

# Meningitis caused by *Pseudomonas paucimobilis*

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**SUMMARY** This appears to be the first report of meningitis due to *Pseudomonas paucimobilis* and the first report of a clinically significant isolate of this species in the UK. Characteristics by which the species may be recognised are given, and attention is drawn to the possible confusion of *Ps. paucimobilis* with other yellow-pigmented pseudomonads and *Flavobacterium* species.

*Pseudomonas paucimobilis* is a species described only recently (Holmes *et al.*, 1977). The strains on which the description of the species was based had been recovered largely from human clinical specimens and the hospital environment, but none was known to be the causative agent of infection. Although the clinical significance of *Ps. paucimobilis* remained unknown we now report what is, as far as we know, the first case of meningitis due to this species.

## Case report

A 39-year-old male epileptic was admitted on 24 June 1978. He had had epilepsy for three years and was currently treated with phenobarbitone 60 mg and phenytoin 100 mg three times a day. He complained of headache for two days and had started to have convulsions on the day of admission. This was controlled with a single dose of 20 g diazepam intravenously. However, he remained very drowsy 6 hours later, and the axillary temperature was found to be 39.2°C (103°F). Clinical examination showed neck stiffness and a positive Kernig's sign.

A lumbar puncture was performed and turbid fluid obtained, giving the following results: white cells 0.2 × 10<sup>9</sup>/l (200/mm<sup>3</sup>), 95% lymphocytes, 5% neutrophils; protein 0.4 g/l (40 mg/100 ml), glucose 3.7 mmol/l (67.2 mg/100 ml); the blood glucose level was 4.7 mmol/l (85 mg/100 ml). Gram and Ziehl-Neelsen films were initially reported as negative. However, 48 hours later repeat examination of the original Gram-stained film revealed numerous Gram-negative rods. Other tests included haemoglobin 15.4 g/dl, white cell count 12.8 × 10<sup>9</sup>/l (12 800/mm<sup>3</sup>), 82% neutrophils showing toxic granulation and a shift to the left. A chest film was normal.

In view of the initial findings, tuberculous meningitis had to be considered and, because of the clinical state of the patient, treatment was started immediately with streptomycin 1 g daily intramuscularly, rifampicin 600 mg daily orally, and isoniazid 600 mg daily intramuscularly. The patient rapidly improved and became apyrexial within 30 hours.

Treatment was continued for four days and he was discharged symptom-free on the tenth day.

## BACTERIOLOGY

Cultures of cerebrospinal fluid and blood, taken before the start of treatment, were incubated aerobically at 37°C on blood agar. After 48 hours cultures of both specimens yielded a moderately heavy pure growth of a yellow-pigmented, non-fermentative, Gram-negative, rod-shaped bacterium which could not be identified by routine laboratory tests. The isolates were sensitive to rifampicin.

Three isolates, two from cerebrospinal fluid and one from blood, were submitted to the National Collection of Type Cultures for computer-assisted identification. There, a set of 68 characteristics were determined for each isolate using methods described previously (Holmes *et al.*, 1975). In these tests the three isolates yielded identical results (Table), thereby indicating that the isolates represented a single strain. On the results of these characteristics, in conjunction with an unpublished probability matrix, the isolates were identified as *Ps. paucimobilis*. The isolates proved typical of the species except in their ability to produce an alkaline reaction on Christensen's citrate medium and in their inability to produce acid from salicin in ammonium salt sugar medium.

Cultures of swabs taken from the nose, throat, ear, and axilla of staff examining specimens in the laboratory, and from the houseman who performed the lumbar puncture and took blood for culture

Table Characteristics of the three isolates of *Pseudomonas paucimobilis* examined

