

College of Natural & Applied Sciences

- (O) *Cyanide Reduction in Cassava Breads: Particle Size Effects*
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This paper presents a method for detoxifying the bitter cassava during its conversion to cassava bread. Freshly chopped bitter cassava was separated into three particle sizes: 1-2, 0.5-1.0, and <0.5 mm and treated as follows before cooking: (1) water-soaked 5 for hours (2) air-dried (3) air-dried and water-soaked. Each of the above samples was thereafter either pressed for 24 hours or un-pressed, then baked. Levels of cyanide were determined by spectrophotometric analysis with light absorbance at 510 nm following extraction by elution of cyanide vapour condensate on picric acid-impregnated paper in 5 ml of water.

Cyanide gas levels decreased to a greater degree before than after baking. The most effective single factor was particle size. After treatment, the <0.5 mm particles contained 250% less than the 1-2mm particles and 55% less than the 0.5-1.0 mm particles. The decrease in cyanide from the smaller particles was attributed to the exposure of a greater number of cells to catalysis of linamarin cyanohydrins by linamarase. The rise in cyanide levels after baking, which was greater with an increase in particle size, was attributed to, firstly, the denaturing of the cell walls by strong heat. This process allowed the water subsequently added for the duration of 16 hours to complete the break-down of cell walls thereby releasing extra cyanide. The larger particles exhibited greater cyanide release after baking because they contained a greater number of unbroken cells just prior to the baking process.

- (P) *The Effect of Allium Sativum (Garlic) and Hibiscus Sabdariffa*
(Jamaican sorrel) on Cancer Cells

Paul Gyles, Juliet Bailey-Penrod and Patrice Williams-Gordon

This study demonstrates that two natural products can destroy human larynx (hep-2) and lung (A549) cancer cells while having negligible effects on non- cancerous cells (BHK). Viability studies indicated that garlic had a greater anti-neoplastic effect on lung cancer cells than the sorrel extract. DNA electrophoresis showed a unique band of 0.5 kb in cancer cell lines. Events characteristic of cell death including: cell fragmentation, cytoplasmic shrinkage and chromatin condensation were observed. The morphological changes observed in laryngeal cancer cells were more remarkable when treated with sorrel extracts as compared with garlic, thereby suggesting that the mechanisms associated with each treatment modality is cell-type specific. Hep-2 cells proved to be significantly affected by both sorrel extracts (seed and calyx) but more by that of the seed extracts. The fact that Hep-2 cells were destroyed indicates that the natural products (more so the seed extract) has overridden the resistance capacity of the Bcl-2 gene. The A549 cell line also displayed an anti-neoplastic response to all three natural products, with greatest response to the garlic extract followed by the seed extract. These observed differences in degree and format of morphological change suggest that the mechanism of the natural product extract may vary both with cell line and extract treatment. Further investigation will be needed to understand the mechanism by which cancer cells are affected by natural products.

(P) *Prevention of Benign Prostatic Hyperplasia: Effects of Pumpkin and Watermelon Seeds on the Testosterone-Induced Serum Levels of Prostate-Specific Antigen in Rats*

Hugh Saunders, Miguel Francis and Samson Omoregie

The effects of pumpkin and watermelon seeds on the testosterone-induced serum levels of prostate-specific antigen (PSA) were studied in male rats. Sprague-Dawley rats were divided into four groups. An aliquot of 3 mg testosterone/100 g body weight per day was administered to all rats for 21 days, except those of Group A (which served as the control group). Rats in Groups B and C were fed with pumpkin and watermelon seeds respectively for the 21-day period of study while those in group D were fed with Hi-Pro feed. PSA analyses were conducted on the serum of all rats on a weekly basis for the three weeks. Rats in group D responded to the testosterone induction, increasing steadily for the three weeks period to a peak serum PSA level of 32.2 ± 3.7 $\mu\text{g/L}$ in the third week of the study. Serum PSA levels of rats in groups B and C were 2.63 ± 0.47 $\mu\text{g/L}$ and 2.45 ± 0.27 $\mu\text{g/L}$ respectively in comparison to the control group which came to 0.48 ± 0.24 $\mu\text{g/L}$ in the same period. ANOVA analysis of the samples indicated no significant difference between control group and test groups fed pumpkin and watermelon seeds. These rats maintained levels of PSA that indicated that their prostate remained normal and should not be at risk of developing hyperplasia. However, the serum PSA levels in rats fed Hi-Pro feed were significantly high from week 1 to week 3 rising far beyond levels that could be implicative of prostatic hyperplasia. The results suggest that pumpkin and watermelon seeds could possibly prevent increase in serum PSA levels to dangerous levels that could have pointed to development of prostatic hyperplasia. Further studies on the long-term effects of feeding rats with these and other seeds in the same family are following.

