11th Annual Meeting of the
D&CVD EASD Study Group
10-12 June 2018 | Herzliya, Israel

Poster Board #1

Establishing Correlations between Structural and Functional Cardiac Changes and Plasma and Hemodynamicparameters in Atherosclerosis - Associated Diabetes Mellitus

Nicoleta Alexandru[1], Cristina Ana Constantinescu[2], Sabina Frunza[3], Alexandru Filippi[1], Monica Tucureanu[2], Daniela Rebleanu[2], Letitia Ciortan[2], Manuela Calin[2], Agneta Simionescu[4], Ileana Manduteanu[2], Adriana Georgescu[1]

[1]*Pathophysiology and Pharmacology Department, Institute of Cellular Biology and Pathology 'Nicolae Simionescu' of Romanian Academy, Romania*
[2]*Department Of Biopathology And Therapy Of Inflammation, Institute of Cellular Biology and Pathology 'Nicolae Simionescu' of Romanian Academy, Romania*
[3]*Internal Medicine Clinic, Emergency Clinical Hospital, Romania*
[4]*Cardiovascular Tissue Engineering and Regenerative Medicine Lab, Clemson University, USA*

Background: Aortic valve disease and especially calcific aortic valve disease is a global health burden in all aging societies.

Objective: To evaluate the early and progressive changes in plasma, hemodynamic and cardiac parameters in vivo, and to establish causal associations among them in atherosclerosis-associated diabetes mellitus.

Methods: The streptozotocin-induced diabetic apolipoprotein E-deficient mouse model maintained on a high-fat cholesterol-rich diet was used. The blood was collected at 1, 2, 4 and 8 weeks from the last streptozotocin injection. To assess the structural and functional aspects of aortic valve, aortic arch and left ventricle, echocardiography-based in vivo imaging was applied.

Results: Important increases of plasma glucose, cholesterol, LDL/HDL cholesterol, triglyceride and fetuin-A concentrations occurred just from the first week of diabetes. These caused early impairments in structure and function of: **(1) aortic valve:** thickness, calcification, increases of velocity time integral and transvalvular velocity and reduction of aortic cusp separation; **(2) aortic arch**: arterial wall thickness, greater aortic pulse wave velocity and lower distensibility; **(3) left ventricle:** shortening fraction and mass increases. Longer diet and treatment times did not induce more spectacular changes in the cardio-biochemical parameters. **Conclusion:** Our study demonstrates abnormalities of cardiac structure and function despite the short duration of diabetes, highlights the potential high cardiovascular risk occurring in diabetes and provides new possible biomarkers and targets for cardiac-valvular disease.

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Poster Board #2

Skin Impedance Spectroscopy Device for Noninvasive Diabetes Monitoring

Rok Ražman, Anton Pleteršek, Jurij Tasič, Janez Trontelj

Faculty of Electrical Engineering, University of Ljubljana, Slovenia

An Application-Specific Integrated Circuit (ASIC) for impedance spectroscopy is proposed for non-invasive bioimpedance analysis of human skin. It combines an on-board square wave generator controlled through serial peripheral interface (SPI) and an analog front-end (AFE) capable of determining the real and imaginary component of an unknown external impedance (Z_x) at each excitation frequency.

The AFE exploits synchronous detection (SD) as the technique for complex impedance measurement. A current source injects an alternating current to a pair of electrodes connected to Z_x. The measured voltage potential across Z_x is preamplified by a differential band-pass instrumentation amplifier, multiplied with a signal in-phase with the injected current and low-pass filtered to obtain a dc level corresponding to the real part of Z_x. Multiplication with a 90° shifted signal yields the imaginary part of Z_x.

A custom made Graphical User Interface has been developed to enable bidirectional communication with the ASIC using an external microprocessor as SPI-USB intermediary. The GUI allows to periodically select the excitation frequency and to sample and store response dc signals from AFE in a file.

The proposed ASIC was designed and fabricated in 0.35µm CMOS technology. The measurement results will be presented and discussed.

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Poster Board #3

The Anti-diabetic and Antioxidant Potential of Combined Inositol Hexakisphosphate and Inositol in Streptozotocin-induced type 2 diabetic Rats

Ruby Lindo[1], Shadae Foster[1], Lowell Dilworth[2], Felix Omoruyi[3]

[1]*Department of Basic Medical Sciences, The University of the West Indies, Jamaica*
[2]*Department of Pathology, The University of the West Indies, Jamaica*
[3]*Department of Life Sciences, Texas A&M University, USA*

Background: Diabetes-induced oxidative stress caused by increased levels of reactive oxygen species and reduced levels or activities of antioxidant defence systems is now identified as the quintessential reason for the development of diabetic complications.

Objective: This study examines the effects of combined inositol hexakisphosphate (IP6) and inositol supplement on liver and kidney antioxidant activities and blood glucose levels of type 2 streptozotocin-induced diabetic rats.

Methods: Thirty male Sprague-Dawley rats were divided into five groups (n = 6). High-fat diet and a single dose of intraperitoneal injection of streptozotocin (35 mg/kg body weight) were used to induce type 2 diabetes mellitus in 18 rats. The diabetic rats were randomly divided into three groups: IP6 and inositol combination (IP6+INO), glibenclamide (Glib) and diabetic control (DC). The other two non-diabetic groups were fed normal diet (NC) and high fat diet (HFC) during the initial 4 weeks. However for four weeks, the rats were fed normal diet and given their respective treatment regime. The non-fasting blood glucose level and antioxidant status were measured.

Results: Both glibenclamide and the IP6+ inositol supplement significantly reduced blood glucose concentration (282 ± 80 mg/dL and 306 ± 53 mg/dL respectively) when compared with the diabetic control group (522 ± 24 mg/dL). Kidney and hepatic catalase activities, liver superoxide dismutase activity and reduced glutathione level were significantly increased, while kidney lipid peroxidation level was significantly decreased in the diabetic rats treated with combined IP6 and inositol compared with the diabetic control.

Conclusion: Combined IP6 and inositol supplement possesses anti-diabetic properties and improves kidney and hepatic antioxidant status in type 2 diabetic rats.