Should it stay or should it go? Using contact lenses during poor air quality due to bushfire smoke

Natural Hazards Research Australia

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Particulate matter deposits on soft contact lenses during simulated wildfire

Wildfires release large quantities of carbon particles called particulate matter (PM) into ambient air[1]. Exposure to wildfire smoke is known to cause eye surface irritation[2,3]. Although, other particles such as pollen are known to deposit on contact lens surfaces[4], it is unclear whether airborne PM can deposit on contact lens surfaces.

AIM

To examine particulate matter deposition on soft contact lenses during a simulated wildfire in a pilot study.

METHODS

1. Wildfire smoke was simulated by burning vegetation to generate airborne PM at Firelab (University of Tasmania). Airborne PM was monitored using DustTrack II.

2. Worn (n=2) and unworn (n=2) soft contact lenses (BioTrue OneDay, & Precision 1) were exposed to smoke for up to 10 minutes.

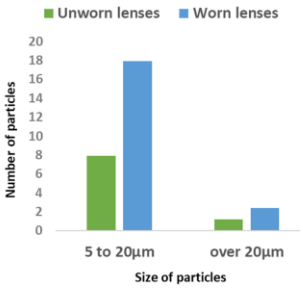
3. Lenses were air dried in a dessicator for 8 days and then examined with scanning electron microscopy (UNSW EMU)

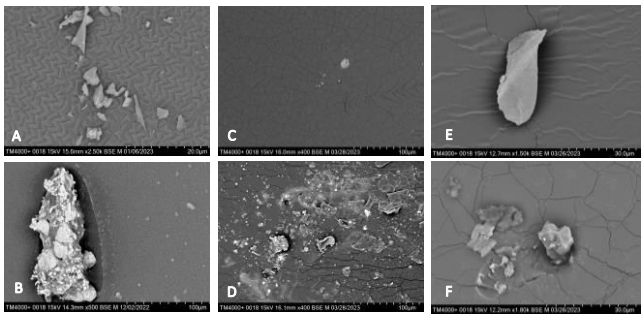
4. Up to 10 non-overlapping images (30-2000x) per lens were obtained. Two investigators independently assessed lens surfaces for:
(i) Density of PM deposition (manual count)
(ii) Size and shape of PM deposition (qualitative assessment)

RESULTS

Ambient PM concentration during exposure (µg/m³)	
Mean	1600
Maximum	7450
Minimum	95

Average PM density on lens surface (particles per mm²)		
Size of PM	Unworn lenses	Worn lenses
5 µm – 20 µm	114	256
> 20 µm	28	35





PM imaged on contact lens surfaces varied in size, shape (A & B) and density (C & D). Some PM deposited on the surface (E) while others were embedded in the lens matrix, damaging the surface (F).

DISCUSSION

Should a lens that has sustained damage by PM continue to be worn?
It can be speculated that microdamage to the lens surface from PM may harbour bacteria and reduce comfort.

Can the deposited PM transfer into the tear film during lens wear?
Further research is needed to determine if such transfer occurs and whether the PM can then damage the eye surface.

Will rubbing or rinsing remove PM from the surface of contact lenses ?
Existing literature has shown that rinsing can remove PM from contact lens surfaces.[5]

NEXT STEPS

- Deposition of PM smaller than 5µm on contact lens surfaces will be studied with field emission electron microscopy
- Further projects are planned in collaboration with firefighting agencies to understand the impact of smoke exposure on the eye surface

References
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Further information

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