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Acanthamoeba Keratitis — Multiple States, 2005–2007

In May 2006, the Illinois Department of Public Health (IDPH) informed CDC about a possible increase in *Acanthamoeba* keratitis (AK) at an ophthalmology center in Illinois during the preceding 3 years. The University of Illinois at Chicago (UIC) was investigating this possible increase. In October 2006, IDPH updated CDC about the ongoing UIC investigation. At that time, CDC informally contacted multiple ophthalmology centers in the United States to assess whether the potential increase in cases extended beyond Illinois. Responses from the ophthalmology centers were inconclusive. In January 2007, CDC initiated a retrospective survey of 22 ophthalmology centers nationwide to assess whether cases were increasing throughout the United States. In March 2007, data received from 13 centers demonstrated an increase in culture-confirmed cases of AK with wide geographic distribution. The increase in cases had begun in 2004 and continued to the present. On March 16, 2007, CDC initiated a multistate investigation to look for risk factors associated with this increase in AK cases. This report summarizes recent preliminary results of that investigation, which, indicated an association with AK in soft contact lens wearers who used Advanced Medical Optics (Santa Ana, California) Complete® MoisturePlus™ (AMOCMP) multipurpose cleaning solution. CDC and the Food and Drug Administration (FDA) are taking steps to notify the public and the medical and public health communities of this preliminary association. The manufacturer has undertaken a voluntary recall of the product.

AK, a rare but potentially blinding infection of the cornea, is caused by a ubiquitous, free-living amoeba (*Acanthamoeba*) that is found commonly in the environment, including water (e.g., tap and recreational water), soil, sewage systems, cooling towers, and heating/ventilation/air conditioning (HVAC) systems. AK primarily affects otherwise healthy persons who wear contact lenses; an estimated 85% of U.S. cases occur in contact lens wearers (including wearers who follow recommended contact lens-care practices) (1). Persons who improperly store, handle, or disinfect their lenses (e.g., by using tap water or homemade solutions for cleaning); swim, use hot tubs, or shower while wearing lenses; come in contact with

contaminated water; have minor damage to their corneas; or have previous corneal trauma are at increased risk for infection (2). Based on an analysis of cases reported to CDC during 1985–1987, the incidence of AK in the United States has been estimated at one to two cases per million contact lens users (3,4). An estimated 30 million persons in the United States wear soft contact lenses (5).

Initial case finding for this investigation was facilitated through postings on the *Epidemic Information Exchange (Epi-X)*, on ophthalmology/optometry/infection control listservs and websites, and through queries of clinical microbiology laboratories. As of May 24, 2007, a total of 138 patients with onset of symptoms on or after January 1, 2005, and positive *Acanthamoeba* cultures from corneal specimens had been reported to CDC by public health authorities and ophthalmologists from 35 states and Puerto Rico. Standardized telephone interviews of patients, ophthalmologists, and primary eye-care providers are being conducted by state and local health officials and CDC. Laboratory testing of clinical specimens, contact lenses, bottles of solution, and contact lens cases received from AK patients, including typing of *Acanthamoeba* spp. isolates, is ongoing. An initial analysis was conducted using data from the first 46 completed patient interviews.

Among the 46 culture-confirmed patients who were interviewed, the median age was 40 years (range: 15–77 years); six (13%) were aged <18 years. Twenty-seven (59%) were female. Of the 37 of these patients for whom clinical data were available, medical therapy was unsuccessful for nine (24%), and they were required or expected to undergo corneal transplantation. Of the 46 patients, 39 (85%) wore soft contact lenses, three (7%) wore rigid lenses, and four (9%) reported no contact lens use. Among the 42 contact lens users, 16 (38%) reported swimming while wearing contact lenses and 35 (83%) reported showering while wearing contact lenses during the month before symptom onset.

Among the 39 soft contact lens users, 36 reported using one or more specific types of contact lens solution, 21 of these (58%) reported any use of AMOCMP in the month before

symptom onset, 20 (56%) reported using AMOCMP as their primary solution, and 14 (39%) reported using AMOCMP as their exclusive solution. Exposure data from the 36 patients who wore soft contact lenses and used any type of contact lens solution were compared with exposure data from controls who were interviewed as part of the 2006 CDC *Fusarium* keratitis outbreak investigation (6). These controls, who were selected as geographically matched controls for the *Fusarium* keratitis cases, represented a sample of adult soft contact lens wearers from different U.S. states who were asked about product use and behaviors during March 2006 (6).

