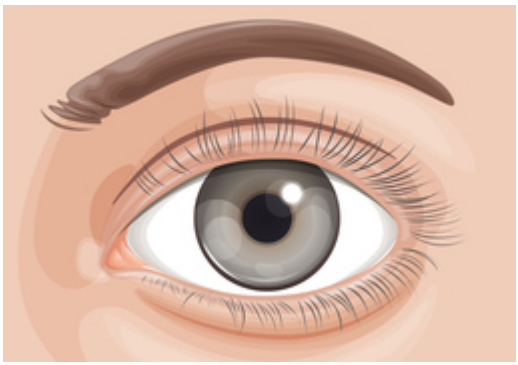
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Spectral-Imaging Diagnostic for Characterization of Corneal Infections

TECHNOLOGY NUMBER: 2022-106



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Category
Medical Devices
Life Sciences

Inventor
David Burke
Joshua Herzog
Kayla Coalmer
Volker Sick

Further information
Katherine Pollard
kpollar@umich.edu

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OVERVIEW

A device to measure microbial types and concentrations in corneal infections

- Utilizes two monochrome scientific cameras to facilitate visualization of infection
- The absolute intensity of the fluorescent images correlates with microbial concentration

BACKGROUND

Microbial keratitis is a common cause of corneal opacities and monocular blindness in developing countries. Rural agricultural communities in low- and middle-income countries are at a greater risk of infection due to corneal abrasions from agricultural activities, manual labor, and domestic work. The main cause of corneal infections in developed countries such as the United States is trauma from contact lens usage. These infections may be difficult to diagnose, especially in the absence of an ophthalmologic clinician. Historically, evaluation for infection has depended on gram staining and culture of corneal samples, a process which has suboptimal sensitivity and specificity. Delayed diagnosis correlates with formation of corneal ulcers and an increased risk for vision loss.

INNOVATION

Researchers at the University of Michigan have designed a device that uses two monochrome scientific (CMOS) cameras which use readily available components from optics and optomechanics manufacturers to facilitate imaging of corneal infections. The design consists of appropriate filters, a fixed-wavelength LED module, a set of dichroic beam splitters, and an aspheric lens that is shared by both cameras. The LED module directs UV emissions into the

patient's eye using a beam splitter, exciting fluorescence from any microbes present in the eye and dividing them into two wavelength bands. These images are subsequently imaged using the aspheric lens. The relative intensity of the fluorescent images helps to define the microbial species by detecting tracer molecules such as NADH and FAD, chemicals that take part in chemical metabolism. Additionally, the absolute intensity of the fluorescent images correlates with microbial concentration. A software tool will be developed to help perform these analyses.