<i>Isolates positive in:</i>			
Acid from the following ammonium salt sugars:	lactose maltose raffinose sucrose trehalose xylose	Alkali production on Christensen's citrate agar Catalase production Cytochrome oxidase production Deoxyribonuclease production Growth at 37°C Growth at room temperature (18°C-22°C) Growth on $\beta$ -hydroxybutyrate	Poly- $\beta$ -hydroxybutyrate inclusion granules Production of yellow pigment Tween 20 hydrolysis Tween 80 hydrolysis Tyrosine hydrolysis $\beta$ -galactosidase production
fructose	Aesculin hydrolysis		
<i>Isolates negative in:</i>			
Acid from the following ammonium salt sugars:	Acid from glucose (10 g/100 ml) Acid from lactose (10 g/100 ml)	Growth at 42°C Growth on cetrinide agar Growth on MacConkey agar Growth on Simmons' citrate agar Hugh & Leifson O-F test Hydrogen sulphide production† Indole production	Nitrate reduction Nitrite reduction Opalescence on lecithovitellin agar Ornithine decarboxylase Phenylalanine deamination Pigment production on tyrosine agar
adonitol	Arginine desimidase	KCN tolerance	Reduction of selenite (0.4 g/100 ml)
dulcitol	Arginine dihydrolase	Lysine decarboxylase	Starch hydrolysis
glycerol	Casein digestion	Malonate utilisation	Urease production
inositol	Fluorescence on King's medium B	Motility‡	3-ketolactose production
mannitol	Gas from PWS glucose		
rhamnose	Gelatinase production*		
salicin	Gluconate oxidation		
sorbitol	Growth at 5°C		
Acid from PWS glucose			

PWS = peptone water sugar.

\*By stab and plate methods.

†By both lead acetate paper and triple sugar iron agar methods.

‡At both 37°C and room temperature (18°C-22°C).

from the patient described above, proved negative for *Ps. paucimobilis*.

## Discussion

Two of the strains on which the original description of *Ps. paucimobilis* was based were representative of a group that had been designated group IIk, biotype 1 by workers at the Center for Disease Control, Atlanta, USA (Tatum *et al.*, 1974). This implies that group IIk, biotype 1 and *Ps. paucimobilis* are the same taxon, and thus, even before the description of *Ps. paucimobilis*, isolates belonging to the species were being recognised in human clinical material, principally from blood, environmental sources, spinal fluid, urine, and various wounds and abscesses (Tatum *et al.*, 1974). Although they would have been labelled unclassified non-fermenters when first received, after several isolates had been collected, strains were recognised as belonging together in a distinct taxon, provisionally as group IIk, biotype 1, but later as *Ps. paucimobilis*. However, because initial isolates of the taxon were labelled only as unclassified non-fermenters, clinical details were not requested on receipt of the strains, and consequently none was known to be implicated as a cause of infection. Also group IIk, biotype 1 was little recognised outside the USA, but since the naming of *Ps. paucimobilis* the species has become more widely known and recognised in clinical laboratories, and clinically significant isolates have been recognised: from a leg ulcer in Australia (Peel *et al.*, 1979) and from a septicaemia in the USA (Slotnick *et al.*, 1979). The case herein reported appears to be the

first of a clinically significant isolate of this species in the UK and the first report of this species as a cause of meningitis.

*Ps. paucimobilis*, because of its yellow pigment and because motility is difficult to demonstrate (room temperature in a hanging-drop preparation is recommended, and even then only a very low proportion of the cells may be actively motile), is most likely to be confused with *Flavobacterium* spp. However, *Flavobacterium* spp. usually grow on MacConkey agar, produce caseinase and gelatinase, and show resistance to carbenicillin and gentamicin, characters rarely, if ever, seen in *Ps. paucimobilis*. Yellow-pigmented strains of *Ps. cepacia*, *Ps. maltophilia*, and *Ps. stutzeri* may also be encountered occasionally, but, as well as all growing on MacConkey agar, they can be further distinguished from *Ps. paucimobilis* by production of caseinase and growth on Simmons' citrate in the case of *Ps. cepacia*, production of caseinase, gelatinase, and decarboxylation of lysine in *Ps. maltophilia*, and by the wrinkled colonies and nitrate reduction (to nitrogen gas) in *Ps. stutzeri*.

The role played by *Ps. paucimobilis* in infections is still uncertain although it may be responsible for various opportunistic infections. However, our patient had been previously healthy, had not been on any antibacterial therapy, and had had no recent contact with hospitals. The association of *Ps. paucimobilis* with moist sites suggests that the species is water-borne, and it is therefore possible that initial entry into the body was through the gastrointestinal tract. Failure to recover the organism from staff involved in the collection and examination of the patient specimens reinforces our belief that

*Ps. paucimobilis* was the causative agent of meningitis in this patient.

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