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Pseudomonas pseudomallei Infection from Drowning: the First Reported Case in Taiwan

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We report a case of *Pseudomonas pseudomallei* infection, in which the patient acquired the bacteria by aspiration of river water after a drowning incident near Manila, the Philippines. The pulmonary form of melioidosis was noted at the onset, but septicemia developed at a later stage. Positive blood cultures were obtained 17 days after the accident. The patient was treated successfully with a combination of amikacin and cephalothin. This is the first report of *P. pseudomallei* infection documented in Taiwan.

Melioidosis, a rapidly fatal granulomatous disease caused by *Pseudomonas pseudomallei*, was first described by Whitmore and Krishnaswami in 1912 (29). It was observed that human infections with *P. pseudomallei* occurred almost exclusively in the between latitude 20° north and latitude 20° south. It is endemic in Southeast Asia (Indochina) (19). Although Taiwan is very close geographically to this area, no case of melioidosis has been reported. The present report describes the first imported case of *P. pseudomallei* infection in Taiwan. Interestingly, the route of infection was neither airborne transmission nor introduction of the bacterium into a skin wound as reported for the majority of the cases (2, 7, 12). The patient acquired the organisms by aspiration of river water, and developed sepsis after a drowning incident near Manila, the Philippines.

CASE REPORT

This 46-year-old female Taiwanese was transferred by airplane from San Juan De Dios Hospital, Pasay City, the Philippines, to Chang Gung Memorial Hospital, Lin-Kou Medical Center, Taipei, Taiwan, on 12 September 1982, with bilateral bronchopneumonia secondary to drowning. Before the accident, she was in excellent health. During a boat excursion on a river near Manila, the Philippines, the canoe the woman was in turned over and she almost drowned. Loss of consciousness was noted for several minutes. Cardiopulmonary resuscitation was performed successfully. She was admitted to a local hospital and then was transferred to our hospital complaining of shortness of breath and cough. At the time of admission in addition to bronchopneumonia, she also had multiple rib fractures and contusion of the left chest.

On admission, she appeared to be acutely ill and slightly lethargic. Her temperature was 38.7°C, her pulse rate was 92/min, her respiratory rate was 18/min, and her blood pressure was 130/80 mmHg. She displayed severe tenderness over the left chest wall, rhonchi audible over the right anterior middle and bilateral posterior lower lung fields, with scattered moist rales, and a sutured laceration wound measuring 3 cm over the right anterior tibia.

The result of laboratory tests on the day of admission revealed hemoglobin at 11.2 gm/100 ml; hematocrit at 34.7%; leukocyte count at 15,621/mm^3, with 5% nonsegmented neutrophils, 86% segmented neutrophils, and 9% lymphocytes; elevated serum bilirubin (1.8 mg/100 ml); aspartate-aminotransferase (60 IU/liter); and alanine-aminotransferase (85 IU/liter). The chest radiograph on the same day disclosed diffuse bilateral pulmonary infiltrates, with more appearing on the right side, left pleural effusions, and fractures of the left 4th and 5th ribs (Fig. 1). Five initial blood cultures showed no bacterial growth. Sputum culture yielded mixed flora. Culture of the right anterior tibial laceration wound grew *Staphylococcus aureus* and *Enterobacter aerogenes*.

The patient was treated with combined antimicrobial therapy of intravenous penicillin G (12 million U per day) and intramuscular gentamicin (180 mg per day). The patient remained febrile. Spiking fever with a temperature above 39°C was noted. Three sets of blood cultures were obtained on 27 September, about 2 weeks after admission. One of these sets yielded *P. pseudomallei* susceptible to amikacin, carbenicillin, kanamycin, and chloramphenicol. Bronchoscopic examination was normal at this time, except for the presence of whitish sputum in the right upper lobe bronchus. Follow-up chest X-ray performed 1 week after the positive blood culture finding revealed a thin-walled cavity in the posterior segment of the right upper lung with an air-fluid level (Fig. 2). Sputum cultures and additional blood cultures did not reveal *P. pseudomallei*.

