

## *Propionibacterium avidum*

The Propionibacteria are pleomorphic, sometimes branching, gram positive coryneform bacilli. They are non-motile, non acid-fast and prefer anaerobic conditions for growth although some species are microaerophilic (aerotolerant). The genus consists of some 16 species.

*Propionibacterium spp* are commensals of the skin and oral cavity. They are common contaminants of clinical specimens and are deemed to be of low pathogenicity. However, at times they may be a cause of clinical infection.

### **Colonisation by *Propionibacterium avidum***

*Propionibacterium avidum* resides in the pilosebaceous hair follicles of the more humid areas of the body. Water appears to play an important role in the ecology of the organism (*P.acnes* and *P.granulosum* appear to require skin surface lipids rather than a higher water content). It can be isolated as "normal flora" from the nose and the rectum as well as the groin and axilla, suggesting an intestinal and/or respiratory reservoir.

An English study, reported in 1984, showed that the prevalence of *P.avidum* in the axilla appears to increase with age as the environment within the axilla changes during puberty. This is a gradual process and is similar between the sexes. As puberty occurs, the environmental changes within the axilla are caused by the activation of the apocrine sweat glands and a gradual change from an acidic to an alkaline pH. This results in a change in water and nutrient availability. By the ages of 15 and 16, the axilla of around 50% of the population tested were colonised by *P.avidum*, with girls



Culture of *P. avidum*

being colonised slightly earlier than boys. As females tend to reach maturity earlier than males this appears to confirm that the most important factor of axilla colonisation is that of the onset of puberty. The organism is rarely recovered from individuals under the age of 11 years.<sup>(1)</sup>

### **Infection**

*P.avidum* has been isolated from clinical specimens from a range of sites including breast, splenic and perianal abscess, bone and joint infections and endocarditis. It has been isolated in pure and mixed culture.

As a normal commensal of the skin and having low pathogenicity, what contributes to this organism causing infections at times? Immunostimulatory mechanisms are thought to be one factor and these include: complement activation, the stimulation and release of lysosomal enzymes from neutrophils and the production of serum-dependant neutrophil

chemotactic factors. There are other well documented patient factors that predispose to infections: immunosuppression, malignancy, diabetes, obstruction of sinuses and ducts, foreign bodies and preceding surgery or trauma, where organisms from the skin gain entry to the bloodstream and spread.<sup>(2)</sup> Where isolated in mixed culture the organism is an opportunistic pathogen but where isolated in pure culture from a sterile site it may play a pathogenic role.

### **Treatment**

*Propionibacterium spp* are reported to be very susceptible to antimicrobial agents. In a New Zealand study, isolates were found to be susceptible to: penicillin, augmentin, piperacillin/tazobactam, cefoxitin, cefotetan, ceftriaxone, clindamycin, imipenem and meropenem. All isolates were resistant to metronidazole. Preceding studies performed by this group show no increasing resistance.<sup>(3)</sup>

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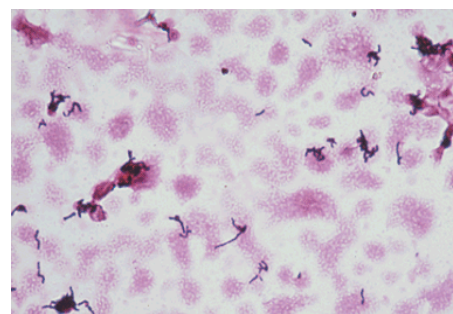
*P.avidum*, specifically, has been found susceptible to most common antibiotics in clinical situations including: penicillin, augmentin, erythromycin, vancomycin, clindamycin, ciprofloxacin, tetracycline, cotrimoxazole, rifampicin, cephazolin and piperacillin. All were resistant to metronidazole. <sup>(2,5)</sup>

At CHL, we test our *P.avidum* isolates against the following: penicillin, vancomycin, erythromycin, tetracycline, cotrimoxazole and ciprofloxacin. These are reported as non-standardised as no CLSI (Clinical Laboratory Standards Institute) standards are available for interpretation. Although most of our isolates had antibiograms that

showed susceptibility to all the above, in 2007 we had two isolates that showed resistance to penicillin and one that showed resistance to ciprofloxacin. In 2008, one isolate showed resistance to cotrimoxazole.

## Identification

*P.avidum* grows well in an anaerobic atmosphere at 37°C but will also grow in CO<sub>2</sub> with resulting smaller colonies. Anaerobically, the colonies are smooth, creamy colonies with a wide zone of B-haemolysis after 2-3 days on 5% sheep blood agar. *P.avidum* appears to be the only species that exhibits B-haemolysis. The organism is a gram positive, non-sporing, pleomorphic bacillus. Biochemically, the organism is:



Gram stain of *Propionibacterium*

catalase, gelatinase and esculin positive; oxidase, nitrate, indole and urea negative. Commercial kit systems may be used for identification. At CHL, we make a presumptive identification based on colonial morphology and B-haemolysis, which is confirmed by API © Coryne if necessary.

## References

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3. Roberts, S.A. et al 2006, Antimicrobial susceptibility of anaerobic bacteria in New Zealand: 1999-2003, J Antimicrob Chemother 5:992-998
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## *P. avidum* isolates at CHL Jan 2007-present

	Year	Age	Sex	Site <sup>1</sup>	Culture <sup>2</sup>
1	2007	19	M	Asp, R) neck	M
2	2007	64	M	Asp, L) nipple	M
3	2007	56	F	Tiss, L) axilla	M
4	2007	45	F	Asp, R) breast	M
5	2007	17	M	Sw, neck sinus	M
6	2007	24	F	Asp, R) preauricular abscess	M
7	2007	54	F	Sw, pus from vaginal incision	P
8	2007	71	F	Tiss/Asp, abdominal wound	P/P
9	2007	19	M	Sw, perianal abscess	M
10	2007	52	M	Tiss/Asp, L) hip	P/P
11	2008	34	F	Asp, L) shoulder	P
12	2008	44	F	Tiss/Asp, breast	P/M
13	2008	21	F	2x sw, L) breast abscess	P/P
14	2008	38	F	Sw, L) breast fistula	M
15	2008	43	M	2x sw, R) shoulder & clavicle	M/M
16	2008	38	F	Asp, L) breast	M
17	2008	61	F	Sw, L) breast cavity	M

1: Sw=swab, Asp=aspirate, Tiss=tissue, 2: solated in pure (P) or mixed (M) culture

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