

# Fournier's gangrene caused by *Listeria monocytogenes* as the primary organism

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A 70-year-old man with a history of tongue cancer presented with Fournier's gangrene caused by *Listeria monocytogenes* serotype 4b. Surgical debridement revealed undiagnosed rectal adenocarcinoma. The patient did not have an apparent dietary or travel history but reported daily consumption of sashimi (raw fish).

Old age and immunodeficiency due to rectal adenocarcinoma may have supported the direct invasion of *L. monocytogenes* from the tumour. The present article describes the first reported case of Fournier's gangrene caused by *L. monocytogenes*. The authors suggest that raw ready-to-eat seafood consumption be recognized as a risk factor for listeriosis, especially in cases of skin and soft tissue infection.

**Key Words:** Fournier's gangrene; *Listeria monocytogenes*; Raw ready-to-eat food; Rectal carcinoma

*Listeria monocytogenes* is an aerobic and facultative anaerobic Gram-positive rod. *L. monocytogenes* can tolerate high salt concentrations, temperatures <4°C, drying, freezing and absence of oxygen, can survive in animals that appear healthy and contaminate foods of animal origin such as meats and dairy products.

*L. monocytogenes* causes meningitis, meningoencephalitis and bacteremia in immunosuppressed patients, neonates, elderly adults and pregnant women. However, healthy individuals can ingest high numbers of *L. monocytogenes* and only develop self-limited febrile gastroenteritis. *L. monocytogenes* outbreaks are known to occur worldwide and are associated with the consumption of meat products (deli meat, ham), dairy products (cheese, unpasteurized milk) and vegetables/fruits (celery, cantaloupe). Fournier's gangrene is a necrotizing infection of the scrotum and perineal soft tissue typically caused by *Enterobacteriaceae* and anaerobes. Herein, we report the first case of Fournier's gangrene caused by a primary *L. monocytogenes* infection.

## CASE PRESENTATION

A 70-year-old man complained of a calloused right hemiscrotum for three weeks and pain for 24 h. In the previous year, the patient had tongue cancer that required surgical removal. Examination of the patient's social history revealed that he had retired 10 years previously and had since lived with his wife. A detailed medical history revealed that he did not have an apparent dietary or travel history that indicated exposure to *L. monocytogenes*. However, the patient did report that he consumed sashimi (raw fish) daily.

The patient presented with a blood pressure of 123/77 mmHg, a heart rate of 81 beats/min, a temperature of 36.4°C, and a conscious and alert

## Une gangrène de Fournier causée par le *Listeria monocytogenes* comme organisme primaire

Un homme de 70 ans ayant des antécédents de cancer de la langue s'est présenté avec une gangrène de Fournier causée par un *Listeria monocytogenes* de sérotype 4b. Le débridement chirurgical a révélé un adénocarcinome rectal non diagnostiqué. Le patient n'avait pas d'antécédents alimentaires ou de voyage apparents, mais a déclaré consommer des sashimis (poisson cru) tous les jours.

L'âge avancé et l'immunodéficience causée par l'adénocarcinome rectal ont peut-être favorisé l'invasion directe du *L. monocytogenes* par la tumeur. Il s'agit du premier cas déclaré de gangrène de Fournier attribuable au *L. monocytogenes*. Les auteurs proposent d'inclure la consommation de fruits de mer crus prêt-à-manger dans les facteurs de risque de listériose, notamment en cas d'infections de la peau et des tissus mous.

state. On examination, erythema and blackish discoloration of the skin around the right buttock toward the back of the scrotum with a foul odour was noted. Computed tomography demonstrated subcutaneous gas formation and Fournier's gangrene was diagnosed. He immediately underwent surgical debridement of the necrotic tissue, suprapubic cystostomy and resection of an incidentally identified rectal tumour (Figure 1).

Blood cultures were performed, and intravenous antimicrobial treatment was administered empirically using meropenem (1 g every 12 h), clindamycin (600 mg every 8 h) and vancomycin (15 mg/kg of body weight every 12 h). Gram stain of necrotic tissue specimens obtained during surgery demonstrated dominance of Gram-positive rods, and the blood culture and the necrotic tissue specimens yielded *L. monocytogenes*. Species identification of *L. monocytogenes* was performed using the MicroScan Walkaway 96si PC3.1J panel (Siemens Healthcare Diagnostics, USA). The serotype of the isolate was assessed using commercial *Listeria* antisera (Denka Seiken, Japan) according to the manufacturer's instructions and was determined to be 4b. *Escherichia coli* was concomitantly isolated only from the necrotic tissue specimen. The treatment was subsequently switched to ampicillin/sulbactam at a dose of 3 g intravenously every 4 h. The antimicrobial treatment regimen was continued for a period of 21 days. In addition, the rectal tumour was identified as an adenocarcinoma, and the patient consequently underwent stoma and abdominoperineal resection along with D2 lymph node dissection.

