Nocardia cyriacigeorgica Infections Attributable to Unlicensed Cosmetic Procedures—An Emerging Public Health Problem?

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We describe an outbreak of Nocardia cyriacigeorgica soft-tissue infections attributable to unlicensed cosmetic injections and the first report using multilocus sequence typing sequence data for determining Nocardia strain relatedness in an outbreak. All 8 cases identified had a common source exposure and required hospitalization, surgical debridement, and prolonged antimicrobial therapy.

Multiple recent publications and news reports, both in the United States and internationally, have highlighted investigations of illnesses associated with cosmetic procedures performed by unlicensed individuals [1–5].

In February 2010, the New Jersey Department of Health and Senior Services (NJ DHSS) was notified by a physician of 3 female patients reporting to 1 emergency department (ED) with cellulitis in the buttocks after receiving injections of an unidentified substance for cosmetic enhancement. An epidemiologic investigation was launched to determine the outbreak’s cause and magnitude.

All 3 women were determined to have infections caused by Nocardia species. Nocardia are Gram-positive, rod-shaped bacteria that are partially acid-fast, slow growing, and ubiquitous in soil and water. Infections caused by Nocardia species are acquired through inhalation or percutaneous inoculation from environmental sources. Eighty percent of nocardiosis cases present as invasive pulmonary infection, disseminated infection, or brain abscess; 20% present as cutaneous disease, including chronically draining ulcerative lesions, slowly expanding nodules, pustules, abscesses, cellulitis, or pyoderma [6].

A case was defined as a culture-positive Nocardia species infection in a New Jersey resident evaluated during August 2009–April 2010 who had received cosmetic injections. This time frame encompassed 6 months prior to the identification of the first case and 2 months following identification of the last case. To identify additional cases, we distributed messages to public health and healthcare professionals through New Jersey’s and the Centers for Disease Control and Prevention’s (CDC’s) health alert networks requesting that persons meeting our case definition be reported to the NJ DHSS.

We interviewed patients with reported cases using a standardized questionnaire to assess demographics, travel history, past medical history, cosmetic procedure history, and details regarding injections received within the period of interest. We reviewed case medical charts using a standardized data collection tool to obtain information regarding presenting symptoms, hospitalizations, and treatment within the period of interest and through 31 December 2010.

In total, we identified 8 case-patients (3 initially reported cases and 5 additional cases) who received buttocks injections during November 2009–February 2010; symptom onset occurred during 19 February–23 March 2010. Two patients reported receiving multiple injections; for these cases, the incubation period was calculated using the last injection date to symptom onset date. Incubation periods ranged from 8 days to 3 months. All 8 patients presented to the ED with soreness, pain, and abscess formation at the injection site (Figure 1). All cases were in black women; the median age was 27 years (range, 22–42). None of the patients had notable prior medical histories nor were immunocompromised. All patients were hospitalized (median, 19 total hospitalization days; range, 8–55) and had multiple healthcare-related visits (median, 5 visits; range, 2–13); patients sought care for a median 4.8 (range, 0.5–9.5) months following initial healthcare visit. All patients required injection-site surgical debridement; 5 required multiple procedures (range, 2–7 procedures/patient). All patients received empiric antimicrobial therapy prior to microbiologic identification. Patients received antibiotics for a median of 48 (range, 24–128) days; the median number of antibiotics prescribed to each patient was 8 (range, 5–11). Because of delays...
in correctly identifying the causative agent and in obtaining antimicrobial susceptibility profiles, only 1 patient had received the recommended antibiotic regimen (trimethoprim/sulfamethoxazole) in her initial therapy.

All patients reported having received injections of unknown substances described as “hydrogel,” “botulinum toxin,” “silicone,” “gel filler,” or “biogel.” Six patients indicated that they had received injections from an unlicensed person, either at home, in a hotel, or at a gathering where these injections were administered to multiple persons; these patients had been referred to this provider through friends or Internet sites. No information was available from the remaining 2 patients, who refused to provide information to public health authorities. Three of the 6 patients identified the same individual as the provider; no specific information was available from the remaining 3 patients.

Eight clinical specimens were sent to commercial laboratories for culture and susceptibility testing; 7 specimens were initially identified as Nocardia asteroides complex and 1 as Rhodococcus equi. Available clinical isolates from 7 patients (6 N. asteroides and 1 R. equi) were forwarded to the CDC’s Special Bacteriology Reference Laboratory for identification by 16s ribosomal RNA (rRNA) gene sequencing and antimicrobial susceptibility testing as previously described [7, 8]. Molecular subtyping by multilocus sequence typing (MLST) was conducted as previously described by Langer et al, except gene fragments for gyrB, glcB, hsp65, and pfk were used [9].

