

## Please read this bit first

The HPCSA and the Med Tech Society have confirmed that this clinical case study, plus your routine review of your EQA reports from Thistle QA, should be documented as a “Journal Club” activity. This means that you must record those attending for CEU purposes. Thistle will **not** issue a certificate to cover these activities, nor send out “correct” answers to the CEU questions at the end of this case study.

The Thistle QA CEU No is: **MT00025**.

Each attendee should claim **THREE** CEU points for completing this Quality Control Journal Club exercise, and retain a copy of the relevant Thistle QA Participation Certificate as proof of registration on a Thistle QA EQA.

## Cycle 24 - Organism 12:

# **CORYNEBACTERIA**

The actual organism issued was *C. pseudodiphtheriticum*, an opportunistic organism causing respiratory infections in immunocompromised patients. Most labs will never have identified this organism and finding details of it were nigh-impossible. We have accepted *Corynebacterium sp.* as “correct” for this organism and give the following notes for CPD points – without once mentioning *C. psuedodiphtheriticum!*

The genus ***Corynebacterium*** includes obligate human pathogens and opportunistic species. They are slightly curved club-shaped gram-positive rods, non-spore-forming, aerobic or facultative anaerobic, catalase positive and non motile. The most important pathogenic species is ***Corynebacterium diphtheriae***, the causative agent of diphtheria. Before the introduction of vaccination it was spread mainly among small children. The course of infection was either subclinical or clinical with also fatal cases. ***C. pseudodiphtheriae*, *C. xerosis*, *C. pyogenes*, *C. ulcerans*** are commensals of mucous membranes of respiratory, urinary tract and conjunctiva and are called **diphtheroids**.

**Pathogenesis of infection:** The toxin production is induced by the temperate bacteriophage – lysogenic conversion. (Nontoxigenic corynebacterial strain is infected by a bacteriophage from a toxigenic strain). Toxigenity is directed by the phage gene, invasiveness of bacterial strain by the bacterial genes. Diphtheria toxin is an exotoxin, a heat-labile polypeptide which causes destruction of the epithelium and superficial inflammation. Pseudomembranes are formed on tonsils, pharynx and larynx. The distant toxic action is found in heart muscle, liver, kidney, adrenal glands, peripheral nerves. The infection induces the production of toxin neutralizing antibody.

## **LABORATORY DIAGNOSIS:**

**Specimen collection:** Swabs from nose, throat, the borders of pseudomembranes or other lesions (skin diphtheria) are taken in pairs. One is used for microscopy, the other one for cultivation.

**Microscopy:** Slightly curved club-shaped gram-positive rods, the bacterial cell often remains attached at an angle and give V and Z forms. Characteristic for *C. diphtheriae* is the presence of metachromatic granules (phosphate deposits) stained by Albert or Loeffler or Neisser.

**Cultivation:** Samples are inoculated on Loeffler slant (coagulated horse serum in 1% glucose broth). After 6 hours of incubation the smear and the subcultures are made. On blood agar *C. diphtheriae* forms gray, waxy colonies with a small zone of hemolysis. Selective and differential culture media contain tellurite salts (Manzula, Clauberg and Skovranek medium) where *C. diphtheriae* grows in black colonies surrounded with reduced tellurium. Three cultural types according to the growth characteristics and severity of disease are distinguished – gravis, intermedius and mitis.

**Toxigenity testing:** All isolated strains of *C. diphtheriae* must be tested for the toxin production. In vivo guinea pig lethality test and in vitro Elek agar immunodiffusion test or tissue culture test can be used for diphtheria toxigenity testing.

**Therapy:** The successful therapy of diphtheria depends on the early neutralization of toxin with specific antitoxin. Bacterial growth is suppressed by antibiotics (penicillin, erythromycin).

**Prevention:** Vaccination against diphtheria belongs among the basic ones. The baby at the age of 3 months is vaccinated with diphtheria toxoid (= anatoxin; purified toxin with antigenic properties without toxicity) together with tetanus toxoid and pertussis bacterin, revaccination is after 6 weeks and 6 months, booster doses in 6 years.

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**CPD Questions:**

1. How would you perform the microbiological diagnosis of diphtheria?
  2. How can you diagnose *C. diphtheriae* in microscopy and culture examination?
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