

**UTILITY OF PFGE FOR OUTBREAK INVESTIGATIONS IN LOS ANGELES COUNTY:  
A REPORT FROM THE ENHANCED SURVEILLANCE PROJECT**

Background

Molecular typing of microorganisms is essential to establish or disprove the existence of an outbreak in cases of nosocomial bacterial infections, and may be useful in community outbreaks to link human, food, or environmental isolates. The Acute Communicable Disease Control Unit was awarded funds by the Centers for Disease Control and Prevention (CDC) to develop molecular typing capacity in the Public Health Laboratory. In January 1996, equipment was installed and staff trained at the CDC. The following report describes our experience with pulsed-field gel electrophoresis (PFGE) for outbreak investigations over a two-year period.

Methods

Outbreaks from January 1996 to December 1997 were summarized to see when and how PFGE was incorporated into investigations. A health facility outbreak (HF) outbreak was defined as cases of nosocomial infections in excess of background rate within same area or unit of a health care facility or among staff or patients of a home health care agency. A community outbreak was defined as two or more persons with similar illness, associated in time and space, not under medical care in a health facility or by a home health care agency. Decisions to utilize PFGE were made in consultation between epidemiologists and laboratorians when the epidemiologic or preliminary laboratory data were inconclusive, and when appropriate microbiologic specimens were available for analysis.

Results

During this two-year period, 576 outbreaks were reported and investigated, including 175 in health facilities and 401 in community settings (Table). The distribution of outbreaks among acute hospitals, subacute health facilities, and the community was unchanged from 1996 to 1997. Bacteria were identified as the cause of 140 outbreaks, 24% of the total. Thirty-six percent of health facility outbreaks were caused by a bacterial agent, while only 19% of community outbreaks were bacterial in origin. PFGE was used in 32 of the 140 bacterial outbreak investigations (23%). Twenty-nine of these 32 outbreaks (91%) took place in health facilities, and all of those were acute care hospitals. Seven organisms were responsible for the 29 hospital outbreaks; the most common were vancomycin-resistant enterococci and *Staphylococcus aureus*.

PFGE served several purposes in these investigations, including examination of links between environmental organisms and clinical isolates; exploration of relationships

<b>Reported Outbreaks of Bacterial Etiology in Which PFGE Was Employed Los Angeles County, 1996-1997</b>			
<b>Outbreak Setting</b>	<b>Total Outbreaks</b>	<b>Bacterial Etiology</b>	<b>PFGE Employed</b>
Health Facility	175	63	29
Community Setting	401	77	3
Total	576	140	32

between simultaneous case clusters in separate parts of a facility; demonstration that an outbreak had not occurred; documentation of persistence of a single bacterial strain over an extended period of time in a facility; and in one instance, comparison of a health care worker isolate to the outbreak strain.

PFGE was used in only 3 of 77 community outbreak investigations (4%). The organisms studied were *Vibrio vulnificus*, *Legionella pneumophila* serogroup 1, and *Salmonella* serotype Braenderup. In the first investigation, a cluster of fatal *Vibrio vulnificus* cases (n=5) occurred in a six-week period. No clonal relationship was found by PFGE among the five isolates, thus eliminating the need for additional environmental investigation.

In the second community outbreak investigation, an outbreak of gastrointestinal illness due to *Salmonella* serotype Braenderup occurred among 186 attendees of four parties held at a buffet-style restaurant on one weekend. A cohort study of patrons of the two largest parties suggested that either breaded fish patties or chicken may have been the vehicle of transmission. The PFGE profile for the outbreak strain A was compared to profiles of six sporadic cases of *S. Braenderup* reported during the prior month. While three were unrelated to strain A, three others appeared closely related (differing by only 2 bands, labeled strain A1). Two of the persons with strain A1 were ill less than one week before the outbreak but had no discernible connection to it. The third case with strain A1 worked for a food supplier that sold bread crumbs to the restaurant. She had had a gastrointestinal illness shortly after the restaurant outbreak. Both the worker and her employer denied her having any direct contact with bread crumbs. This is an example where the epidemiologic investigation was inconclusive in spite of PFGE results suggesting a possible common source.

The third investigation began in December, when passive reporting identified three cases of legionellosis with disease onset within 4 days. Cases lived or worked within a one-mile radius on the west side of the county. PFGE analysis showed these three to be identical to each other but unrelated to recent isolates from the southwest coastal region of the county. Active case-finding yielded 5 additional cases from the same 1-mile area, with onset dates from November 17 to December 8; an epidemiologic investigation including a case-control study and environmental sampling was conducted. In this investigation, PFGE results were instrumental in focusing our attention on a specific geographic on the west side, rather than across a much larger region of the county.

### Conclusion

In Los Angeles County, PFGE has been most useful for investigating nosocomial outbreaks in acute-care hospitals. PFGE may assist to distinguish nosocomially transmitted agents from unrelated cases acquired endogenously, from another patient or health care worker, or from an environmental source. PFGE was rarely used in community outbreak investigations since traditional epidemiologic and laboratory methods generally sufficed. We were unable to link clinical and food isolates in any outbreak as it was rarely possible to isolate pathogens from food. More timely reporting may permit culture of suspect food items. If reporting delays can be shortened, PFGE may become more useful for future community outbreak investigations.