

# TOXIGENIC CUTANEOUS DIPHTHERIA IN A RETURNED TRAVELLER

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## Abstract

Diphtheria is rarely reported in Australia. A case of cutaneous diphtheria was reported to the South Australian Department for Health and Ageing in April 2013 in an Australian-born 18-year-old female following travel in India. The case presented with a skin ulcer on her toe. Toxigenic *Corynebacterium diphtheriae* was isolated from a swab of the lesion. The case was treated with antibiotics. The public health response included infection control advice, assessing the case and household contacts for organism carriage and providing antimicrobial chemoprophylaxis to contacts. Although cutaneous diphtheria is not included as part of the Australian communicable disease surveillance case definition, this may be an oversight as international evidence demonstrates that it is a source of organism transmission and can potentially result in outbreaks among susceptible populations. This formed the rationale for the public health response to this particular case. The protocol for the public health management of diphtheria in South Australia has since been revised to include cutaneous lesions caused by the toxigenic strain of the organism as part of the surveillance case definition. *Commun Dis Intell* 2014;38(4):E298–E300.

Keywords: toxigenic *Corynebacterium diphtheriae*, cutaneous

## Introduction

Diphtheria is rare in Australia owing to high immunisation coverage. Cases are largely observed among unimmunised individuals with recent travel to countries where diphtheria remains endemic, or among the contacts of such travellers. Diphtheria endemic countries in the Asia and South Pacific region include Afghanistan, Bangladesh, Cambodia, China, India, Indonesia, Malaysia, Nepal, Pakistan, Papua New Guinea, the Philippines, Thailand and Vietnam.<sup>1</sup> There were 6 cases reported in Australia between the years 2004 and 2013.<sup>2</sup> A death from pharyngeal diphtheria was recorded in 2011 in an unimmunised contact of a traveller who acquired the infection in Papua New Guinea.<sup>3–5</sup> The index case who was the traveller, and 1 other asymptomatic contact in this cluster were previously immunised,<sup>5</sup> demonstrating the protective effect of the vaccine against systemic toxicity. We report the public

health response to a case of imported cutaneous diphtheria in South Australia. Informed consent was obtained from the case.

## Case presentation

In April 2013, the Communicable Disease Control Branch (CDCB) of SA Health received notification from a laboratory of toxigenic *Corynebacterium diphtheriae* in a clinical specimen collected from an Australian-born 18-year-old female. The specimen was a swab from an ulcerating skin lesion on the first digit of the right foot. In addition to *C. diphtheriae*, *Streptococcus pyogenes* (Group A) and mixed anaerobes were isolated from the 1st swab of the lesion. Nucleic acid testing confirmed that the *C. diphtheriae* was a toxigenic strain.

The case was a South Australian resident who had travelled to India in January and February 2013. She had previously received 5 doses of diphtheria toxoid-containing vaccine as part of routine childhood immunisation. Approximately 3 weeks after her return, she noted dry skin on her toe, which progressed to become erythematous and tender with purulent discharge 2 days later. She did not report any associated respiratory symptoms. She was initially prescribed dicloxacillin and cephalexin with no clinical improvement. A skin swab was then collected at a 2nd presentation approximately 2 to 3 weeks later, and a course of amoxicillin commenced.

## Public health response

An urgent public health investigation was commenced and the case was interviewed on the day of notification. She was requested to submit nasal and throat swabs to assess *C. diphtheriae* carriage status. These were negative for *C. diphtheriae*. The case was referred to an infectious disease physician for further management. Information and education on infection control measures, namely wound contact isolation and hygiene practices associated with wound care were provided. Organism clearance was documented on 2 repeat wound swabs collected at least 24 hours apart with the 1st swab collected 24 hours after completion of the course of antibiotics.

Three household contacts were identified; all reported having received diphtheria toxoid containing vaccines within the last 10 years. It was recommended that they submit nasal and throat

swabs to assess organism carriage status. Two were Australian-based contacts and received antimicrobial chemoprophylaxis with amoxicillin or penicillin prescribed by either a general practitioner or obtained from the emergency department of a public hospital. The 3rd contact was overseas and prescribed antibiotics by a medical practitioner guided by the public health unit at that location. Although the South Australian guidelines recommend isolation of contacts until their carriage status is known, it was not possible to implement isolation in this scenario as 2 contacts were travelling at the time of the investigation. No organism carriage was detected on nasal and throat swabs for the household contacts.

## Discussion and public health significance

Cutaneous diphtheria usually presents as indolent, non-healing lesions.<sup>6,7</sup> However a case presenting with a rapidly progressive lower limb ulcer with systemic inflammatory response syndrome was reported in Germany in 2010.<sup>8</sup> Causative organisms include *C. diphtheriae* and *C. ulcerans*. *C. diphtheriae* is often isolated with other known skin pathogens such as *Staphylococcus aureus* and *Streptococcus pyogenes*; as evident in the case described.<sup>6,7</sup> Treatment requires a course of antimicrobial therapy; however the role of antitoxin in treatment has not been assessed by clinical trials.<sup>8</sup>

Although rarely associated with systemic intoxication, cutaneous lesions form a reservoir for person-to-person transmission with the potential to result in outbreaks in susceptible populations.<sup>6,7,9,10</sup> Organism shedding from skin lesions is more prolonged compared with that from the respiratory tract, and can contaminate the environment through dust and fomites leading to respiratory and cutaneous infections.<sup>6,9</sup> A Canadian review reported non-toxigenic cutaneous diphtheria outbreaks occurring in a susceptible population characterised by homelessness, high prevalence of drug use and multiple comorbidities such as HIV and hepatitis C infections.<sup>7</sup> Experience from the United Kingdom demonstrated the occurrence of laryngeal diphtheria and organism carriage among household and school contacts of a case of cutaneous diphtheria.<sup>9</sup>

Despite such reported experiences, cutaneous diphtheria is not included as part of the national surveillance case definition in Australia and in the United States Centers for Disease Control and Prevention case definition.<sup>11,12</sup> Hence it was unclear at the time of initial notification whether a public health response was warranted. The

current Australian definition of a confirmed case requires laboratory definitive evidence and clinical evidence with the clinical evidence defined only as having at least one of pharyngitis and/or laryngitis (with or without a membrane) or toxic (cardiac or neurological) symptoms.<sup>11</sup>

Following discussions with the microbiologist at the regional public health laboratory and a rapid literature review, as well as taking into consideration that the isolate was toxigenic, a decision was made to urgently respond to the notification following the local protocol for the public health management of diphtheria in South Australia. The South Australian case definition for diphtheria was subsequently revised to include cutaneous diphtheria caused by toxigenic strains of the organism to guide public health response for future cases. The omission of skin in the Australian case definition may be an oversight that requires timely review. While antitoxin therapy was not warranted for the case reported here, a revision of the state protocol also provided the opportunity to clarify the role of the CDCB in supporting clinicians to obtain antitoxin when indicated, as this is not routinely stocked in South Australia.

In summary, the occurrence of diphtheria is uncommon in Australia where the most frequently reported exposure factor is travel to diphtheria-endemic countries. Although the risk of systemic toxicity is low in cutaneous diphtheria, the risk of transmission and potential to cause outbreaks among susceptible populations, warrants an urgent public health response and its inclusion in the national case definition to help guide that action.

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