

Special Interest Group

On



NanoBiosensors for Detection of Cardiovascular Disease Biomarkers

An Initiative
of
Research Division
JSS AHER, Mysuru-15.



Team Lead
Dr. Asha Srinivasan
Assistant Professor and Program
Coordinator
Division of Nanoscience & Technology
School of Life Sciences
JSS AHER, Mysuru

Started on 2019-20

JSS Academy of Higher Education & Research

(Deemed to be University)
Accredited "A" Grade by NAAC



REG/ACA/SIG/NDCDB/442/2019-2020

13436

Date: 11.03.2020

NOTIFICATION

Sub: Constitution of Special Interest Group in "Nanobiosensors for detection of cardiovascular disease biomarkers".

Ref: Your request letter No. REG/FLS/GEN/2019-20/1101 dated 05.03.2020.

Special Interest Group (SIG) – "Nanobiosensors for detection of cardiovascular disease biomarkers"

In exercise of powers conferred under Section 50 (xii) and 12 [ii (a)] of the MoA/Rules of JSS Academy of Higher Education & Research as per UGC Regulations 2016, the Special Interest Group (SIG) in the area of "Nanobiosensors for detection of cardiovascular disease biomarkers" has been constituted for focusing on basic and applied research in the mentioned area with the following members:

SLNo.	Name of the member	Remarks
1	Dr. Asha Srinivasan Assistant Professor Division of Nanoscience & Technology Faculty of Life Sciences JSS AHER.	Group Leader
2	Dr. Akila Prashant Professor, Dept. of Biochemistry JSS Medical College.	Member
3	Dr. Swetha N K Assistant Professor Dept. of Biochemistry JSS Medical College.	Member
4	Dr. Sapna Patel M C Associate Professor, Dept. of Pathology JSS Medical College	Member
5	Ms. Chaitra N Assistant Professor, Division of Medical Statistics Faculty of Life Sciences JSS AHER.	Member
6	Dr. Mohanan P V Scientist E Sree Chitra Tirunal Institute for Medical Sciences and Technology, Jai Nagar W Rd, Chalakkuzhi, Thiruvananthapuram, Kerala 695011	Special Invitee
7	Prof. Thakur M S Chief Scientist (Retd.,) and former Head CSIR – CFTRI, Mysuru.	Special Invitee

8	Dr. Rajendra Kumar Associate Professor, Dept. of Nanoscience & Technology Bharathiar University, Coimbatore, Tamil Nadu.	Special Invitee
9	Dr. Viswanathan C Associate Professor, Dept. of Nanoscience & Technology Bharathiar University, Coimbatore, Tamil Nadu.	Special Invitee
10	Dr. Annalisa Tirella Professor, Division of Pharmacy & Optometry University of Manchester, UK.	Special Invitee

The SIG "Nanobiosensors for detection of cardiovascular disease biomarkers" shall function for a period of three years from the date of Notification.

The SIG shall submit their report once in six months to the JSS AHER. The budget for the functioning shall be submitted by the Group leader of the SIG and approval shall be obtained from the JSS AHER for carrying out their various activities.



REGISTRAR

To,

All the above members,

Copy to:

1. The Pro Chancellor, JSS AHER.
2. The Vice Chancellor, JSS AHER.
3. The Controller of Examinations, JSS AHER.
4. The Director (Academics), JSS AHER.
5. The Director (Research), JSS AHER.
6. The Dy. Registrar (Senior Grade), JSS AHER.
7. The Dy. Director (Academics), JSS AHER.
8. The Dy. Director (Authorities), JSS AHER.
9. The Associate Director (Research), JSS AHER.
10. The IQAC Coordinator, JSS AHER.
11. The Asst. Director (Academics), JSS AHER.
12. The Asst. Director (Research), JSS AHER.
13. The Principal, JSS Medical College.
14. The Principal, JSS Dental College & Hospital.
15. The Principal, JSS College of Pharmacy, Mysuru.
16. The Principal, JSS College of Pharmacy, Ooty.
17. The Head, Dept. of Water & Health (FLS), JSS AHER.
18. The Coordinator, Dept. of Health System Management Studies, JSS AHER.
19. Office Copy

Guidelines for the formation of Special Interest Groups:

Objective: To promote research in specific area by a group of individuals working in the constituent colleges of the JSS AHER, who are desirous of promoting research in a specific area through

- Continuous dialogue
- Conducting Group meetings
- Submitting research projects
- Development of new ideas in research in the identified area and translating the same into research proposals to external funding agencies and research publications in indexed journals.
- Translating research findings into the clinical applications
- Organizing seminars related to objectives of the Group.

