

# High Risk Behaviors, Keratitis, and Contact Lenses

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# Increasing *Acanthamoeba* keratitis (AK) case reports prompts CDC's first AK case-control study

CDC's first case-control study of soft contact lens wearers conducted

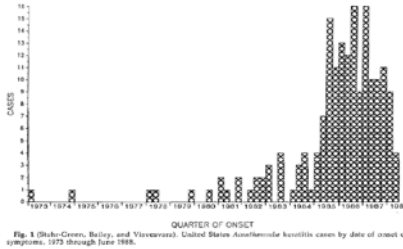


Fig. 1. (Stehr-Green, Bailey, and Visvesvara). United States *Acanthamoeba* keratitis cases by date of onset of symptoms, 1973 through June 1986.

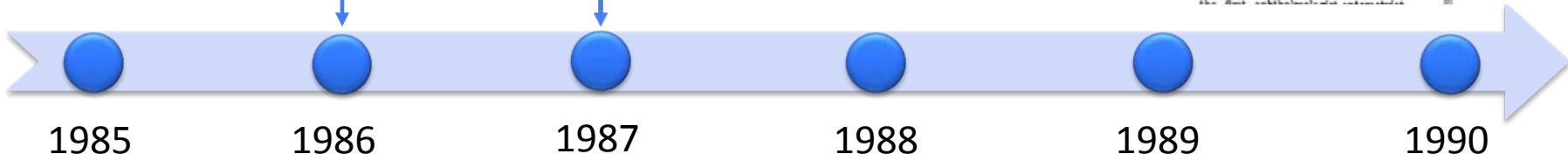
## *Acanthamoeba* Keratitis in Soft Contact Lens Wearers A Case-Control Study

Jeanette K. Stehr-Green, MD; Theodore M. Bailey, MD, MPH; Floy H. Brandt; Janice H. Carr; Walter W. Bond, MS; Govinda S. Visvesvara, PhD

*Acanthamoeba* keratitis is a rare, serious protozoal infection of the cornea associated with wearing contact lenses. To identify risk factors in soft contact lens wearers, we interviewed 27 patients with *Acanthamoeba* keratitis and 81 uninfected matched controls to compare contact lens care practices, brands of contact lenses and associated solutions, and behavioral activities. Patients were significantly more likely than controls to use homemade saline instead of commercially prepared saline (21/27 [78%] vs 14/81 [17%]; odds ratio [OR],  $\infty$ ), and wear their lenses while swimming (17/27 [63%] vs 24/81 [30%]; OR, 6.2). Contact lens disinfection schedules could be determined for 25 of the patients and all of the controls. Patients were significantly more likely than controls to disinfect their lenses less frequently than recommended by lens manufacturers (18/25 [72%] vs 26/81 [32%]; OR, 5.8). Microbiologic assay of contact lens solutions from controls showed frequent contamination with high levels of bacteria. *Acanthamoeba* species were isolated from homemade saline solutions from two controls. These findings emphasize adherence to recommended methods of soft contact lens care, especially when using nonsterile lens care solutions.

JAMA 1987;258:57-60

keratitis, to assure better recall we included only patients with onset of symptoms of keratitis between June 1986 and August 1986 (one year before the study was initiated). Cases and controls were matched on general contact lens type (daily wear soft contact lenses vs extended wear soft contact lenses), age ( $\pm 5$  years), and geographic location. To identify geographically matched controls, the ophthalmologist-optometrist who originally prescribed contact lenses for the patient was asked to select four controls meeting the matching criteria. This was accomplished by locating the patient's chart in the ophthalmologist-optometrist's file and choosing the next four patients in the file who met the matching criteria. If the original prescribing ophthalmologist-optometrist refused to participate,



1985

1986

1987

1988

1989

1990

# CDC conducts multi-state investigation, multi-purpose contact lens solution is recalled

RESEARCH

Multi-state investigation;  
Multi-purpose contact  
lens solution recalled



## National Outbreak of *Acanthamoeba* Keratitis Associated with Use of a Contact Lens Solution, United States

Jennifer R. Verani, Suchita A. Lorick, Jonathan S. Yoder, Michael J. Beach, Christopher R. Braden, Jacquelin M. Roberts, Craig S. Conover, Sue Chen, Kateesha A. McConnell, Douglas C. Chang, Benjamin J. Park, Dan B. Jones, Govinda S. Visvesvara, and Sharon L. Roy, for the *Acanthamoeba* Keratitis Investigation Team<sup>1</sup>