After isolation of *P. pseudomallei* from the blood culture, a combination of cephalothin (4 g per day) and amikacin (500 to 750 mg per day) was instituted. This therapy appeared to be effective and resulted in defervescence. Although cloudy pneumonia of both lungs persisted as evidenced by chest radiograph, the patient was discharged on 26 October. Because of positive microhemagglutination assay for *Treponema pallidum*, she was treated with penicillin G benzathine three times before discharge (2.4 million U per week). She was followed regularly at an out-patient clinic. Her last visit was on 9 November 1984. She had no complaints, and a chest X-ray was normal. No serological tests for *P. pseudomallei* were performed because there is no reference laboratory in Taiwan.

RESULTS AND DISCUSSION

Melioidosis is a disease of humans and animals caused by a gram-negative rod, *P. pseudomallei*. It was first discovered and identified by Whitmore and Krishnaswami in 1912 from autopsies on morphine addicts and vagabonds found dead in the streets of Rangoon, Burma (29). Melioidosis has been observed in all age groups. It may occur in previously

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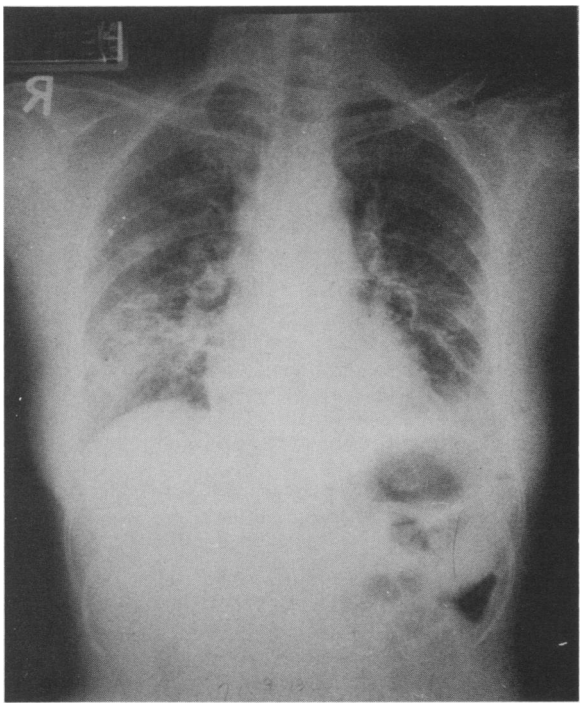

FIG. 1. Chest X-ray on the day of admission showing bilateral pulmonary infiltrates, left pleural effusions, and fractures of left 4th and 5th ribs.

healthy individuals as well as persons with debilitating illness. Interestingly, almost all of the reported cases, with very few exceptions (16, 20–22, 25) including laboratory-acquired infections (16, 25), have been in persons who were living in or had returned from an area endemic for melioidosis between latitude 20° north and latitude 20° south (19).

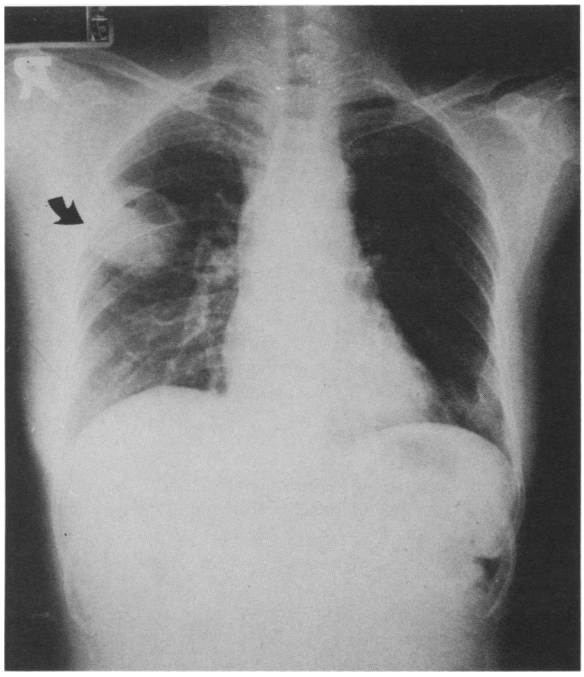

FIG. 2. Chest X-ray performed 1 week after positive blood culture revealed a cavity (pointed by the arrow) in the posterior segment of the right upper lung with an air-fluid level.

