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Use of Pulsed-Field Gel Electrophoresis for Investigation of a Cluster of Invasive Group A Streptococcal Illness -- Spokane, Washington, 1999

On January 25, 1999, health officials in Spokane County, Washington (1999 population: 415,000), were notified of a fatal case of necrotizing fasciitis (NF) caused by community-acquired invasive group A streptococcus (GAS) infection. Although invasive GAS infection is not a reportable disease in Washington, Spokane health officials requested reports of additional invasive GAS cases from local hospital infection-control professionals and the medical examiner to identify other cases. This report describes a cluster of fatal illnesses caused by GAS in five residents of Spokane County and illustrates how investigators used pulsed-field gel electrophoresis (PFGE) to determine whether the cluster was unrelated sporadic cases or attributable to a common source.

For this investigation, a case of invasive GAS infection was defined as any illness with onset after January 1, 1999, in a Spokane County resident with isolation of GAS from a normally sterile body site such as blood or deep muscle tissue. Medical records of each patient were reviewed, and at a University of Washington laboratory, GAS isolates from all patients were compared using PFGE with three separate enzymes (*Sma*I, *Apa*I, and *Sac*II); GAS isolates also were T- and *emm*-typed at CDC.

Including the index case, five cases were identified, with illness onsets from January 25 through March 25. All cases were community acquired and fatal within 5 days of onset. All occurred in women aged 24-59 years. Four patients were morbidly obese (weights were 350, 374, and approximately 350 lbs; weight was not recorded for one). Four lived in the city of Spokane (1999 population: 189,000), and one lived in a nearby town. NF was diagnosed in four patients, and sepsis was diagnosed in one. GAS was isolated from both blood and wound tissue in three patients, from blood in one patient, and from a wound in one patient. Three had pre-existing skin breakdown at the NF site: one had had an open surgical abdominal wound for several months, one had chronic venous stasis of the legs with cellulitis and ulceration, and one had severe recurrent genital herpes.

GAS isolates from the five patients yielded four distinct PFGE patterns. The patterns of isolates from two patients were identical, while each pattern of the isolates from the other three patients was unique. Isolates from the two patients with identical PFGE patterns also had identical T- and *emm*-types (*emm*-type 1); isolates from the other three patients were unique (*emm*-types 3, 11, and 12). No epidemiologic relation between the two patients with identical isolates could be established. Prophylactic antibiotic treatment of close contacts was not pursued, and no secondary cases were identified.

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Editorial Note:

The cases of GAS (i.e., *Streptococcus pyogenes*) infection described in this report were clustered in time and geographic area, suggesting they were epidemiologically related. Most cases of invasive GAS infection occur sporadically, although common-source outbreaks do occur, usually in long-term-care facilities or hospitals, especially among elderly, postsurgical, or postpartum patients (1,2). Investigators from Spokane and the state health department used PFGE in their investigation to determine that these cases were not caused by a common source.

GAS is a common cause of pharyngeal, skin, and other soft tissue infections. Transmission of GAS is generally person to person through contaminated secretions. Rarely, infection results in invasive disease, with clinical manifestations that include NF, pneumonia, meningitis, puerperal sepsis, and streptococcal toxic shock syndrome (STSS). The case-fatality rate of invasive disease is approximately 15%, although this figure increases to greater than 50% if STSS results (3). In 1998 in the United States, an estimated 10,000 cases and 1300 deaths resulted from invasive GAS infection, of which 4.6% were associated with NF (4).

Risk factors for invasive GAS disease include diabetes, alcoholism, human immunodeficiency virus infection, malignancy, lack of skin integrity, recent surgery, abortion, or childbirth, and antecedent varicella in children (5,6). Four of the women with invasive GAS infection described in this report were obese. Obesity has not been associated previously with invasive GAS infection and merits further study.

GAS strains can be serotyped (identification of M and T antigens) with specific antisera and by genetic sequencing of the 5' M-protein gene (*emm*) variable region (7). In the United States, the strains most likely to cause invasive infection are *emm* types 1, 3, and 12 (5,8). However, because these laboratory methods are not widely available and common-source community outbreaks are rare, GAS isolates from community-acquired cases are not routinely subtyped to determine relatedness. PFGE is widely available and discriminates GAS isolates effectively (9).

This report provides evidence that PFGE can be useful for assisting epidemiologic investigations of illnesses caused by GAS. In this investigation, PFGE results were concordant with traditional typing methods, performed locally, and available within 4 days of submission of the isolates. The investigators used PFGE to determine that the five cases, despite their similarities, did not represent a common-source outbreak but were a clustering of sporadic cases. PFGE testing provided evidence that a search for a common-source for these infections, which would have required substantial public-health resources, was not warranted.

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