

# Addressing an Outbreak of DLK

BY JOHN F. DOANE, MD; RICHARD S. HOFFMAN, MD; SIMON HOLLAND, MB, FRCS; AND ROBERT K. MALONEY, MD

*For each installment of "Today's Topics," section editor John F. Doane, MD, will identify a hot-button topic in cataract and refractive surgery and ask several experts to share their thoughts.*

**Serial, cluster, or outbreak diffuse lamellar keratitis (DLK) associated with LASIK continues to be a significant clinical issue. What are your recommendations for centers that have this occurrence?**

## JOHN F. DOANE, MD

An outbreak of DLK (eg, several people exhibiting DLK from the same day of surgery) is a distinct entity, as opposed to a single patient who developed DLK on a day when no one else exhibited symptoms.

For an outbreak of DLK, I recommend looking for a specific causal link. After reviewing numerous outbreaks throughout the past decade, I found that the two most frequent causal agents are the contamination of reservoir sterilizers by gram-negative endotoxins<sup>1</sup> and surgical glove-associated DLK.<sup>2</sup> With the latter cause, it is believed that the contamination of talc-free gloves by silicone oil irritated the eye and led to a robust white cell reaction in the interface.

These two causes must be ruled out first during the investigation of the surgical process. If neither led to the outbreak, all stones should be overturned until the source is discovered.

## RICHARD S. HOFFMAN, MD

Between 2000 and 2003, my colleagues and I faced DLK on a daily basis, with a frequency ranging from 3% to as high as 38%. We became so accustomed to seeing DLK that we thought it was a common part of the post-operative course. As the rate started to increase slowly, however, I attempted to isolate the cause by systematically eliminating surgical variables that might have contributed to the outbreaks. I switched topical antibiotics, changed microkeratomes, stopped Betadine preparations (Purdue Pharma L.P., Stamford, CT), and changed

sterilizers. We also switched from detergent cleaners to enzymatic cleaners and then back to detergents. At one point, I even started to pray the rosary. Nothing seemed to change our rate of DLK.

Then, one of our nurses told us about a practice on the East Coast that had discovered that talc-free surgical gloves might be causing DLK. We switched gloves, and the DLK stopped. In the last 4 years, I have seen one case of mild DLK.

Prior to switching gloves, I was probably one of the most experienced surgeons in the world with regard to DLK. Our analysis of the DLK-associated gloves revealed silicone oil on the surface. We believe that microkeratome blades, irrigating tips, and the tips of Meroceel sponges (Meroceel ENT, Jacksonville, FL) that eventually came into contact with the LASIK interface were probably the mechanism by which silicone oil was deposited on the eye, thus leading to the subsequent chemotactic infiltration of white blood cells.<sup>2</sup>

When faced with a regular series of DLK patients in your surgery center, first consider which kind of gloves you are using and if they could be the cause. If this approach is not effective, start changing surgical variables one at a time to isolate the offending agent. With good detective work, the cause can be identified and eliminated.

## SIMON HOLLAND, MB, FRCS

I think it is important to remember that someone facing an outbreak of DLK is not alone. Many of us have been confronted by the sudden appearance of multiple cases of DLK on a single day, after years of sporadic cases.

Our institution reported one of the first outbreaks in 1998 and underwent a painstaking investigation to pinpoint the source. We performed more than 20 changes in the surgical process before finding a link to an endotoxin released from biofilm residue on the sterilizer. Short-cycle sterilization effectively kills bacteria but not their endotoxin, which is a potent antigen for inciting inflammation (eg, DLK and toxic anterior segment syndrome). It can be isolated from the steam condensation and deposit on instruments if a sterilizer's reser-

voirs are not well maintained.

Since our outbreak, our informal group—including a microbiologist and epidemiologist—has attempted to assist with more than 60 outbreaks in North America and internationally. Finding the culprit in these cases is often difficult, because the affected clinics frequently made multiple, simultaneous changes. Endotoxins from multiple sources (eg, balanced salt solution, surgical sponges, lubricating agents, oils in microkeratomes and gloves) are the most common cause.

I suggest considering these steps first when investigating DLK's intrusion into your clinic:

1. Prepare an epidemiologic log that documents the DLK (eg, total cases per week, surgeon, day, time of surgery, etc.).
2. Document all of the components of and alterations to the surgical process, including changes in staff, suppliers, and techniques. The cause may be as simple as switching from distilled water or using blades produced in a different factory. Compare any changes to the epidemiologic log.
3. Contact your local colleagues to see if they have noticed an increase in the frequency of DLK using similar equipment and procedures.
4. Isolate the culprit by making individual changes to your procedure, beginning with the most common causes.

Outbreaks of DLK are difficult to investigate and may be multifactorial. The good news is that most cases are resolved. Still, be prepared to offer advice and readily available resources to affected patients.

**ROBERT K. MALONEY, MD**

Surgical gloves and sponges, detergent build-up on an instrument, povidone iodine solution in the eye, and endotoxins are common causes of an outbreak of DLK. Recently, however, surgical marking pens were found to be another cause of DLK (B. Hadden, personal communication, 2008).

The first step in identifying the cause of serial outbreaks of DLK is to determine what has changed most recently in the OR. Are you using gloves from a new supplier or a new cleaning system? A thorough examination of the equipment and techniques will often pinpoint the cause. ■

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