

Drop in temperature may explain the increase in dry eye suffering

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Springtime may be just what the doctor orders for individuals suffering from dry eye condition, a disorder resulting from insufficient tear production or altered tear film composition. According to a study published in *Investigative Ophthalmology & Visual Science*, a temperature less than 30 degrees Celsius on the eye and eyelid could be the cause for the onset or worsening of the disorder.

The study, (Meibomian Lipid Films and the Impact of Temperature) showed that the cold temperature causes the meibum, the oily substance which helps to form the outermost layer of the tear film, to become too thick and stiff to spread onto the eye surface.

"In outdoor conditions, the wind accelerates the drop in temperature of the ocular surface and the eyelids, thus the effect is even more pronounced," says author Igor A. Butovich, PhD, assistant professor, Department of Ophthalmology and Graduate School of Biomedical Sciences at the University of Texas Southwestern Medical Center. "This mechanism seems to be one of the major factors that cause [dry eye](#) to worsen in cold, windy weather such that it can affect even healthy people."

Based on previous experience, the research team expected to see measurable effects of temperature on meibum. However, the researchers were surprised the results of their experiment found that a bulk of meibum abruptly melted in a very narrow range of temperatures, right around an eye surface and eyelid temperature of 32 – 34 degrees Celsius.

If the temperature fell just a few degrees below that, the bulk meibum solidified, which could then result in plugging up the meibomian gland ducts.

The experiments further demonstrated that even if the thicker, stiffer substance does reach the eye surface, it may not spread as easily as under normal conditions. The tear film that forms on the eye will not have the right characteristics, which might cause it to evaporate more quickly and decrease its protective capabilities.

Butovich underscores that the goal is to maintain the quality of the tear film as close to normal as possible, under all conditions. "In cold climate, anything that keeps eyes and eyelids warm should help meibum flow easier, and form and maintain a better tear film; in windy conditions, protection from the wind — for example, with eye goggles — should reduce the tear film evaporation."

The authors strongly suggest that temperature be tightly controlled in future studies, especially since over-the-counter and prescription eye lubricant formulations that are being tested are most likely temperature-dependent. "Our experiments provided strong evidence that even a small drop in the ocular surface and eyelid temperatures is critical," stresses Butovich. "It would be logical to use this information and our approaches while designing new eye drop formulations."

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