The SIG should categorize their objectives as short term and long-term objectives and while submitting the progress reports, highlight their achievements under the same.

Structure: The SIG shall consist of 5-7 members with a group leader. They shall meet periodically and submit the report annually of the group activities and achievements.

The Special Interest Group shall function for a period of 3 years from the date of notification, which can be extended further, based on the outcomes and reviewed by the Board of Management of the JSSAHER.

Budget: The budget required for functioning of the SIG shall be allocated from Research and Development fund of the JSS AHER based on the budget prepared and submitted by them annually.

The budget shall be provided for following aspects.

- Meeting expenses of the Group.
- Short travels within India for the purpose of group objectives.
- Secretarial assistance as required by the Group.
- Preparation of research project proposals/reports.

The JSS AHER shall provide in its budget for the expenditure proposed by the Special Interest Groups and make the funds available to the respective group.

Evaluation of outcomes: The JSS AHER shall evaluate the SIG periodically in respect to their group objective examining the follows.

- Progress in the proposed research projects.
- Publication of research findings in periodicals and presentations
- Reports.

Name of the SIG: Nanobiosensors for detection of cardiovascular disease biomarkers

Approval Reference: REG/ACA/SIG/NDCDB/442/2019-2020/13436 dated 11.03.2020

Team Lead: Dr. Asha Srinivasan

Sl.No.	PI	Role
1.	Asha Srinivasan Assistant Professor and Program Coordinator Division of Nanoscience & Technology JSS AHER, Mysuru	Group Leader
2.	Dr. Sunil Kumar S Professor and Head Department of Cardiology JSS Hospital, Mysuru	Member
3.	Chaitra N, PhD Division of Medical Statistics. School of Life Sciences. JSS AHER, Mysuru	Member
4.	Dr. Akhila Prashant Professor and Head Department of Biochemistry JSS Medical College, Mysuru	Member
5.	Hardik J. Pandya, Associate Professor Department of Electronic Systems Engineering Division of EECS Associate Faculty, Department of Design and Manufacturing Division of Mechanical Sciences Indian Institute of Science, Bangalore 560 012, India.	Collaborator

6.	<p>Dr. Annalisa Tirella, Professor, Division of Pharmacy and Optometry, University of Manchester. UK. Assistant Professor Department of Industrial Engineering University of Trento Via Sommarive, 9 - 38123 PovoItaly</p>	<p>External Member</p>
7.	<p>Dr. MS Thakur Former Scientist CSIR- CFTRI</p>	<p>Special Invitee</p>

Objectives

- To address the India's prime health issue in Cardiovascular diseases.
- To develop an interdisciplinary intervention to identify risk of heart failure using nanoengineering
- Develop a simple, cost-effective, noninvasive nanobiosensors for early real time detection of congestive heart failure using nano-immunosensors
- Clinical testing of the nano-immunosensor at A&E at JSS Hospital
- Use the nanosensor as a Point of care device at all hospitals in India for identification of risk of heart failure.

Statistics of Congestive Heart Failure

- According to WHO 2021 report, cardiovascular diseases (CVDs) are the leading cause of death globally.
- An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke.
- Over three quarters of CVD deaths take place in low and middle-income countries.

It is important to detect cardiovascular disease as early as possible so that management with counselling and medicines can begin



Figure 1: Mortality rate due to CVDs across globe

From 1990 to 2019, the number of CVD deaths in Asia rose from 5.6 million to 10.8 million.

Out of the total CVD mortality in Asia, 39% were premature deaths. CVDs, including heart failure (HF), are leading causes of death and disability in both urban and rural India. Estimates suggest a HF prevalence of 1.3 million to 22.7 million, with an annual incidence of 0.5–1.8 million in India. Early detection or diagnosis is a critical step in the treatment of any pathological condition as it helps to prevent the risk of further damage by providing better prognosis. This research proposal focuses on the development of innovative non-invasive methods to optimize treatments through effective diagnosis, and overall improve healthcare. Biosensors, an analytical device in which, a specific analyte from biological samples can be detected by physicochemical detector, have been widely used as a noninvasive method for diagnosis.

