Basic Science

Chair: L Lindo and D Pepple

(O − 08)

Investigating the anti-diabetic properties of Dioscorea alata cv Renta

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Background: Diabetes mellitus is a chronic disease caused by an inherited and/or acquired deficiency in insulin production. These deficiencies result in an increase in blood glucose concentration. Present treatment involves the use of drugs to reduce hyperglycaemia, however, these drugs have severe side-effects. Consequently, there is a demand for new anti-diabetic agents that are not only effective, but also inexpensive, with less severe side-effects. Plants have been sought as a possible source and have been found to possess anti-diabetic properties, due to their diverse phytochemical content. Yam (common name used to refer to members of the genus *Dioscorea spp*) is one such plant. Yams are monocots that serve as a staple source for millions of people that live in the tropics. *Dioscorea alata* has been used in traditional Indian folklore medicine for the treatment of diabetes. Additionally, an ethanolic extract of *D alata* tuber was found to exhibit anti-diabetic activity in alloxan-diabetic rats. The aim of this project is to determine the anti-diabetic properties of Jamaican *Dioscorea alata* extracts with a view to develop a potent anti-diabetic agent.
Materials: *Dioscorea alata cv* Renta Yam tubers, distilled water, ethanol, ferric chloride, magnesium-ribbon, conc. hydrochloric acid, bismuth (III) nitrate, potassium iodide, chloroform, conc. sulphuric acid, glacial acetic acid and ammonia.
Results: Phytochemical screening of Jamaican *Dioscorea alata cv* Renta Yam detected flavonoids, saponins, alkaloids, terpenoids and cardiac glycosides in the ethanol extracts of harvested tubers.
Conclusion: Jamaican *Dioscorea alata cv* Renta Yam contains phytochemicals that have been linked with anti-diabetic properties in the literature.

(O − 09)

The effect of nicotine on growth and biofilm formation in *Pseudomonas aeruginosa*

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Objective: This study sought to determine the impact of nicotine from cigarette on the growth and biofilm formation of *Pseudomonas aeruginosa (P aeruginosa)*, a common respiratory pathogen.
Methods: Growth of *P aeruginosa* (ATCC27853) in the presence of nicotine was assessed on media supplemented with nicotine extract (made from commercially-available cigarette) or commercial nicotine (3, 6, 9 and 12 mg/mL) over an eight hour period. The ability of the bacteria to utilize nicotine as an energy source was determined on minimal media with nicotine extract incorporated. Biofilm formation in the presence and absence of nicotine was examined using the microtitre biofilm formation assay. Significant differences among growth rates and biofilm formation were determined using the Student's *t*-test, with $p \leq 0.05$ considered as significant.
Results: Growth in media containing nicotine was observed at all concentrations examined, however, when nicotine was used as the sole source of energy, growth was observed in minimal media supplemented with 6 mg/mL nicotine extract only. Bacterial growth rates in the presence of pure nicotine ($p = 0.04$) or extract ($p = 0.02$) were significant reduced compared to those not exposed. When nicotine was the sole carbon source, growth rate was similar to that of *P aeruginosa* grown on media alone ($p = 0.286$). Biofilm formation was significantly higher in bacteria utilizing nicotine for energy when compared to those unexposed ($p = 0.003$).
Conclusion: Similar growth rate of *P aeruginosa* utilising nicotine extracted from cigarette as an energy source compared to bacteria grown on media, coupled with the significant biofilm forming capacity of these strains suggest growth characteristics that could complicate treatment of a smoker with *P aeruginosa* infection.

