

## *Bordetella bronchicanis* (bronchiseptica) infection in man: review and a case report

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**SUMMARY** *Bordetella bronchicanis* is a common respiratory tract commensal of mammals. Rarely it causes whooping cough in children. Compromised adults in hospitals may be colonised, and one terminal pneumonia is on record. The fatal pneumonia of a malnourished alcoholic described here was contracted at home.

Ferry (1910) isolated a Gram-negative coccobacillus from enzootic distemper of laboratory dogs and named it *Bacillus bronchicanis*. It was later placed successively in the *Brucella*, *Haemophilus*, *Alcaligenes* and, finally, *Bordetella* genus, because it resembles the pertussis and parapertussis bacilli in habitat (mammalian upper respiratory tract), antigens, toxins, metabolism, and phage-susceptibility, although it is motile, grows on the selective salmonella-shigella (SS) agar, and has a different GC ratio in the DNA (Pittman, 1974). The species name *bronchicanis* has precedence over the popular *bronchiseptica* (Johnson and Sneath, 1973; Gilardi, 1976).

Canine distemper turned out to be a viral infection. *Bordetella bronchicanis* is a global respiratory tract commensal of wild as well as domestic mammals, occasionally causing outbreaks of fatal rhinitis, otitis, tracheobronchitis, or pneumonia with septicaemia. A priming viral infection may not be essential (Bemis *et al.*, 1977a).

Stressed captive primates may die of bronchopneumonia (Seibold *et al.*, 1970), but adult men seem to be resistant (Switzer *et al.*, 1966). The mild cold-like infection in handlers of infected laboratory animals (Winnser, 1960) is probably superimposed on a viral infection. Gardner *et al.* (1970) detected nosocomial colonisation of the respiratory tract in 'compromised' hosts and reported one case of terminal pneumonia.

The following case report shows that adults can be infected in the community.

### Case report

A 73-year-old man, who lived alone in a slum and had been attending clinics over several years for alcoholic malnutrition, was admitted with respiratory

and peripheral circulatory failure, hypothermia, dehydration, mental confusion, Hb 120 g/l, and WBC  $17 \times 10^9/l$  with neutrophilia. A chest x-ray showed an abscess in the right mid-zone.

Intravenous methicillin, ampicillin, and gentamicin were started after taking blood cultures which yielded *B. bronchicanis*. The next day the x-ray showed bilateral bronchopneumonia. He was put on a respirator. The trachea was full of pus. Gram stain and cultures showed profuse aerobic and anaerobic bacteria consistent with aspiration pneumonia. Subsequently *B. bronchicanis* alone was seen in smears and cultures of pus obtained daily by tracheal suction until he died three days later. There were no viral studies nor necropsy.

### BACTERIOLOGY

Tiny, non-haemolytic, catalase- and oxidase-positive colonies grew aerobically on sheep blood agar after 24 hours at 35°C. The organisms were motile, short Gram-negative coccobacilli and bacilli. Only citrate utilisation and urease reaction occurred in the API 20E kit (Denver Laboratories). Results of macrotests (Cowan, 1974) and antibiotic susceptibility by a disk-diffusion method (Stokes and Waterworth, 1972) are summarised in the Table.

### Discussion

Procedures for phenotyping non-fermenting bacteria are recent and insufficient. Tatum *et al.* (1974) could name only 13% of strains referred to the Centre for Disease Control (CDC) in America after using a wide range of tests. Such groupings are necessarily tentative.

The descriptions of *B. bronchicanis* before 1950 are inadequate (Gardner *et al.*, 1970). Cowan (1974) preferred to include it in the genus *Alcaligenes*.

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Table Biochemical reactions and antibiotic susceptibility of the isolate: composite positive results in percentage of 71 strains, mostly stock, in parentheses (Johnson and Sneath, 1973; Snell, 1973; Gilardi, 1976)