Cardiovascular disease (CVD) has become a leading cause of mortality globally since the last few years. CVD includes coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease and deep vein thrombosis and pulmonary embolism. The diagnosis of CVD can be done only in the final stages of the condition, where the patient should undergo painful surgeries or may even lead to death. Hence, early detection of CVD with methods using nanobiosensors could be very useful and this may aid to improvise the condition by using medication instead of surgeries.

Biomarkers offer a cost-effective, lower risk, and fast reversal process, which primarily provides significant data for the determination of congestive heart failures [4] About 50% of heart failure patients have heart failure with preserved ejection fraction (EF) which is associated with elevated left ventricular dysfunction. (BMC 2020). The cardiac biomarkers are released on the stretching of the myocardial wall. Hence these biomarkers can help in the diagnosis of left ventricular hypertrophy, left ventricular dysfunction, and early diagnosis of heart failure. Conventionally ECG and ECHO have been used to rule out these conditions. However, this requires proper etiquette and expert technicians for accurate results.

Whereas biosensors don't require expert people for accurate results. Various types of biosensors have been developed for the recognition of cardiac biomarkers such as optical, electrical, and electrochemical-based biosensors. Among these sensors, electrochemical-based sensors have less manufacturing cost which can be simply miniaturized for point of care (POC) diagnosis and are simple to utilize. They are highly susceptible, specific, and have high authenticity.