## DISCUSSION

The incidence of *L. monocytogenes* infection is much lower in Japan than in Western Europe and North America. A questionnaire-based

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nationwide surveillance of hospitals in Japan estimated the incidence of *L monocytogenes* infection to be 0.65 cases per 1,000,000 individuals (1). However, the incidence was 2.9 cases per 1,000,000 individuals in the United States (2), and 6.3 cases per 1,000,000 individuals in 2006 in Europe (3).

It is speculated that *L monocytogenes* is primarily transmitted vertically or feco-orally through the consumption of contaminated foods including processed meats, unpasteurized milk and soft cheeses. However, the patient in the current case lacked a diet or travel history indicative of *L monocytogenes* exposure. Furthermore, older age and immunosuppression due to an associated rectal adenocarcinoma were considered to be possible risk factors. There are no published reports of *L monocytogenes* causing necrotizing skin and soft tissue infection. In our case, Fournier's gangrene was possibly caused by undiagnosed rectal adenocarcinoma and *L monocytogenes* invasion from the tumour, similar to a previously reported case (4). Further investigation of colorectal lesions as a portal for entry of *L monocytogenes* is, therefore, warranted.

Individuals of Japanese descent often consume a unique diet comprising large quantities of raw ready-to-eat (rRTE) seafood, including sashimi and sushi. Examination of rRTE seafood in Japan revealed that raw minced tuna, which is a common appetizer in Japan, and fish roe products are frequently contaminated with *L monocytogenes* (5.7% to 12.1% of the time) (5). The rRTE seafood has been reported to be relatively safe from contamination as long as it is consumed immediately after purchase. However, bacterial cell number will rapidly increase, especially when rRTE seafood is not properly maintained under refrigeration (5).

In Japan, elderly individuals generally do not eat large quantities of food and the Japanese culture is careful not to let food waste (a practice referred to as 'mottainai'). Therefore, elderly individuals living alone or with their partner will often store foods in a refrigerator for extended periods of time and eat them slowly. Furthermore, frequent opening and closing of the refrigerator door may increase the temperature inside the refrigerator above the recommended temperature for extended periods of time. Therefore, it is quite conceivable that consumption of rRTE seafood, such as sashimi, may result in ingestion of *L monocytogenes*, resulting in infection.

The United States Food and Drug Administration has established preventive regulatory guidelines for raw seafood, such as RTE foods, that can support *L monocytogenes* growth (6), and these guidelines have been effective in reducing the incidence of *L monocytogenes* infection (7). However, in Japan, regulation of foods linked with *L monocytogenes* infection is limited to dairy products and RTE meat products. It should also be noted that there are no official statistics regarding the prevalence of *L monocytogenes* infection from rRTE seafood in Japan owing to the lack of a mandatory reporting system. Therefore, we propose that such a system be established for the control of *L monocytogenes* infection in Japan.

In the present case, the *L monocytogenes* isolate was determined to be of serotype 4b, which is the most frequently occurring form, accounting for 64% of cases in the United Kingdom (8) and 59.9% of cases in Japan (9). Interestingly, the 4b serotype is not the leading serotype isolated from samples in Western countries. In addition, serotype 4b has been found to account for only 10.2% of reported cases associated with commercial foods in Japan. In a 2002 review, Kathariou (10) suggested that such a discrepancy between food incidence and prevalence of illness may exist because serotype 4b is more virulent to humans than any of the other known serotypes. However, the details related to such an effect remain unclear.

The strain isolated from blood culture was susceptible to penicillin G (minimum inhibitory concentration [MIC] 0.25 mg/mL using E-test [bioMérieux, France]) and ampicillin (MIC 0.25 mg/mL) according to the breakpoints of Clinical Laboratory Standards Institute M45-A2. *L monocytogenes* isolated from humans has been rarely reported to be resistant to penicillins (11). However, most (92%) *L monocytogenes* isolated from dairy farms is resistant to ampicillin (MIC  $\geq 2$  mg/mL) (12). Furthermore, statistical analysis showed an



**Figure 1)** Fournier's gangrene after surgical debridement of the necrotic tissue around scrotum and suprapubic cystostomy

increase in MICs for aminopenicillins in *L monocytogenes* isolated from humans, which was not associated with clinical failure (11). This could be explained by increased use of beta-lactams in human and animals, particularly in recent years. This indicates that continuous surveillance of the susceptibility of *L monocytogenes* to antibiotics may be useful.

To our knowledge, this is the first report of Fournier's gangrene caused by *L monocytogenes* infection. Old age and immunodeficiency due to undiagnosed rectal adenocarcinoma may have supported the direct invasion of *L monocytogenes* from the rectal adenocarcinoma, thereby causing infection. The consumption of rRTE seafood should be considered to be a possible risk factor associated with *L monocytogenes* infection. Moreover, the findings suggest that *L monocytogenes* should be considered to be a possible pathogen when patients with known risk factors for listeriosis present with skin and soft tissue infection.

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