The 14 AK soft contact lens-wearing case-patients with symptom onset dates before April 1, 2006 (the period most comparable to *Fusarium* controls), who reported use of a single solution were compared with 115 controls from the *Fusarium* investigation who reported using a single solution. The results indicated that four (29%) of the 14 AK case-patients had used AMOCMP, compared with six (5%) of the 115 *Fusarium* controls (odds ratio: 7.3 [95% confidence interval (CI) = 1.7–30.1]). In a separate comparison, 36 soft contact lens-wearing AK case-patients with symptom onset dates before May 24, 2007, who reported use of one or more solutions were compared with 124 *Fusarium* controls who reported using one or more solutions. The results indicated that 21 (58%) of the 36 AK case-patients had used AMOCMP, compared with eight (6%) of the 124 *Fusarium* controls (odds ratio: 20.3; [CI = 7.6–53.9]). AMOCMP lot numbers were available for 10 patients who reported using the solution; no single lot number was repeated, suggesting that AMOCMP was not intrinsically contaminated. Analysis of the reported use of other brands of contact lens solution did not reveal any statistically significant associations.

The AK investigation by CDC, state and local health departments, FDA, and other partners, is continuing, and interviews of the remaining patients with culture-confirmed AK, their treating ophthalmologists, and their primary eye-care providers are ongoing. Although the results of initial analyses are preliminary, they suggest that use of AMOCMP increases the risk for AK. Additional studies will provide a more definitive assessment of the risk associated with use of AMOCMP. However, based on the preliminary findings, persons who wear soft contact lenses and who use AMOCMP should 1) stop using the product immediately and discard all remaining solution, including partially used or unopened bottles; 2) choose an alternative contact lens solution; 3) discard current lens storage container; 4) discard their current pair of soft lenses; 5) see a health-care provider if they experience any signs of eye infection, including eye pain or redness, blurred vision, sensitivity to light, sensation of something in the eye, or excessive tearing.

Contact lens users with questions regarding which solutions are best for them should consult their eye-care provider. Patients should also consult their eye-care provider if they have any of the following symptoms: eye pain or redness, blurred vision, sensitivity to light, sensation of something in the eye, and/or excessive tearing. AK symptoms, which can last several weeks to months, vary among patients. Early in the infection, symptoms can be similar to the symptoms of other more common eye infections; however, AK can result in vision loss or blindness if untreated.

All contact lens wearers should follow established guidelines to help reduce the risk for eye infections, including AK (Box). Primary-care clinicians evaluating contact lens users with symptoms of eye pain or redness, tearing, decreased visual acuity, discharge, sensitivity to light, or foreign body sensation should consider the diagnosis of AK and refer patients to an ophthalmologist, if appropriate. Diagnosis of AK requires a high degree of suspicion, especially in a contact lens wearer with a recent diagnosis of another form of keratitis, such as herpes simplex virus keratitis, who is not responding to therapy. Diagnosis of AK is based on clinical presentation and isolation of organisms from corneal culture or detection of trophozoites and/or cysts on histopathology.

BOX. Guidelines for contact lens users to help reduce their risk for eye infections

- Visit your eye-care provider for regular eye examinations.
- Wear and replace contact lenses according to the schedule prescribed by your eye-care provider.
- Remove contact lenses before any activity involving contact with water, including showering, using a hot tub, or swimming.
- Wash hands with soap and water and dry before handling contact lenses.
- Clean contact lenses according to the manufacturer's guidelines and instructions from your eye-care provider.
 - Use fresh cleaning or disinfecting solution each time lenses are cleaned and stored. Never reuse or top off old solution.
 - Never use saline solution and rewetting drops to disinfect lenses. Neither solution is an effective or approved disinfectant.
- Store reusable lenses in the proper storage case.
 - Rinse storage cases with sterile contact lens solution (never use tap water) and leave open to dry after each use.
 - Replace storage cases at least once every 3 months.

However, a negative culture does not necessarily rule out *Acanthamoeba* infection. Confocal microscopy and polymerase chain reaction assays to detect *Acanthamoeba* can also assist with diagnosis. Early diagnosis can greatly improve treatment efficacy.

Clinicians should consider obtaining clinical specimens (e.g., corneal scrapings) for culture before initiating treatment. Clinicians or microbiology laboratories should report cases of AK to state and local health departments or directly to CDC at telephone, 770-488-7775. *Acanthamoeba* isolates should be submitted to state laboratories according to instructions provided by local and state public health laboratories. Public inquiries should be made via telephone 800-CDC-INFO. Further information regarding *Acanthamoeba* infections is available at <http://www.cdc.gov/ncidod/dpd/parasites/acanthamoeba/index.htm>

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