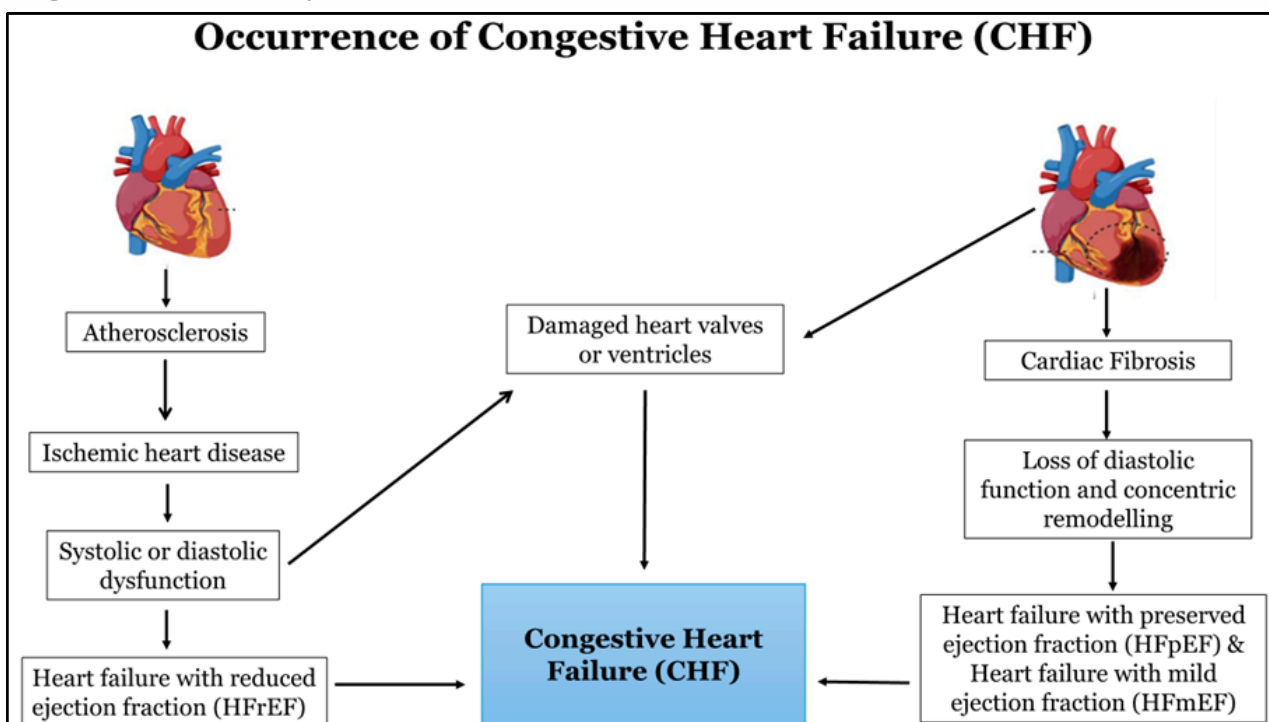


Figure 2. Occurrence of heart failure

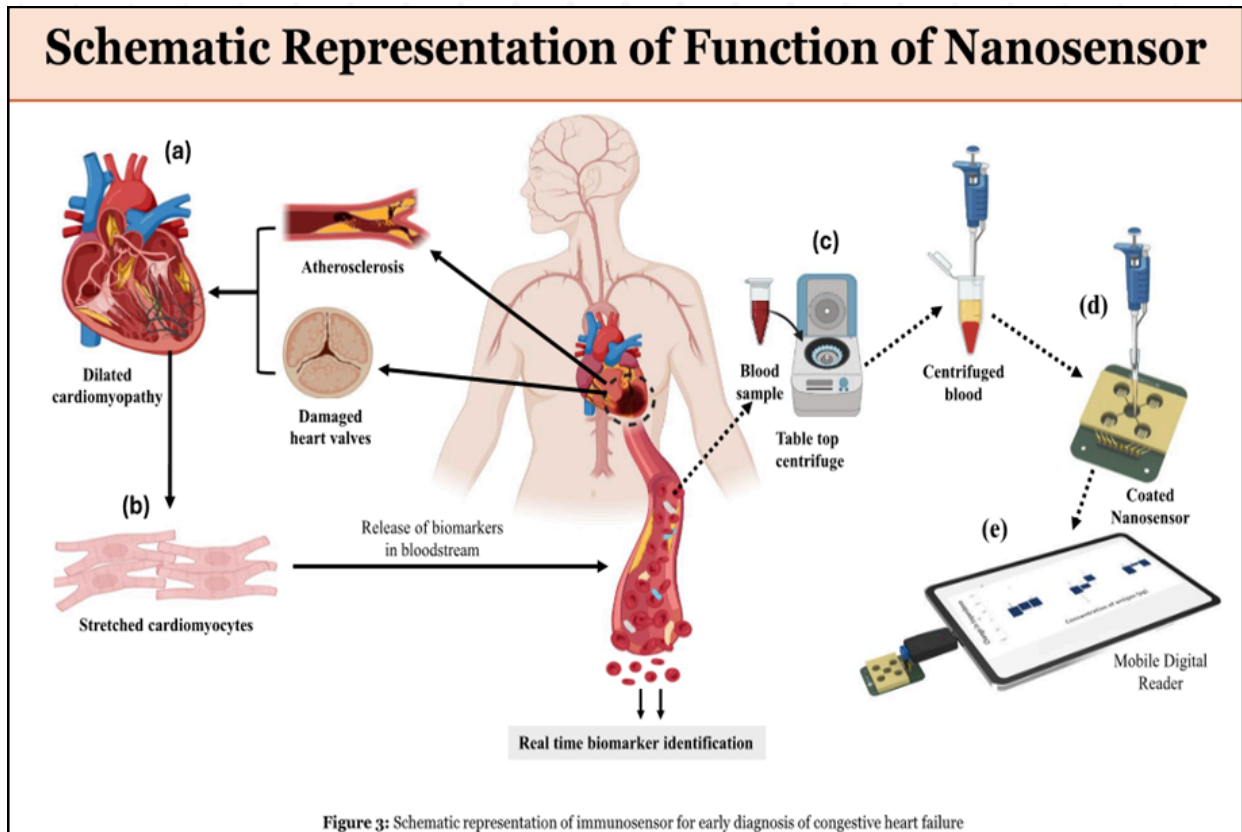


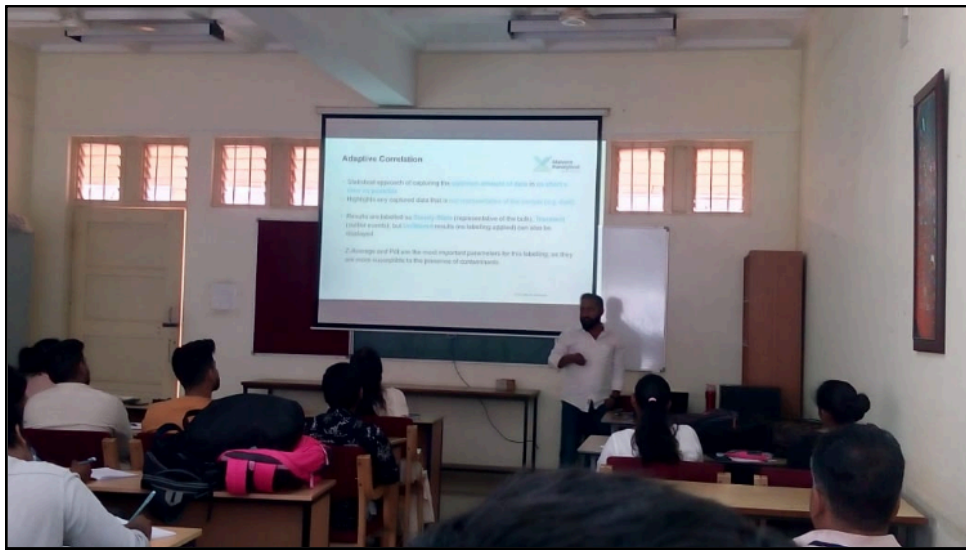
Figure 2. Schematic Representation of function of nanosensor

The above SIG is collaborative effort from Emergency medicine, IISc and Cardiology, to support the development and implementation of an impactful, interdisciplinary, translational research agenda for CHF patients. The agenda through this SIG will be to address and create an interdisciplinary leadership team; establishing mechanisms to solicit input from ED, investigators, local and national networks, and the broader scientific community; monitoring progress of CHF translational research, including the signature research project proposed in this application; and creating “centerness”

This SIG in Bionanosensors was formed to maintain a robust research infrastructure to support the translational research agenda in CVD. Through this, the aim is to improve on early diagnosis of CVDs and encourage innovation in CHF research.

Activity

The SIG has organized Special Interest Technical and Scientific Sessions: Dr. Sandeep Title: Function and Application of Zetasizer Ultra Red on Thursday 22nd December 2022 at 11am



