

Outbreak of Sporadic Diffuse Lamellar Keratitis (DLK) Related to a Steam Humidifier

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Financial Disclosures

The author has no financial interest in any product

Sporadic DLK

Sixteen patients

- Which eye
 - one right
 - eleven left
 - four bilateral;
- Duration of the ablation
 - nine hyperopia
 - seven myopia
- Type of Surgery
 - fourteen primary
 - two enhancements.

Risk factors-

- Left >>>>right (10/1)
 - Unlikely to be related to instruments, autoclave or drops
 - Suggested an environmental etiology
- Hyperopia >>> myopia (10/1)
 - Surgery longer with more pulses
 - Suggests that excimer laser irradiation increases the risk

The third case of DLK occurred when the humidistat was turned up.



That day condensation was noted on a window with a crack in the thermal glass

When the humidifier chamber was checked, organic debris was noted in the chamber; the unit was turned off.



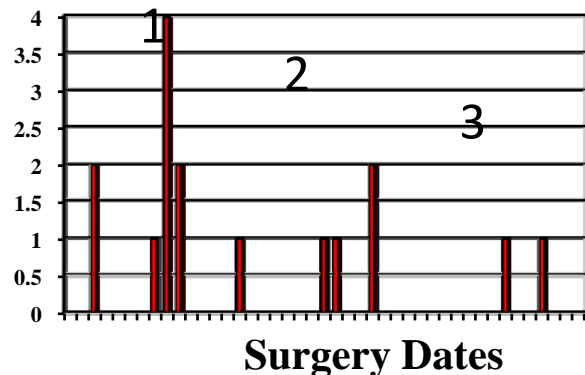
- The steam chamber in the humidifier is comparable to the chamber in an autoclave
- The unit had stayed full of fluid during the summer because of a slow leak in the water supply valve
- Note organic brown debris in the bottom (and sides)
- Note calcium deposit in the base

Mild cases occurred when :

- HEPA filters were upgraded
- new unit was installed

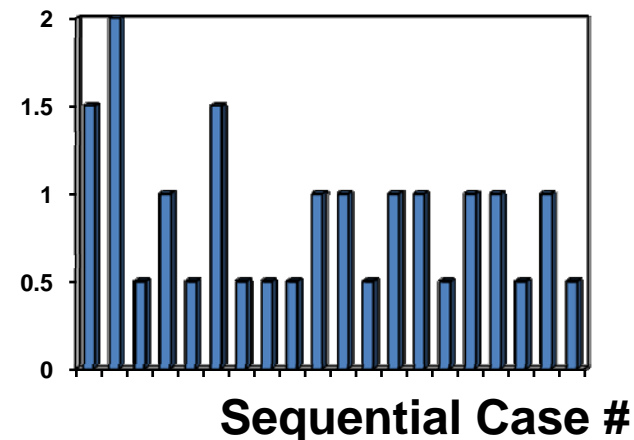
DLK events

1. Turned off humidifier
2. Modified HEPA Filters
3. New Humidifier turned on



•DLK: Grade (0-4)

- All cases mild
- Treated with Pred forte hourly
- No adverse outcomes



New humidifier after one month of use



- Chamber is manually drained and refilled daily
- Calcium buildup is noted
- There is no evidence of organic debris or discoloration
- Chamber can be replaced yearly

Related risk factors

Laser Fragmentation of Debris

1. Excimer irradiation of chimney exhaust increases particle number two orders of magnitude

Christopher B. Stipe, Post-Doctoral Research Fellow Mechanical Engineering Department, University of Minnesota

2. Patient treatment with excimer laser increases the operating room particle number six-fold

Anonymous ,A Mysterious Tale: The Search for the cause of 100+ cases of DLK, JRS 18,Sept 2002,Page 551-554

Air filtration

1. The highest number of cases occurred the week after the humidifier was turned off
 - Consistent with dispersal of material into the OR from areas not protected by HEPA filtration
2. Possible that contaminants were released when work was done on the air filtration system
 - Several mild cases were noted when the HEPA filters were changed or modified
 - Several mild cases were noted when a new humidifier was installed

Nozzle position:

Determines the difference between
right and left eye

**Air is pulled across the left eye
and along the nose**



**Compared to the left side, less
air is pulled across the right eye**



Conclusion

Events were consistent with

- airborne contaminants from the humidifier as the cause,
- the excimer laser creating multiple smaller particles
- the aspirator location increasing the incidence in left eyes