

**Details of the Project sanctioned under the Human Resource Development scheme of  
Department of Health Research**

- 1. Project Title** : Elucidating the molecular mechanism behind the role of circulating miRNAs as novel biomarkers and therapeutic targets in Type 2 diabetes mellitus using *in vivo* and *in vitro* studies
- 2. Category of fellowship** : ICMR WOMEN SCIENTIST TYPE V
- 3. PI (Name & Address)** : Dr. H.Haseena Banu  
No:30; Gandhi street  
West Mambalam, Chennai – 600 033.  
Tamil Nadu
- 4. Qualifications** : M.Sc., M.Phil., Ph.D.
- 5. Mentor or Co.PI (Name & Address)** : Dr P.Shanthi  
Professor & Head  
Department of Pathology  
Director  
Dr ALM P-G Institute of Basic Medical Sciences  
University of Madras  
Chennai -600113.
- 6. Duration of the project** : 3 years
- 7. Broad area of Research** : Diabetes Mellitus
- 7.1 Sub Area** : Type 2 Diabetes Mellitus and miRNA's

**8. Summary of the Project :**

Type 2 diabetes mellitus(T2D) is one of the most common metabolic disorders characterized by insulin resistance in the liver, muscle and adipose tissue, as well as progressive  $\beta$

cell dysfunction leading to hyperglycaemia (Taniguchi et al., 2006). The development of biomarkers for early detection of DM will help identify individuals at risk of developing DM and greatly improve the care for these individuals and reduce or delay the occurrence and severity of the disease. Recently, a new class of RNA regulatory genes known as microRNAs (miRNAs) has been found to introduce a whole new layer of gene regulation in eukaryotes. miRNAs are small, non-protein-coding RNAs that negatively regulate gene expression by promoting degradation and/or inhibiting translation of target mRNAs (Chen and Rajewsky, 2007). The emergence of miRNAs as critical metabolic regulators has added another mechanistic layer of regulation and suggests a possible role of these RNA species in the defect of the insulin sensitive tissues thereby playing crucial roles during the onset and progression of this complex metabolic disease (Dwi Setyowati Karolina et al., 2012).

Recent studies have shown the role of polyphenols, flavonoids in modulating the expression of the miRNAs under diabetic conditions (Dragan Milenkovic et al., 2012; Laura BaselgaEscudero et al., 2013). Gallic acid (GA), an endogenous plant phenol have been reported to have a role in up regulating miRNAs. Hence, the project aims to explore the role of circulating miRNAs in detecting Type 2 diabetes mellitus and the relevance of these miRNAs expression to insulin sensitive tissues. It also aims to elucidate the effect of gallic acid in modulating the expression of the specific miRNAs.

### **9. Objectives of the Proposal:**

- 1) To characterize the expression of circulating miRNAs in blood of Type 2 diabetic rats so as to highlight the potential of circulating miRNAs as biomarkers of T2D.
- 2) To understand the relevance of circulating blood miRNAs expression to those of insulin target tissues.
- 3) To identify the specific signaling pathway of the tissue specific miRNAs contributing to insulin resistance and  $\beta$  cell dysfunction.
- 4) To elucidate and unravel the role of gallic acid polyphenol in modulating these miRNAs.

### **10. Innovations in the project: (Give in about 100 words)**

The project aims to find out the relevance between circulating miRNAs with that of tissue specific miRNAs. The difference in the miRNAs expression levels in the pre diabetic and diabetic

stage will be explored. In addition the role of polyphenolic compound in modulating the expressions of these miRNAs will be elucidated.

**11. Significance of the outcome of the project:(Give in about 150 words)**

A greater understanding of the relevance of circulating miRNAs to those of insulin sensitive tissues would help to uncover the origin and/or function of circulating miRNAs. Identification of signature miRNAs in T2D and their significance in insulin signalling. And also identification specific circulating miRNAs will help to act as novel biomarkers in order to screen the patients who are at an increased risk of developing the disease at a later stage.

**12. Relevance in Public Health:**

This work will help in identification of specific circulating miRNAs to act as novel biomarkers in order to screen the patients who are at an increased risk of developing the disease at a later stage.

*H. Haseenabane*

**Signature of the Fellow /Faculty**