ARTICLE

### Risk Factors for *Acanthamoeba* Keratitis—A Multistate Case–Control Study, 2008–2011

Allison C. Brown, Ph.D., M.P.H., Jonathan Ross, M.D., Daniel B. Jones, M.D., Sarah A. Collier, M.P.H., Tracy L. Ayers, Ph.D., Robert M. Hoelstra, Ph.D., Bryon Backensen, MS, Sharon L. Roy, M.D., Michael J. Beach, Ph.D., and Jonathan S. Yoder, MSW, M.P.H., for The *Acanthamoeba* Keratitis Investigation Team

2006

2007

2008

2009

2010

2011



## Estimated Burden of Keratitis — United States, 2010

Sarah A. Collier, MPH<sup>1</sup>, Michael P. Gronostaj, MD, PharmD<sup>1</sup>, Amanda K. MacGurn, MPH<sup>1</sup>, Jennifer R. Cope, MD<sup>1</sup>, Kate L. Awsumb, MA, MPH<sup>1</sup>, Jonathan S. Yoder, MPH, MSW<sup>1</sup>, Michael J. Beach, PhD<sup>1</sup> (Author affiliations at end of text)

- Data used: national ambulatory care, emergency department, and insurance claims databases
- **930,000** doctor's office and outpatient clinic visits and **58,000** emergency department visits annually for keratitis and contact lens disorders
- Cost: **\$175 million** in direct health care expenditures



# Contact Lens Wearer Demographics and Risk Behaviors for Contact Lens-Related Eye Infections — United States, 2014

- **41 million** adult contact wearers
- **99%** report at least one contact lens hygiene risk behavior
- Nearly **1/3** reported having experienced contact lens-related red or painful eye requiring a doctor's visit





# Prevalence of risk behaviors for eye infections among contact lens wearers

Risk factor/behavior	% of wearers (n=1,141)
Sleeping overnight in CLs	50.2
Napping in CLs	87.1
Topping off solution	55.1
Replacing lenses at interval longer than recommended	49.9
Replacing case at interval longer than recommended	82.3



## Where lenses were purchased, 2014

Source	% of wearers (n=1,141)
Provider office	66.9
Retail store without eye exam	10.4
Internet	20.8

## Where lenses were purchased, 2016

Source	Adolescent (12–17 years)	Young adult (18–24 years)	Older adult (≥25 years)
Provider office	68.0	65.5	65.4
Retail store without eye exam	15.8	22.5	21.3
Internet	10.5	20.6	18.8
Other	3.6	--	1.7



# Contact Lens-Related Corneal Infections — United States, 2005–2015

- Data: FDA’s Medical Device Report (MDR) database
- Mandatory reporters: manufacturers, importers, and device user facilities
- **1,075** contact lens-related MDRs containing the terms “ulcer” or “keratitis”
  - **86%** reported by contact lens manufacturers
  - **14%** reported by eye care provider or patient
  - **20%** described a patient with a central corneal scar, decrease in visual acuity, or required a corneal transplant following the event

# Education is key: many CL wearers don't know they are doing things wrong

## WATER AND CONTACTS DON'T MIX

Germs found in water can stick to contact lenses and infect your eyes.



 [www.cdc.gov/contactlenses](http://www.cdc.gov/contactlenses)

## PROTECT YOUR EYES

Get rid of the grime, add new solution to your case every time.

Dump old solution & add new solution every time.



 [www.cdc.gov/contactlenses](http://www.cdc.gov/contactlenses)

## CONTACT LENSES ARE LIKE UNDERWEAR



- 1 DON'T OVER-WEAR**  
Replace your contacts as often as your eye doctor tells you to.
- 2 AVOID THAT SKETCHY PAIR**  
If a contact comes out and you can't disinfect it right away, throw it out. Don't buy contacts without a prescription.
- 3 CARRY A SPARE PAIR (OF GLASSES)**  
Always carry a spare pair of glasses as a backup.

**COVER YOUR BUTT, TAKE CARE OF YOUR EYES**

 [www.cdc.gov/contactlenses](http://www.cdc.gov/contactlenses)

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## The Healthy Contact Lens Program at CDC

A close-up photograph of a person's eye. A hand is shown inserting a clear contact lens into the eye. The background is a light, neutral color.

**Contact Lens Health Week**  
August 21-25, 2017  
[www.cdc.gov/contactlenses](http://www.cdc.gov/contactlenses)

The logo for the U.S. Department of Health and Human Services, featuring an eagle with wings spread, and the logo for the Centers for Disease Control and Prevention (CDC), featuring the letters 'CDC' in a stylized font.

U.S. Department of  
Health and Human Services  
Centers for Disease  
Control and Prevention



## Contact lens wearer stories: Ryan's story



For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)



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.

