AngII infusion caused two-fold increase in ROS production of WT hearts ($p<0.05$) (but not $p47^{phox}$ KO mice), which was inhibited significantly by diphenyleneiodonium (DPI, a flavoprotein inhibitor) or superoxide dismutase, significantly but slightly by NG-nitro-l-arginine methyl ester (L-NAME, a nitric oxide synthase inhibitor), but not by rotenone (mitochondrial respiratory chain inhibitor) or oxypurinol (xanthine oxidase inhibitor). Increased ROS production in WT AngII-infused hearts was accompanied by significant phosphorylation of ERK1/2. In conclusion, $p47^{phox}$ and $p47^{phox}$ signalling through ERK1/2 play an important role in AngII-induced cardiac hypertrophy.

219 GALANGIN, A DIETARY FLAVONOID REDUCES MITOCHONDRIAL DAMAGE IN STREPTOZOTOCIN-INDUCED DIABETIC RATS

Khalid S Alnumair*, Chinnadurai Veeramani, Chandramohan Govindasamy, Mohammed A Alsaif. *Department of Community Health Sciences, College of Applied Medical Sciences, King Saud University, Riyadh*

10.1136/heartjnl-2017-311726.217

Introduction Hyperglycemia-induced ROS generation within mitochondria plays a major role in the development of diabetic complications. Mitochondria are one of the most important cell organelles in diabetes research because of its crucial role as a regulator of energy balance. The present study was aimed to evaluate the effect galangin, a flavonoid, on oxidative mitochondrial damage in in streptozotocin (STZ)-induced diabetic rats.

Materials and methods Diabetes was induced by intraperitoneal administration of low dose of STZ (40 mg/kg body weight (BW)) into male albino Wistar rats. Galangin (8 mg/kg BW) or glibenclamide (600 µg/kg BW) was given orally daily once for 45 days to normal and STZ-induced diabetic rats.

Results Diabetic rats showed a significant ($p<0.05$) increase in kidney and heart mitochondrial oxidant (Thiobarbituric acid reactive substance) levels and a significant decrease in enzymatic (superoxide dismutase, glutathione peroxidase) and non-enzymatic (reduced glutathione) antioxidants levels as compared to control rats. The activities of mitochondrial enzymes such as isocitrate dehydrogenase, alpha-ketoglutarate dehydrogenase, succinate dehydrogenase, and malate dehydrogenase and mitochondrial respiratory chain enzymes such as NADH dehydrogenase and Cytochrome c-oxidase were decreased significantly ($p<0.05$) in diabetic rats as compared to control rats. Administration of galangin to diabetic rats resulted in the following findings as compared to diabetic control rats: the oxidant levels decreased significantly ($p<0.05$); the enzymatic and non-enzymatic antioxidants levels increased significantly ($p<0.05$); and the function of mitochondrial enzymes and the mitochondrial respiratory chain enzymes increased significantly ($p<0.05$).

Conclusion From the results, we conclude that galangin could maintain kidney and heart mitochondrial function in diabetic rats.

220 DAPHNIA MAGNA AS A MODEL FOR QUANTIFYING CHAOS IN CARDIAC ARRHYTHMIA

[1]Andrew M. Whiteoak*, [2]Peter E. Penson. *[1]Pharmacy and Biomolecular Sciences, Liverpool John Moores University; [2]School of Pharmacy and Bimolecular Sciences, Liverpool John Moores University*

10.1136/heartjnl-2017-311726.218

Introduction *Daphnia magna* are an established model in ecology for the investigation of toxins in freshwater systems, as well as an emerging model in medical science. *Daphnia* have a myogenic heart, exhibiting responses comparable to that of the human heart to a range of established therapeutics, and displaying varying arrhythmias on exposure to pro-arrhythmic agents. Given the multitude of mathematical methods put forward to predict arrhythmia, it is surprising as yet none are in clinical use. This study aims to rectify this issue.

Methods *D. magna* cardiac action was captured on HD film for periods of 24 s (120+ heart contractions) both prior to and following chemical induction of cardiac arrhythmia. A novel semi-automatic process gave heart area values over the full 1440 frames per film. Along with time domain data, this gave parameters for heart rate and cardiac output after parabolic peak interpolation. Data were analysed in linear terms, including ellipse fitting[1] and standard deviation of successive differences;[2] and in non-linear terms including complex correlation,[3] multi-scale ratio analysis,[4] median stepping increment[5] and finite time growth.[6]

Results Results demonstrate that non-linear analysis methods are superior to linear methods in differentiating cardiac arrhythmias from both one another and from normal rhythm. While most published methods do not differentiate arrhythmic heart conditions with significance, finite time growth, by contrast, may offer some headway toward a robust method of quantifying cardiac arrhythmia.

Implications The *Daphnia* filmatographic model presents an opportunity to examine heart action *in vivo*; offering highly accessible means of assessing both current and developing models for the prediction of arrhythmias.

REFERENCES

1. Mohebbi M, Ghassemian H. Prediction of paroxysmal atrial fibrillation based on non-linear analysis and spectrum and bispectrum features of the heart rate variability signal. *Comput Methods Programs Biomed* 2012;105(1):40–9.
2. Galland BC, Taylor BJ, B, *et al*. Heart rate variability and cardiac reflexes in small for gestational age infants. J App Physiology 2006;100(3):933–9.
3. Karmakar CK, Khandoker AH, *et al*. Complex Correlation Measure: a novel descriptor for PoincarÃƒÂ© plot. *BioMed Eng OnLine* 2009;8(17).
4. Huo C, Huang X, *et al*. A multi-scale feedback ratio analysis of heartbeat interval series in healthy vs. cardiac patients. *Med Eng Phys* 2014;36(12):1693–1698.
5. Gong Y, Lu Y, *et al*. Predict Defibrillation Outcome Using Stepping Increment of Poincare Plot for Out-of-Hospital Ventricular Fibrillation Cardiac Arrest. *BioMed Res Int* 2015;(493472):7.
6. Wessel N, Voss A, *et al*. Nonlinear analysis of complex phenomena in cardiological data. Herzschr Elektrophys 2000;11:159–173

221 ALTERED BIOPHYSICAL PROPERTIES OF THE VOLTAGE-GATED SODIUM CHANNELS IN MOUSE ATRIAL AND VENTRICULAR CARDIOMYOCYTES

Sian-Marie O'Brien*, Andrew Holmes, Geroge Parnell, Clara Apicella, Larissa Fabritz, Paulus Kirchhof, Davor Pavlovic. *The University of Birmingham*

10.1136/heartjnl-2017-311726.219

Introduction Several antiarrhythmic drugs target the cardiac sodium current I_{NA}. There is an increasing interest in atrial-