A RAPID, EFFICIENT AND LOW COST METHOD FOR DETERMINING THE LIPID CONCENTRATION IN A TEAR SAMPLE
IITM Technology Available for Licensing

Problem Statement

- Lipids play crucial roles in various biological functions, and even a slight deviation in their concentration (as low as 10%) can lead to significant physiological changes and disorders, including dry eyes.
- **Dry Eye Disease (DED) severity is strongly correlated with reduced lipid levels**, which form the outermost tear film layer, preventing excessive evaporation.
- Current methods for lipid concentration determination are often time-consuming and expensive.
- So, **there is a need to have a low cost, rapid, and efficient method and system** for determining the concentration of lipid from a sample.

Intellectual Property

- IITM IDF Ref. **1930**
- **IN 201941045776**

Technology Category/ Market

Category - Lipidomics
Applications - Opthalmology and Bio-medical Sciences.
Industry- Biomedical Research, Point-of-Care Testing.
Market- The global dry eye syndrome treatment market size is estimated to grow at a **CAGR of 7%** between 2022 and 2032, surpassing a valuation of US$9.4 Billion.

TRL (Technology Readiness Level)

TRL - 3:Proof of concept stage.

Research Lab

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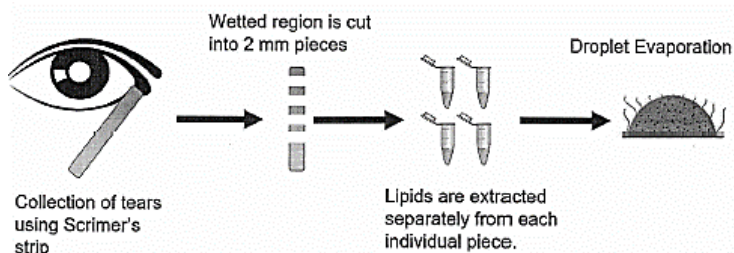Dept. of Applied Mechanics and Biomedical Engineering. (sbajpai@iitm.ac.in)

FIG. 1. Depicts the schematic process of collecting tears using the Schirmer's strip followed by a lipid extraction protocol from the strip using methanol:chloroform mixture.

Technology

The present invention **relates to the field of lipidomics, particularly a method and system for determining lipid concentration in a tear sample. (Fig. 2)**

1. Sample Collection
- Tear samples are collected from a subject. (Fig. 1)

2. Lipid Extraction
- Lipids are extracted from the tear sample.

3. Lipid-Nanoparticle Suspension
- A suspension of lipid nanoparticles is prepared.

4. Deposition
- The lipid nanoparticles suspension is deposited onto a pre-cleaned surface to obtain a dried deposit.

5. Ring Identification:
- The method after obtaining the dried deposit comprises determining and identifying inner ring and further the outer ring. After identifying outer ring and inner ring, the method determines area fraction of the dried deposit and percentage offset of the inner ring along the diameter of the outer ring.

6. Lipid Concentration Calculation
- Using the area fraction and percentage offset data, the lipid concentration in the tear sample is calculated. (Fig. 3)

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Key Features / Value Proposition

1. Efficient Lipid Concentration Determination:
This method offers a rapid and efficient way to determine lipid concentration in tear samples, making it valuable for diagnosing conditions like Dry Eye Disease (DED).

2. Cost-Effective Solution:
The assay utilizes inexpensive and readily available chemicals, ensuring affordability and accessibility for widespread use in clinical settings.

3. Predictive Model:
By analyzing droplet deposition patterns and spatial shifts, the technology establishes a predictive model for lipid concentration, enhancing its accuracy and reliability.

4. Versatile Applications:
Beyond DED, this assay can be applied in various clinical sciences where quantifying non-polar entities is essential, extending its utility across different medical domains.

5. Quick Assessment:
The method's speed makes it suitable for swift lipid concentration analysis, aiding in prompt clinical decision-making and patient care.
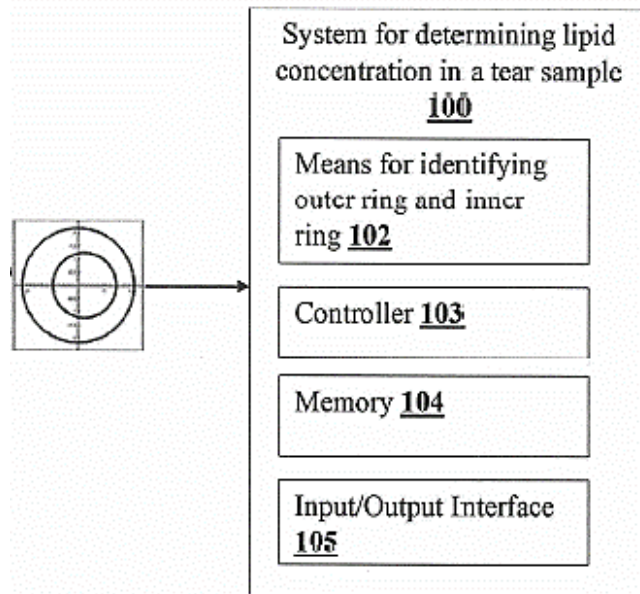
FIG. 2. Shows an exemplary architecture for the system for determining the lipid concentration in a tear sample.
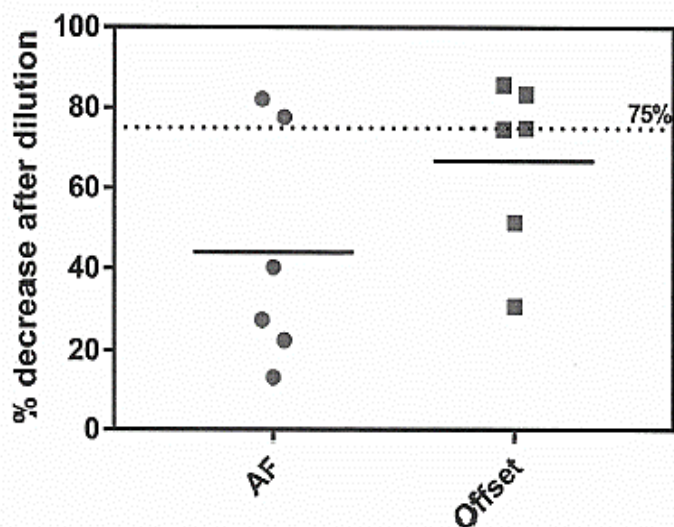
FIG. 3. Shows the predictive-value of area-fraction and off-set, as measures of tear-lipid concentration. Standard used: 75% tear-dilution (dotted-line)