Participant Attending special lecture on function of Zeta Sizer.



Special Talk by Dr. Arjuna, Application Specialist at Malvern, Bangalore.

Collaborative research between Division of Nanoscience, School of Life Sciences and University of Arizona, USA and University of Toledo, USA.



Group session with our collaborators

Invited talks

Dr. Asha Srinivasan, Group leader of SIG Bionanosensor was invited to give a talk at School of Pharmacy, NITTE, Mangalore.



Title of the Talk – PoC for Diagnosis.

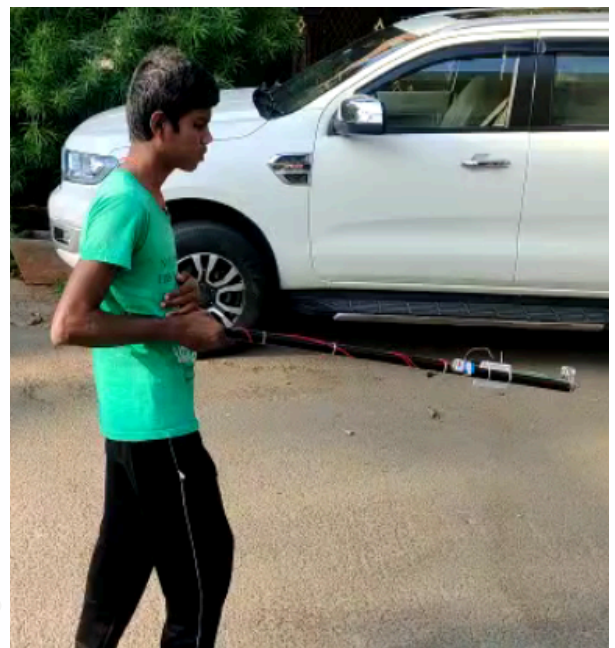
Dr. Asha Srinivasan, Group leader of SIG Bionanosensor was invited to give a talk at JSS Arts and Science College, Ooty Road, Mysuru.



Title of the talk – Nanoelectronics and their applications.



Student project on nanosensor based blind man stick



Nanosensor based blind man stick used by visually impaired person.

DST STUTI Sponsored “Science on Wheels”



MSc Nanoscience students displaying GPS and nanosensor based Geriatric stick



Bench top display of Nano plasmonic Effect during “Science on Wheels” program at Gundelpet.

Future of this SIG:

Clinical trials on the testing the bionanosensor for the CHF biomarkers in human CHF patients at JSS Emergency medicine and at department of cardiology, JSS Hospital, Mysore.