**Tear turnover rate & fluorophotometry**

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Tear turnover rate (TTR) assessment is one method to measure normal versus abnormal tear film dynamics. TTR is more commonly used in research settings, and is defined as the rate at which a fixed amount of sodium fluorescein dissipates from the tear film per minute.

**Methodology**

TTR is measured by placing 1ul of 2 percent sodium fluorescein sodium into the lower fornix, although various amounts and concentrations can be used. A fluorophotometer measures the rate of fluorescein dissipation from the tear film over the course of 20-30 minutes. Data points are gathered every minute or at set time intervals. The slope of the data points can be measured in terms of percent tear turnover per minute for TTR or in terms of µl/minute for tear flow.¹

Various other methodologies exist such as the use of sodium fluorescein in the eye and Schirmer strips. The intensity of staining is compared to a standard color plate to measure tear clearance. This method has been shown to have correlation to TTR measured via fluorophotometry.²

**Results**

- **Normal:** TTR 15 percent – 22 percent / minute¹
- **Dry Eye:** TTR 5 percent – 8 percent / minute¹

**Clinical Uses**

Currently no fluorophotometry devices are marketed for everyday clinical use, although the FM-2 Fluorotron Master (TM) available from OcuMetrics, Inc, is available.³ This device is intended for research purposes; however, it may have some clinical applications in specialty practices.

TTR most accurately measures how quick the tears are eliminated from the eye through the lacrimal system. TTR is reduced, particularly, in aqueous deficient dry eye patients.¹ Measuring TTR could become a valuable diagnostic tool to monitor the efficacy of dry eye treatments. User-friendly devices need to be developed before this testing becomes common clinical practice.

**Resources**

Fluorophotometry Video (courtesy of the Tear Film and Ocular Surface Society)

http://www.youtube.com/watch?v=6jMzyVrTbwg

**References**


Dr. Smiley is the owner of Vision Professionals, a two-location private practice in Columbus, Ohio. He was a recipient of the American Optometric Foundation Award of Excellence in Patient Contact Lens Care. He has served as a clinical investigator for numerous contact lens studies. Dr. Smiley is a Clinical Assistant Professor of Optometry at The Ohio State University College of Optometry.

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