Positive reactions	Negative reactions
Peritrichate flagella	Haemolysis, sheep blood (10)
Catalase (100)	Pigment in King's medium A/B (0)
Oxidase (100)	Anaerobic growth on nitrate agar (0)
Growth on nutrient agar (100)	Growth on 0.32 g/l tellurite agar (0)
Growth on SS agar (82)	Acid in 1% glucose, sucrose, mannitol, maltose, inositol, or salicin in peptone water (0)
Growth on KCN broth (100)	Acid in 10% lactose agar (0)
Pellicle on nutrient broth (100)	ONPG reaction (0)
Urease production in 1 h (98)	Indole (0)
Alkali in litmus milk	H <sub>2</sub> S in TSI slope (0)
Citrate utilisation (100)	Phenylalanine deamination (5)
Tetrazolium reduction (97)	Lysine/ornithine decarboxylase (0)
Tyrosine hydrolysis (100)	Arginine dehydrolase (see text)
	Malonate utilisation (0)
	Digestion of casein/gelatin (0)
	Hydrolysis of starch/aesculin (0)
	Nitrate reduction (85)
<i>Susceptible to:</i>	<i>Resistant to:</i>
Ampicillin 10 µg (30)	Benzyl penicillin 1.5 µg (7)
Cephalothin 5 µg (75)	Clindamycin 2 µg (0)
Cotrimoxazole 25 µg (78)	Erythromycin 10 µg (93)
Gentamicin 10 µg (80)	Kanamycin 30 µg (65)
Nalidixate 30 µg (86)	Tetracycline 10 µg (100)
Nitrofurantoin 200 µg (54)	
Sulphafurazole 100 µg (86)	

Johnson and Sneath (1973) distinguished it from *Alcaligenes* by tetrazolium reduction, growth on potassium tellurite agar, and antigenic distinctiveness. All their strains hydrolysed arginine, but Snell (1973) and the *API Computer Manual* (Denver Laboratories) recorded a negative reaction. All these workers considered nitrate reduction a characteristic of this organism, but only half the strains examined by Gilardi (1976) and Bemis *et al.* (1977b) reduced nitrate.

Our strain had all the essential diagnostic characters of *B. bronchicanis* (Johnson and Sneath, 1973; Bemis *et al.*, 1977b) viz, morphology, oxidase reaction, rapid urease production in Christensen's medium, citrate utilisation, tetrazolium reduction, failure to grow on tellurite agar, growth on SS agar, and tyrosine hydrolysis. CDC group IV bacteria (Tatum *et al.*, 1974) do not grow on SS agar or have peritrichous flagella, and they are usually citrate negative. Resistance to erythromycin and tetracycline in our strain was unusual, but an R factor has been reported in animals (Hedges *et al.*, 1974).

*B. bronchicanis* affects mostly young animals (Battay and Smits, 1976). Rarely it has caused parapertussis in American children (Brown, 1926; Chang, 1950; Brooksaler and Nelson, 1967) and also possibly about 1:10<sup>3</sup> cases of whooping cough in England (Lautrop and Lacey, 1960). Kristensen and Lautrop (1962) described a Danish farmer whose pet rabbits and subsequently cats died of the infection. Two of his younger children developed

pertussis, another simple bronchitis; three older children became asymptomatic carriers while the eldest and the parents were unaffected. Krepler and Flamm (1958) cured with tetracycline a subacute tuberculoid cavity in the lung of a 14-year-old boy whose sputum yielded *B. bronchicanis* repeatedly on culture. Chang *et al.* (1975) reported that the organism caused meningitis in a child with a closed fracture of the skull after being kicked by a horse; the microbe was not detected in the horse.

Cooper and Gibbs (1967) did not isolate the organism in Australia in a prospective study of whooping cough. The possibilities of its being missed, or classified as *Alcaligenes* sp, is high (Lautrop and Lacey, 1960; Cowan, 1974).

As stated already, normal adult man seems resistant to infection with *B. bronchicanis*. Pedersen *et al.* (1970) isolated 12 strains from hospital inpatients and considered them to be harmless. Gardner *et al.* (1970) regarded 16 strains isolated in 19 weeks from the respiratory tracts of intubated patients as well as another culture from urine as nosocomial colonisation in compromised hosts. However, they isolated *B. bronchicanis* and a pneumococcus from the blood of another man with terminal pneumonia, who was being treated for staphylococcal endocarditis after splenectomy and corticosteroid therapy.

In none of the isolations from adults was the source of the microorganisms established.

Snell (1973) has shown a bacillus isolated by Khaled (1923) from a typhoid-like fever in Egypt to be *B. bronchicanis*. The clinical details are not

available. Apart from this possible exception, our case seems to be the first record of domiciliary human disease due to *B. bronchicanis* in an adult. The case confirms the organism as an opportunist pathogen which is probably overlooked because of its close semblance to *Alcaligenes* (Cowan, 1974).

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