Sequencing of the 1440 base pair 16S rRNA gene fragment and antimicrobial susceptibility profiles showed that all isolates obtained from the 7 patients were identical to the N. cyriacigeorgica (DSM 44484\(^1\)) and reference (W9956) strains. All 7 exhibited susceptibility to amikacin, ceftriaxone, imipenem, linezolid, tigecycline, and trimethoprim/sulfamethoxazole. The MLST results showed that all 7 isolates were identical to each other but differed from the type and reference strains, which suggests a single clone for the patient isolates. These laboratory results were particularly valuable in supporting the epidemiologic investigation, and they indicated a common source outbreak and assisted in institution of the appropriate antimicrobial therapy for the patients.

Our findings and those from similar investigations highlight the need for public health and medical communities to educate consumers about risks associated with procedures performed by unlicensed providers. Patients involved in such investigations have reported easily identifying providers via Internet sites and being enticed by the low cost compared with cosmetic surgery by licensed physicians [2]. Consumers should be aware of the costs to themselves and to society resulting from these illegal procedures.

Substantial resources were used for the care and treatment of the 8 patients. All patients had multiple encounters with the healthcare system and were hospitalized more than once. In addition to antimicrobial therapy costs, all patients required surgical debridement. Treatment of the patients in this outbreak was complicated by the presence of foreign material. Along with direct healthcare costs, indirect costs should be considered, including patients’ lost wages, permanent disfigurement, and expenditure of public health and law enforcement resources.

This investigation provided several challenges and learning opportunities. Patient involvement with an unlicensed provider made the public health investigation particularly challenging because affected patients were hesitant to cooperate with interviews and initially provided inaccurate, conflicting accounts that they later corrected; patients stated that they feared legal repercussions and therefore attempted to protect the identity of the unlicensed provider. Only 6 of the 8 patients eventually cooperated with the epidemiologic investigation. Because the identity and whereabouts of the unlicensed provider were unknown, we were unable to interview that person, observe infection control practices, or obtain product and environmental samples, which substantially hindered our ability to perform analytic studies to identify the particular practices or products associated with these Nocardia infections. In this investigation, public health officials interfaced with law enforcement officials and the New Jersey State Board of Medical Examiners, the agency responsible for licensing and regulating healthcare professionals. Law enforcement officials subsequently identified and indicted the person believed to have performed the procedures on all identified patients; however, public health authorities were still unable to investigate this person and practices or sample the injected material.
Although healthcare providers evaluating persons with infections after cosmetic/other medical procedures should consider typical organisms (eg, *Streptococcus, Staphylococcus*), atypical organisms (eg, *Nocardia, Mycobacterium*) should also be included in the differential diagnosis. Atypical organisms might present as more indolent infections and might not respond to empiric treatments. Species-specific antimicrobial susceptibility patterns are necessary to direct appropriate treatment. Accurate identification of *Nocardia* species is difficult and might be time and labor intensive [10].

Although nocardiosis is not a reportable condition in New Jersey, healthcare providers must report outbreaks caused by any organism. An astute physician involved in the care of 3 patients at 1 acute-care facility brought this outbreak to the attention of public health authorities. Healthcare providers identifying clusters of infections associated with these procedures should notify public health authorities to ensure surveillance activities and infection control measures are initiated. However, even a single case of infection with an atypical organism after a cosmetic or other medical procedure, particularly in an otherwise healthy patient, should be a cause for concern; in such situations, physicians should have a high index of suspicion for improper healthcare/infection control practices during the prior procedure(s), use of contaminated products, or possible practice by an unlicensed provider, and they should report the case immediately to public health and regulatory agencies.

Lastly, this investigation demonstrates the need for all medical and public health professionals to maintain open lines of communication at all times to protect their shared consumer constituencies.

**Notes**

**Acknowledgments.** We thank Ellen Shelly, MPH, Union County Department of Health, and the hospitals’ staff for their assistance with the investigation. We also thank Kristine Bisgard, DVM, MPH, and C. Kay Smith, MEd, Centers for Disease Control and Prevention, for their editorial comments and suggestions.

**Disclaimer.** The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

**Potential conflicts of interest.** All authors: No reported conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

**References**