(O − 10)

The significant inhibitory impact exhibited by dibenzyl trisulfide and extracts of *Petiveria alliacea* on the activities of drug metabolizing cytochrome P450 enzymes and the implications for potential medicinal plant-drug interactions

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Background: In this study, *Petiveria alliacea* (Guinea Hen Weed, GHW) and one of its phytochemicals, dibenzyl trisulfide (DTS) were assessed against major drug metabolizing enzymes, cytochrome P450 (CYP) enzymes, which are known to metabolize over 50% of all clinically used drugs. Inhibition of CYP enzymes carries a significant risk of interference in drug metabolism.
Materials: A fluorescence-based assay was performed to determine the impact (IC_{50}) and nature of inhibition of various GHW extracts (water, 65% ethanolic and 96.5% ethanolic extracts) and DTS on CYP enzyme activities *in vitro*.
Results: The 96.5% ethanolic extract potently inhibited all enzymes successfully screened (CYPs 1A2, 2C19 and 3A4), while the 65% ethanolic and water extracts showed moderate to weak inhibition against the CYP enzymes successfully screened. This is indicative of a proportional relationship between DTS content and CYP inhibition. Dibenzyl trisulfide itself most potently inhibited CYP1A2 with an IC_{50} of 1.9 µM and appears to be an irreversible inhibitor.
Conclusion: The data generated highlights that DTS significantly inhibits the activities of key CYP drug metabolizing enzymes *in vitro* and implies that the amount of DTS present in GHW extracts affects the inhibitory potency of the extracts against these enzyme activities *in vitro*. This information is useful in the clinical setting by helping healthcare providers to assess risks for potential medicinal plant-drug interactions for GHW.

(O − 11)

Hexane extract of *Salvia serotina* (chicken weed) displays the hypoglycaemic role in normal Sprague-Dawley rats

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Objective: To determine the hypoglycaemic effect of *Salvia serotina* (Chicken Weed) in normal Sprague-Dawley rats.

Method: Crude hexane extract of *Salvia serotina* was previously found to have hypoglycaemic activity in normal Sprague-Dawley rats using the oral glucose tolerance test (OGTT), n = 6. For the oral glucose tolerance test (OGTT), fasting blood glucose readings were taken and the sample was administered intravenously in 0.3 mL dimethyl sulfoxide (DMSO). Blood glucose readings were taken at 30 and 60 minutes. Immediately following, a glucose load of 1.75 g/kg BW was given orally and blood glucose readings were taken for an additional 2½ hours at 30-minute intervals. Fractionation of the active extract was done using flash column chromatography to obtain five fractions (TBHeFR1-5). Further purification gave two active fractions, TBHeFR3C and TBHeFR5II which both showed hypoglycaemic activity during the OGTT. Spectrochemical analysis was carried out using Carbon-13 and proton nuclear magnetic resonance (^{13}C-NMR and ^{1}H-NMR) as well as infrared (IR) spectroscopy to elucidate the active hypoglycaemic compounds.
Results: Fraction TBHeFR5II caused significant reduction in blood glucose concentration at the 30 minutes (4.62 ± 0.15 mM *vs* 5.04 ± 0.15 mM), 60 minutes (3.92 ± 0.14 mM *vs* 4.70 ± 0.17 mM), 120 minutes (5.22 ± 0.22 mM *vs* 5.50 ± 0.11 mM) and 150 minutes (4.52 ± 0.24 mM *vs* 5.08 ± 0.17 mM) intervals when compared with the DMSO control with $p = 0.03$, $p = 0.0002$, $p = 0.02$ and $p = 0.02$, respectively. Fraction TBHeFR3C showed hypoglycaemic activity at the 60 minutes ($p = 0.02$) and 120 minutes ($p = 0.004$) intervals.
Conclusion: *Salvia serotina* showed hypoglycaemic activity in normal healthy rats. ^{13}C-NMR, ^{1}H-NMR and IR spectroscopy revealed one of the principles as a sterol. Complete purification of the active fractions is necessary in order to elucidate the structures of the hypoglycaemic principles.

