Fatal Infection of the Hand Due to *Photobacterium damsela*: A Case Report

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We report a case of fatal acute renal failure due to *Photobacterium damsela* infection of the hand. Although the patient received intensive medical care and surgical treatment, he died 8 h after arrival at the hospital. This is the first case of *P. damsela* sepsis proven by blood culture in Japan.

*Vibrio* species are virulent pathogens that often cause death in the immunocompromised host. *Photobacterium damsela*, formerly called *Listonella damsela* or *Vibrio damsela*, was first identified in 1981 [1]. We report a case of fatal acute renal failure due to *P. damsela* infection during surgical wound exploration. Intensive medical and surgical therapy, including administration of appropriate antibiotics, was performed perioperatively. Nevertheless, the patient died 8 h after arrival at the hospital. To our knowledge, this is the first case in Japan of *P. damsela* sepsis proven by blood culture.

A 58-year-old fisherman noticed mild itching in his left wrist several hours after he returned from fishing off the east coast of Okinawa on 16 December 1998. The patient developed hyperpyrexia (temperature, 40 °C), and, by morning, the hand was swollen and erythematous. He went to a local medical clinic and received medications, with no effect. Later that day, the patient was referred to our orthopedic clinic for further treatment.

On admission to the clinic, the patient was awake and alert, his temperature was 37.4 °C, his pulse rate was 127 beats/min, his blood pressure was 110/70 mm Hg, and mild hyperventilation was observed. He reported unremitting pain in the left upper extremity. Patchy purple-gray discoloration of the skin of the arm was noted. His left middle, ring, and little fingers were cold and hypesthesic. No sign of a cutting wound was noted.

Leukocytosis (leukocyte count, 21,000 leukocytes/mm³), hyperglycemia (serum glucose level, 343 mg/dL), glycosuria (urinary glucose value, 4+), and ketonuria (urinary ketone value, 1+) were noted. The results of standard coagulation tests, prothrombin time, activated partial thromboplastin time, bleeding time, platelet count (174 × 10⁴ platelets/mm³), and serum electrolyte concentrations were within normal limits. The C-reactive protein level was moderately elevated (3.14 mg/dL). Ultrasonography of the left hand and forearm showed a low echoic area, suggesting abscess formation. Compartment syndrome due to staphylococcal infection was strongly suspected, and 1 g of cefotiam was administered intravenously after blood samples were obtained for culture and susceptibility testing. Emergent surgical exploration was performed while the patient was under general anesthesia (figure 1). A zigzag skin incision was made to the level of the distal biceps. Many bleeding points in the subcutaneous tissue required electrocautery. However, the areas that were purple-gray did not bleed, and intravenous thrombi were common in the superficial veins. No abscess was identified. The patient’s vital signs were stable for the first 2 h after induction of anesthesia. However, when fasciotomy had been completed, the patient’s urine became dark purple, and then the patient became anuric. Just before the end of surgery, hyperkalemia (potassium level, 6.6 mEq/L) was noted. We prepared the patient for emergent hemodialysis, but he unexpectedly went into cardiac arrest, and cardiopulmonary resuscitation was unsuccessful. The patient was pronounced dead 8 h after arrival at the hospital. Several days later, blood cultures grew gram-negative bacillus. The family permitted only a limited autopsy, consisting of examination of the kidney. Tubular necrosis without intravascular thrombosis was observed. Myoglobin was not detected by immunohistochemical tests. Six months after the autopsy, this gram-negative bacillus was identified as *P. damsela*.

A halophilic gram-negative bacillus, *P. damsela* was initially described as *V. damsela*, later classified as *L. damsela*, and was recently reclassified as *P. damsela* on the basis of phenotypic data [2]. Strains of *P. damsela* are commonly found in marine fish, and it is a pathogen that is found in both fish and humans [3]. Generally, *P. damsela* is considered to be less virulent than *Vibrio vulnificus*, which is regarded as the most virulent bacillus in the genus. Damselysin, a kind of cytolysin, is the exotoxin produced by *P. damsela*, and it has been shown to possess a strong hemolytic activity in erythrocytes [4]. Damselysin was
genetically reproduced in *Escherichia coli*, and its hemolytic activity was confirmed [5].

Infection of a wound with *P. damsela* was reported in 18 patients in English language journals before 2002: 13 patients were in North America, 3 were in Australia, and 2 were in Hong Kong [6–15]. The most notable clinical findings in cases of patients who died included a puncture wound acquired in handling fish; rapid progression to a pattern of patchy skin necrosis without abscess formation; diabetes mellitus, liver dysfunction, or other immunocompromised conditions as underlying medical factors; little effect from parenteral administration of antibiotics and surgical debridement to stop the progress of disease; and acute renal failure and ventricular fibrillation secondary to hyperkalemia. In vitro susceptibility to most antibiotics other than ampicillin is another characteristic of *P. damsela*. Although we could not find any puncture wound in the hand of this particular patient, his family reported that he had received a puncture wound to his left hand. We believe that damselysin was released during the surgical exploration and caused disseminated intravascular coagulation and rhabdomyolysis, which, in turn, caused the acute renal failure and hyperkalemia that resulted in cardiac arrest. The observation of numerous clots in the cutaneous veins, as well as histologic evidence of coagulation necrosis in fibroadipose tissue and rhabdomyolysis, supports this proposed cascade. Therefore, radical though it seems, amputation may be life-saving and the treatment of choice for patients with *P. damsela* infection who have serious underlying medical problems, such as renal or liver dysfunction, a compromised immune system, or diabetes mellitus. A simple, reliable test for identifying *P. damsela* is necessary to permit early identification of this potentially fatal infection.

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**References**