the conjunctival smears in 13 separate cases. Three patients appeared with bilateral infection, two others had recurrent disease 2–4 months after primary detection of *C macginleyi*. The age of these patients ranged from 33 to 86 with an average of 64.5. Five patients were females, five were males. All appeared with unilateral conjunctivitis worsening over a few days, without any history of infection. Visual acuity was unchanged as was intraocular pressure. Most patients showed conjunctival hyperaemia with moderate follicular reaction (Fig 1A). Seven of the patients had a whitish discharge. There were no signs of keratitis or intraocular infection or inflammation in any patient. *C macginleyi* was the only bacterial micro-organism isolated in five out of 13 swabs. From these patients one had a bacterial superinfection of a viral aetiology. In eight of the 13 swabs with *C macginleyi*, other bacterial micro-organisms were co-cultivated. Even *C pseudodiphthericum* was isolated in one case.

Tests for *Chlamydia trachomatis* or cultures for fungi were performed only if clinical suspicion existed. There were no positive results.

Light microscopy of the conjunctival swab before cultivation sometimes showed Gram positive rods and only in few cases a significant increase in leucocytes. In cultures on Columbia agar supplemented with 5% sheep blood almost no growth after 1 night of incubation was visible. Under anaerobic conditions there is no growth to be seen after 48 hours of cultivation. Even carbon dioxide enriched air retards the growth of *C macginleyi*. Colony size after 48 hours of incubation in air remained below 0.2 mm in diameter. These colonies were stained by Gram reagents and analysed microscopically. They consisted of coryneform rods with a distinctly striped pattern, forming irregular arrangements, similar to chinese letters (Fig 1B).

Susceptibility tests were performed for antibiotics, which are usually applied topically for external infections (Table 1). All patients were sensitive to gentamicin. Under treatment with gentamicin 0.5% eye drops four times daily and gentamicin ointment at night, eight out of 10 patients recovered uneventfully after 8 days. The remaining conjunctival irritation was successfully treated with zinc sulphate-containing eye drops (0.2%) over 2–3 weeks.

Discussion

More specific detection methods in recent years have allowed further investigation of the coryneform bacterias. *C macginleyi* was first identified in 1995 by Riegel *et al*[5–7] during investigations on lipophilic corynebacteria. It has been uniquely isolated from ocular surfaces. The first 18 cases of *C macginleyi* conjunctivitis have been detected in Switzerland.[8] Within the recent past we found in 10 patients 13 cases of *C macginleyi* conjunctivitis in Germany, indicating that the presence of this micro-organism is not geographically limited.

Thiel *et al* report on increasing percentage of patients positive for corynebacteria.[10 11] We found in our patients 18.7% *Staphylococcus*

Table 1 Susceptibility patterns of the 10 isolated Corynebacterium macginleyi species

API code	*β lactams*	*gentamicin*	*tetracycline*	*quinolones*	*erythromycin*	*choramphenicol*	*fusidinic acid*	*kanamycin*
1100304	S	S	S	S	S	S	R	S
1100305	S	S	S	I	S	S	—	S
1100305	S	S	S	S	S	S	S	S
1100305	S	S	S	S	S	S	S	S
1100305	S	S	S	I	R	R	S	S
5100305	S	S	S	S	S	—	—	S
5100305	S	S	S	S	R	R	R	R
5100305	S	S	S	S	S	S	S	S
5100305	S	S	I	S	R	R	S	R
5100325	S	S	S	S	S	S	—	S

S = sensitive, I = intermediate, R = resistant, — = not tested.

aureus, 12.1% *Corynebacterium macginleyi*, and 8.4% *Haemophilus influenzae*. Fahmi *et al*, however, found coagulase negative staphylococci in 82% and corynebacteria in 58% of their mainly elderly patients.[12] In our study group we found *C macginleyi* predominantly in middle aged patients without any preference regarding sex. This is in accordance to the cases described by Funke *et al*.[8] Younger children have not been analysed; however, infection with *C macginleyi* can be expected according to Weiss *et al*.[13]

Many systems fail to identify *C macginleyi* strains correctly. The identification of *C macginleyi* is described in the review by Funke *et al*[7]—positive nitrate reduction, negative pyrazinaminidase, positive alkaline phosphatase, acid production from glucose and sucrose but not from maltose.[5–8] It is important to use a system for biochemical identification that is able to detect *C macginleyi* and that the database employed contains information about *C macginleyi*.

C macginleyi is reported to be sensitive to almost all of the topical antibiotic agents.[8] This might be one reason for only rare reports in the literature, as most patients are successfully treated. However, with the availability of more sensitive detection systems diagnosis is likely to become more frequent. Here we show for the first time more resistant species of this bacterium, especially to erythromycin and kanamycin, making susceptibility testing advisable in these patients.

Till now reason for exclusive infection of the ocular surface is unknown. From our data, as well as from Funke *et al*,[8] *C macginleyi* seems to predominantly affect already injured conjunctivas. In our patients only three cases showed *C macginleyi* as only infectious agent. All patients had obvious signs of infection. Further investigations should analyse the normal healthy conjunctival flora for *C macginleyi*.

The role of *C macginleyi* in causing severe ocular infections is also unknown. It has not yet been shown in corneal ulcers, but other low pathogenic agents such as *Mycobacterium cheloniae* can mimic corynebacterium keratitis, so that *C macginleyi* is also likely to be able to cause serious damage to the cornea.[14] All cases suspicious for *C diphtheriae* should therefore also be screened for *C macginleyi*.[15 16]

C minutissimum, as well as *Propionibacterium acnes*, both belonging to the low pathogenic coryneform bacteria, may cause intraocualr infections such as endophthalmitis following penetrating ocular trauma, keratoplasty, and cataract extraction.[17] Similar events could potentially cause *C macginleyi* endophthalmitis.

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