(P) *The Emergence of Cloud Computing: An Exploration of this Transformative Distributed Model, its Characteristics and Potential Impact*

Kenrie Hylton

Over the years, there has been an evolution of software development and distribution, with dynamic shifts in where software processing takes place and various derivatives of the foundational client server model. More recently, there has been an ushering in the era of distributed computing on a grand scale. There are now a number of models whereby processing is distributed across multiple clients or servers. These distributed architectures include Grid computing, Peer to Peer (P2P), and one of the latest – Cloud computing which includes data and technology based services being hosted and deployed via the Internet. Small and medium sized businesses stand to benefit from this new platform by allowing them save considerable amount of money on infrastructure by utilizing cloud based services.

Cloud Computing is indeed changing the way businesses structure their technology model. It is also promoting ubiquitous computing where an individual can have access to their data regardless of the medium. As a relatively new concept, cloud computing is garnering quite a bit of attention especially with major industry leaders such as Google, IBM and Microsoft supporting the architecture. This paper seeks to explore this evolution and provide a brief

history, the characteristics and potential impact of this transformative platform on the information technology sector, as well as on facilitating the creation and growth of new and nascent businesses.

(P) *Evaluation of an Artificial Intelligent Integrated Renewable Energy System for Electricity Generation in Equatorial Developing Countries*

Delroy E. Green

Solar, Wind and Bio-fuels electrical technologies are generating an increasing interest as alternative forms of energy in developed countries. Developing countries, for example, regions such as the Caribbean and the African continent, are slowly catching on; especially regions where the solar indices and wind energy are very high and there is readily available bio-fuel producing plants and wastes. The consideration of moving industrial production to these regions requires the need for cheaper, cleaner and more efficient energy. However, the cost of these technologies is currently very high not being economically viable to produce and implement. New innovations, by way of aggressive research and development, are well needed to improve technology and reduce production and implementation costs. There can be multiple benefits – environmental (alleviation of carbon pollution); economic (reduction in tax/levies); and increased productivity. These countries can efficiently trade under the emission trading scheme and effect good environmental impact and reduce costs and dependency on fossil fuels. This study will examine the combination of renewable energy sources for electricity generation at local levels and in particular the case of equatorial regions such as Jamaica in the Caribbean. A computer model will be developed for the simulation of the operation of the integrated system. The energy supply side will include two renewable energy sources, namely wind and solar in comparison to the conventional high cost electricity supplied by the National Grid (JPS Co Ltd.) The model is an Artificial Intelligence electronic control system that monitors the most efficient combination of renewable electricity. Relations among the variables will be attained from the fusion AFS-600 Mixed Signal FPGA, which will be used as the controller of the system with an ARM7 soft processor core support. Solar will be a balancing factor in the supply-demand interaction because of its large availability and its high cost of production. Conclusions will be drawn on (a) the optimal combination of renewable energy sources to achieve economic viability of the system; and (b) evaluation of energy policy.

(P) *Effects of Phytic Acid and Exercise on some Blood Analytes in Rats Orally Exposed to Cadmium*

Tasha Daley, Samson Omoregie, Vincent Wright and Felix Omoruyi

Cadmium is a ubiquitous environmental pollutant of increasing worldwide concern. The uptake of this element is mainly through ingestion of food crops grown on cadmium containing soil. Cadmium is a well-known human carcinogen and a potent nephrotoxin. Phytic acid is a storage form of phosphorus which is found in significant quantities in plant seeds, roots and tubers and has been shown to be high in some food crops grown in Jamaica. The anti-nutrient property of phytic acid is based on its strong ability to chelate multivalent metal ions, including cadmium, precipitate and decrease the availability of these minerals as a result of the formation of very insoluble salts that are poorly absorbed from the gut. In this study, we determined the effects of phytic acid and exercise on the metabolism of cadmium in rats.

Five groups of rats were fed as follows: Group 1 was fed control diet, group 2 was fed control diet supplemented with cadmium and subjected to exercise, group 3 was fed control diet supplemented with phytic acid plus cadmium and subjected to exercise. Group 4 was fed control diet supplemented with cadmium and phytic acid and group 5 was fed control diet supplemented with cadmium. The animals were fed for four weeks and then sacrificed. Blood samples were collected for some cardiac markers, electrolytes, liver enzymes, lipid profile and some renal function evaluation.

The group that was fed control diet supplemented with cadmium displayed increased electrolytes, liver enzymes and cardiac markers compared to other test groups. Similarly, blood urea nitrogen, uric acid and phosphate were increased in group 5 rats compared to other test groups. Increased alkaline phosphatase activity was observed in group 2 rats while amylase activity increased in groups 2 and 4 rats compared to other test groups. These observations suggest that consumption of diet high in phytic acid with increased exercise may be protective against the adverse effects of cadmium.