The main area of endemic melioidosis is Southeast Asia. Melioidosis may present as an acute, subacute, or chronic form of pulmonary, suppurative, or septicemic disease (2, 3, 5–9, 11–14, 17, 23, 27). In the case presented here, it first occurred in the pulmonary form. The chest radiograph revealed diffuse infiltrates initially. Later on, a thin-walled cavity formed in the upper lobe of the right lung. The disease then advanced to a septicemic form. Organisms isolated from blood culture were identified as *P. pseudomallei* on the basis of typical morphology and biochemical characteristics (1, 4, 24, 28). The bacteria are short, mobile, gram-negative bacilli. On blood agar plates after 24 h of incubation at 37°C, the colonies are smooth, moist, white, dome shaped, about 0.8 to 1.5 mm in diameter, with a putrid odor. After 5 days the fully developed colonies are brown and 5 to 6 mm in diameter. They become centrally umbonated, with radiating ridges on the periphery with a characteristic earthy odor. The results of biochemical reactions are listed in Table 1.

TABLE 1. Biochemical characteristics of the isolated *P. pseudomallei* strain

Method of testing and tests	Test result
Minitek	
Oxidase	+
Growth on MacConkey agar	+
Anaerobic glucose	−
Aerobic carbohydrates	
Glucose	+
Maltose	+
Sucrose	+
D-Xylose	+
Arginine dihydrolase	−
Lysine decarboxylase	−
Ornithine decarboxylase	−
Urease	−
ONPG[a]	−
Indole	−
Nitrate to nitrite	−
Nitrate reduced beyond nitrite	+
Starch hydrolysis	−
Phenylalanine deamination	−
Citrate utilization	−
ERA-18NF	
Pyocyanin	−
O/F glucose	+
O/F fructose	+
O/F lactose	+
O/F mannitol	+
O/F maltose	+
O/F xylose	+
Acetate	+
Esculin hydrolysis	+
Starch	−
Lecithinase	−
DNase	−
ONPG[a]	−
Acetamide	−
Arginine dihydrolase	+
Nitrate to NO_2	+
Nitrate to N_2	+
Oxidase	+
Growth at 42°C	+

[a] ONPG, *o*-Nitrophenyl-β-D-galactopyranoside.

Two different systems, ERA-18NF (Creative Microbiologicals, Taipei, Taiwan) and Minitek (BBL Microbiology Systems, Cockeysville, Md.), were used. Both showed a confidence level of 99.99 in establishing the identity as *P. pseudomallei*. In vitro antibiotic susceptibility data were obtained by the disk diffusion method. The organism was susceptible to amikacin, carbenicillin, chloramphenicol, kanamycin, tetracycline, and trimethoprim-sulfamethoxazole and was resistant to ampicillin, cefamandole, caphalothin, colistin, erythromycin, gentamicin, streptomycin, and tobramycin. These results are similar to other reported antibiograms (10, 18). Although tetracycline or trimethoprim-sulfamethoxazole has been suggested as primary therapy for melioidosis, no satisfactory treatment regimens have been established (15). *P. pseudomallei* is not only resistant to therapy with many antibiotics but clinically may fail to respond to those drugs to which it is susceptible in vitro (13, 26). The present case reveals good correlation between clinical responsiveness and the in vitro results with amikacin. To date, no evidence of relapse or recrudescence has been noted after regular follow-up for more than 2 years.

In conclusion, we report the first case of melioidosis in Taiwan. Infection is assumed to have occurred in the Philippines but could not be established with certainty since the incubation period for this disease may be several months. Because of the large number of tourists and business travelers visiting areas where diseases caused by different microorganisms are endemic, it is important for clinicians and clinical microbiologists to bear in mind the increasing possibility of encountering new disease entities and unusual strains of microbes in patients who travel to foreign countries. We believe we will encounter more cases of meliodosis in the future.

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