Executive Summary

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1. **Title of the Project:** Early detection of C3 and C3a proteins from the eye vitreous of elderly person for the diagnosis of Age-related Macular Degeneration (AMD) and monitoring treatment response

2. **Date of Start of the Project**: 1st October 2020

3. **Aims and Objectives:**

   1. Development of ultrasensitive nanobiosensor platforms (Electrochemical/ Condutometric) for compliment C3 and C3a sensing.
   2. Integration of sensing platform with electronics chip and calibration for quantification of analytes further integration of electronics hardware chip to smart mobile.
   3. . Real time testing with samples (both with blind samples and samples with known analytic concentration)
   4. Data analytic algorithm for accurate quantification of C3 and C3a concentration.
   5. Start up and VC investments.

4. Significant achievements (not more than 500 words to include List of patents, publications, prototype, deployment etc)

Age-related macular degeneration (AMD) is an eye disease that can blur your central vision. It's a leading cause of vision loss for older adults. AMD doesn't cause complete blindness, but losing your central vision can make it harder to see faces, read, drive etc. As of 2020, it affects

more than 190 million people globally with the prevalence expected to increase to 288 million people by 2040 as the proportion of elderly persons in the population increases. Because C3 protein represents the center of convergence for all 3-activation routes and is upstream of all key effectors, C3 is an appealing target (biomarker) in AMD sensing . So, the detection of C3 protein at early-stage with femtomolar concentration will help to reduce the possibility of AMD disease due to early-stage proper treatment.

Our group developed Indium doped ZnO nanofibers and r GO based Electrochemical/ Condutometric biosensors for C3, MMP2 and C3a biomarkers detection for AMD identification. Further Mobile app and readers ckts. were developed and integrated with sensors for point of care applications Successful real-time testing of tear samples from 30 healthy controls was performed for MMP-2 and C3 proteins. However large number of samples not yet done. Schematic diagram of chemi-resistive sensing along to point of care readout ckt and interference study is depicted in figure 1. Data analytic algorithm is developed for control sample. Next phase clinical sample need to be tested.

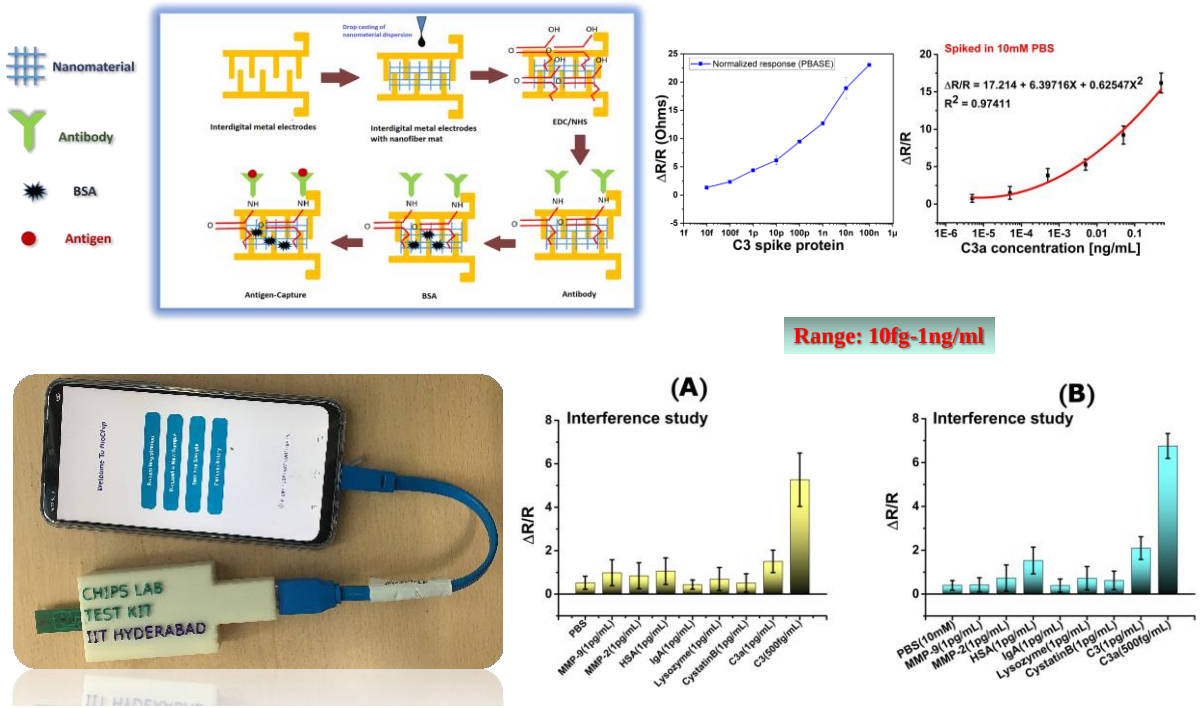

Figure: Pictorial Representation of Chemiresistive Sensing.

Journal paper

1. Electrochemical nano-biosensor based on electrospun indium zinc oxide nanofibers for the determination of complement component 3 protein, Microchimica Acta (2023) 190:320.

Patent filed

1. Design and Micro-fabrication of electrode for multianalyte chemical sensing, File No 2020/41030698, Shiv Govind Singh, Suryasnata Tripathy.

2. 1. Ghosh Tanmoya Nemai, Shiv Govind Singh, "Metallic transition metal dichalcogenide based chemiresistive biosensor",Application No. 202241026382, publication date 11/05/2022.

5. Concluding remarks

Once clinical trial complete on sizable sample, this will pave the way to save millions of people vision across the globe with discover and make in India tag.