

Scarlet Fever Upsurge in England and Molecular-Genetic Analysis in North-West London, 2014

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

An unprecedented rise in scarlet fever occurred in England in spring 2014, with more than 13,000 notifications. The authors analyzed clinical notification data for North-West London during 2009 through 2014 and determined *emm* genotypes of *Streptococcus pyogenes* causing upper respiratory tract, or URT, infections.

During March through May 2014, scarlet fever notifications in North-West London increased 3 to 8-fold compared with the same period in previous years. Although Health Protection regulations in England require clinicians to report suspected cases of scarlet fever, molecular surveillance of noninvasive *Streptococcus pyogenes* is not feasible because testing for it is not routinely advised for patients with a sore throat in the United Kingdom. Nonetheless, a limited number of URT swab specimens are submitted by clinicians for culture. Since 2009, all *Streptococcus pyogenes* URT isolates identified in the West London diagnostic laboratory have been stored. This laboratory serves a population of about 2 million people, overlapping with the North-West London region.

Molecular testing, with standard DNA extraction, *emm* typing, and superantigen typing methods, was performed on all 404 viable *Streptococcus pyogenes* URT isolates identified.

Isolates from March through May 2014 were categorized by at least one of the following clinical features: 1) tonsillitis, pharyngitis, or sore throat and no mention of scarlet fever; 2) any mention of scarlet fever, regardless of other information; 3) any other illness; and 4) no details provided. The 16 scarlet fever-associated isolates were limited to patients ages 1.25 through 11 years, a significant proportion of whom were under 5 years of age; 7 of 16 were *emm3* and 3 of 16 were *emm4*. On the basis of these limited data, *emm3* was significantly associated with scarlet fever in 2014.

An increase in *emm3* and *emm4* *Streptococcus pyogenes* URT isolates was detected in North-West London, during the period in 2014 when scarlet fever notifications peaked. The increase in *emm4* infections was also found predominantly in 4- to 5-year-old children, the group found to be most at risk for scarlet fever. The percentage of children 4 years old in North-West London, which is an urban population, is similar to the national average of 1.3 percent; therefore, the findings are probably relevant to the rest of the United Kingdom.

The results of this historical comparison must be interpreted with caution; obtaining swab samples from patients with URT infections in England is not routine. Therefore, the 2009 through 2013 samples may reflect persistent infections, in contrast to 2014 samples, when clinicians were encouraged to submit swab specimens for scarlet fever case-patients.

Furthermore, the number of strains available for *emm* typing was limited. Nonetheless, this was the only collection of strains available that permitted historical comparison.

Both *emm3* and *emm4* *Streptococcus pyogenes* strains have been associated with scarlet fever. In the Far East, *emm1* and *emm4* isolates were the leading causes of scarlet fever in the late 1990s, although more recently, antimicrobial drug-resistant *emm12* *Streptococcus pyogenes* has dominated there.

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Emm4 isolates are associated with pharyngitis in children; these isolates are entirely acapsular, a phenotype linked to enhanced adhesion to surfaces. Whether this characteristic can increase persistence and transmission is unknown. Surges in scarlet fever are believed to require a population susceptible to pharyngeal infection with specific strain types and specific superantigens. Both *emm3* and *emm4* strains in this study possessed 2 prophage-associated superantigens. Although these toxin genes were found in *emm3* and *emm4* strains not associated with scarlet fever, the probability of triggering scarlet fever may be enhanced through production of 2 such superantigens. An association between these superantigens and scarlet fever has been reported.

Periodic increases in scarlet fever are well recognized, although the magnitude of the upsurge in the United Kingdom was unexpected. Consultation rates for sore throat diminished in the 1990s, and the 2008 UK national guidelines advise against diagnostic testing and recommend a policy of nonprescribing or delayed prescribing for sore throat when the Centor score is less than 3. These recommendations contrast with those of North America and of some European countries. Whether exceeding a threshold level of community *Streptococcus pyogenes* transmission is required for such a marked upsurge is unclear; increased scarlet fever activity was not reported elsewhere in Europe, to the authors' knowledge. Apart from natural fluctuations in population immunity, emergence of hypertransmissible lineages, acquisition of novel phage-encoded toxins, or antimicrobial drug resistance may contribute to scarlet fever surges. Notably, isolates found associated with scarlet fever were not resistant to common antimicrobial agents.

As part of the national response, clinicians were advised to treat scarlet fever to minimize complications and reduce transmission. Whether use of more refined molecular diagnostics could assist future community prevention and management of *Streptococcus pyogenes* infection will require careful evaluation. Increased scarlet fever activity has continued in England in 2015 and 2016, underscoring the need for ongoing surveillance and further investigation.

I've been reading an abridged version of the June 2016 article, *Scarlet Fever Upsurge in England and Molecular-Genetic Analysis in North-West London, 2014*. You can read the entire article at cdc.gov/eid.

I'm Sarah Gregory for Emerging Infectious Diseases.

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