(O − 12)

An investigation of the association of blood cadmium concentration with blood pressure measurements (systolic and diastolic) and hypertension status of residents in the parishes of Kingston and St Andrew

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Background: The cadmium burden in Jamaican soil is exceptionally high. Cadmium has been found to induce hypertension in animal models but in humans, the results have been inconsistent.
Objectives: 1. Quantifying associations of systolic and diastolic blood pressures with blood levels of cadmium in persons living in Kingston and St Andrew. 2. Quantifying distribution of hypertension by gender, age, body mass index (BMI) and other lifestyle categories 3. Determining

the association of dietary patterns with blood cadmium concentration.

Methodology: A cross-sectional study was conducted with 287 persons residing in the parishes of Kingston and St Andrew. Demographic and lifestyle data were captured using closed-ended questionnaires. Systolic and diastolic blood pressure levels were measured using standardized protocol and blood cadmium concentration was measured by atomic absorption spectroscopy.

Results: More than half of the respondents (58.5%) were hypertensive, with the majority being females (65.5%). There was a statistically significant relationship between hypertension status and age, X^2 (3, n = 287) = 51.98, p = 0.001) and hypertension status and BMI (p = 0.008). There was a positive yet small correlation between blood cadmium concentration and blood pressure measurements (systolic and diastolic). However, after multi-variable adjustments, there was no association between blood cadmium concentration and blood pressure measures. Logistic regression analysis indicated that for every, one unit increase in blood cadmium concentration the odds of respondents being hypertensive increases by a factor of 1.035 (95% CI: 0.975, 1.099) unadjusted and 1.014 (95% CI: 0.951, 1.808) adjusted. No association was found between dietary patterns and blood cadmium concentration.

Conclusion: No association was found between blood cadmium concentration and blood pressure measurements (systolic and diastolic measurements) and blood cadmium concentration and dietary patterns. However, a positive association was found between hypertension prevalence and blood cadmium concentration. Further studies with increased sample size will be required to improve the statistical significance among the variables of interest.

(O − 13)

Cannabis withdrawal lowers sleep efficiency and motor activity in schizophrenia patients prescribed risperidone

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Objectives: To assess the impact of *Cannabis* usage on sleep symptoms and motor activity in schizophrenia patients treated with risperidone.

Methods: Male patients, ≥ 18 years, admitted to the University Hospital of the West Indies psychiatric ward between; October 2015 to July 2016 and diagnosed with schizophrenia were recruited for the study. Patients were prescribed risperidone by clinicians for two weeks and classified as *Cannabis* users (CUs) if *Cannabis* was used within 30 days of admission. After one week of admission, patients wore the Actiwatch-2 device on the non-dominant wrist, which consistently measured sleep and motor activity for seven consecutive days and nights. Inferential statistical analysis involved non-parametric tests using median (and IQR) with $p < 0.05$ considered significant.

Results: Twenty-five patients were assessed, median age = 30 (19) years. Majority (17; 67%) were CUs displaying a significantly longer sleep onset latency [16.11(13.91) *vs* 6.52(7.36) minutes; p = 0.001], spent a longer time in bed [656.41(164.43) *vs* 494.9(113.7) minutes; p = 0.010] but spent shorter durations asleep [406.75(73.81) *vs* 531.15(120.7) minutes; p = 0.013), as compared to *Cannabis* non-users (non-CUs). *Cannabis* users had lower activity counts [127521.03(102735.1) *vs* 152232.31 (86006.43); p = 0.038] and longer periods of immobility [320.46(127.25) *vs* 220.39(191.64); p = 0.045] during wake periods but higher activity counts [17565.6(16530.44) *vs* 8500.77(7014); p = 0.006] during sleep periods. Additionally, CUs experienced more frequent awakenings [38.79(23.72) *vs* 22.39(6.62); p = 0.012] for longer periods [80.89(53.15) *vs* 43.61(19.63) minutes; p = 0.035]. This resulted in an overall poorer sleep efficiency percentage [85.74(7.11) *vs* 91.5(2.98); p = 0.013] when compared to non-CUs.

Conclusion: Preliminary findings suggests that *Cannabis* withdrawal lowers sleep efficiency and motor activity in schizophrenia patients during treatment with risperidone.