Unusual “Flesh-Eating” Strain of *Escherichia coli*\(^\text{1}\)\(^\text{7}\)

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We report an exceptional case of life-threatening *Escherichia coli*-induced necrotizing fasciitis. A combined host-pathogen genetic analysis explained the phenotype: the host displayed a susceptibility to intravascular coagulation, and the strain was capable of producing a necrotic toxin (cytotoxic necrotizing factor 1), showing how *E. coli* can be a dermonecrotic pathogen.

**CASE REPORT**

An 83-year-old man was referred to our intensive care unit (ICU) for severe sepsis. His past medical history was significant for aplastic anemia treated by iterative red cell transfusion, chronic atrial fibrillation, and an aortic valvular replacement. He received daily bisoprolol, fluindione, and furosemide. He suffered from fever and left leg pain during 4 days at home and became progressively asthenic and comatose. The patient was then transferred to the ICU. At examination, his central temperature was 39.2°C, heart rate was 150 beats/min, blood pressure was 75/43 mmHg, and Glasgow coma score was 13, without stiff neck. His left leg was erythematous and tender to palpation. The rest of the examination was uninformative. Biological exams revealed severe anemia (hemoglobin, 72 g/liter), and a normal creatinine phosphokinase level (52 IU/liter). Initial treatment consisted of broad-spectrum antibiotic therapy with piperacillin-tazobactam, clindamycin, and gentamicin. The patient rapidly developed septic shock that was treated according to the international guidelines (large volume expansion, mechanical ventilation, norepinephrine up to 1.1 μg/kg body weight/min, and low-dose steroids). Rapidly, swelling, bullae, and extensive necrosis appeared (Fig. 1A and B), leading to an emergency intensive surgical debridement (Fig. 1C). The perioperative examination confirmed the diagnosis of necrotizing fasciitis (NF). Histological examination confirmed the diagnosis and showed dermal-epidermal separation with massive neutrophil infiltrate and multiple thrombi in blood vessels (Fig. 1D and E). Severe disseminated intravascular coagulation (DIC) (platelets, 47 × 10^9/liter; increased D-dimer level; prothrombin ratio, 16%) occurred in the immediate postoperative period. However, after surgery, the patient’s status improved, norepinephrine was stopped at day 4, and renal function recovered after 6 days. The patient was extubated at day 9.

Urinalysis results were within normal limits, and the blood culture was sterile. Direct Gram staining of preoperative samples revealed Gram-negative bacillus. All the samples of necrotic tissues and fascia grew an amoxicillin-susceptible *Escherichia coli* strain identified by the API 20E system (bioMérieux, France). Anaerobic cultures were negative. Because of the unusual clinical phenotype, pathogen and host genotypes were further determined. The *E. coli* strain was analyzed as described previously (3). It harbored the serogroup O2 and belonged to the major phylogenetic group B2. The search for 21 virulence factors (VF)s was performed by PCR using previously published primers and amplification conditions (3, 10, 13). The strain carried genes encoding adhesins (P fimbriae with adhesin PapGIII but not PapGII, Sfa/F1C fimbriae, and heat-resistant agglutinin [hru]), iron-acquisition systems (including versiniabactin, salmochelin, and the Sit system but not aerobactin), and toxins (such as alpha-hemolysin [hly], cytotoxic necrotizing factor 1 [cnf1], vacuolating toxin, and colibactin but not the secreted autotransporter toxin nor the cytolysin [distending toxin]). Finally the strain had no other genetic determinants (colicin V, colicin Ia, iss, etsABC, OmpT, hlyF) that were specific to a large plasmid carried by the highly virulent *E. coli* strain S88 recently sequenced (13). Twenty well-characterized human genetic polymorphisms that have been associated with severe sepsis susceptibility or severity, multiple organ dysfunction syndrome, and coagulation disorders (7) were searched. Genomic DNA was extracted from mononuclear cells using MagNA Pure Compact automate (Roche Diagnostics). Real-time PCR allelic discrimination assays were realized by the TaqMan method on ABI 7900 (Applied Biosystems). Polymorphisms associated with severe sepsis susceptibility involve pathogen recognition receptor genes, which detect different molecular patterns of Gram-negative bacteria (lipopeptides by TLR2, lipopolysaccharide by the complex TLR4/CD14, and mannose by mannose binding lectin) to immediately stop bacterial invasion, decrease bacterial load, and initiate the adaptive immune response. Functional variants have been reported in all of these genes, which decrease bacterial clearance and delay immune responses. However, the host genotyping did not reveal any variant of the

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We report an exceptional case of monomicrobial *E. coli* NF with life-threatening septic shock. NF is the most severe soft tissue infection, characterized by widespread necrosis of the skin, subcutaneous tissues, and superficial fascia. It frequently localizes on limbs or pelvis and is generally due to local wounding. Treatment relies on antibiotic therapy and surgical resection of necrotic tissues. However, even with adequate treatment, mortality of NF remains greater than 30% (1). The causal bacteria typically are adequate treatment, mortality of NF remains greater than surgical resection of necrotic tissues. However, even with local wounding. Treatment relies on antibiotic therapy and soft tissue infection, characterized by widespread necrosis of NF with life-threatening septic shock. NF is the most severe TLR2, TLR4, CD14, and MBL2 genes. The patient carried common genotypes for genes associated with severity of sepsis (TNFA, IL-10, IL-6) and for the factor V gene. However, the patient was carrying the PAI-1 4G/4G phenotype, a strong susceptibility factor for DIC during sepsis (7).

FIG. 1. Leg necrotizing fasciitis. (A and B) Preoperative exam showed large bullae and skin necrosis; (C) extensive debridement was performed; (D and E) a histopathological exam showed massive dermic and hypodermic neutrophil infiltration (arrows) (D) with vasculitis (arrowheads) and small-vessel thrombi (arrow) (E).

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We have no conflicts of interest.

REFERENCES


