

**LETTERS TO THE MJM****AND THE WINNERS ARE...**

In our true scholarly spirit, the MJM remains committed to supporting budding scientist at all stages of their careers. This year we are pleased to provide you with a unique collection of abstracts outlining the high caliber projects that were undertaken by the most recent winners of the 27th annual Montreal Regional Science and Technology Fair (MRSTF) that was held at Marianopolis College from March 22-24th 2009. This unique event not only invites hundreds of students from greater Montreal area high schools and CEGEPs to present their projects to their peers, but also permits them with a unique opportunity to interact with leading researchers and university professors from top academic institutions. By supporting such initiatives the MJM hopes to further encourage young scientists and engineers to pursue their interests in the sciences so that they may excel and can become tomorrow's leaders.

**Deletion of 25-Hydroxyvitamin D-24-Hydroxylase Gene Restores Normal Skeletal Growth in Hyp Mice**

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X-linked hypophosphatemic rickets (XLH) is characterized by hypophosphatemia, and inappropriately low-normal serum concentration of 1,25-dihydroxyvitamin D<sub>3</sub> [1,25(OH)<sub>2</sub>D<sub>3</sub>] levels. Much of our understanding of XLH came from the murine homolog, the Hyp mouse. The 25-hydroxyvitamin D-24-hydroxylase enzyme (CYP24) is responsible for the catabolic breakdown of 1,25(OH)<sub>2</sub>D<sub>3</sub>. In this study, we sought to investigate the contribution of Cyp24 to the deranged vitamin D metabolism observed in Hyp mice. We bred male Hyp mice with female Cyp24 +/- mice to generate obligate heterozygotes in female mice, and then crossed female Cyp24 +/- Hyp mice (Phex+/-) with male Cyp24 +/- mice to obtain male Cyp24 -/- Hyp mice. Mice were sacrificed around 50 days post partum and serum and tissues were procured for analysis and comparison to controls. Genotyping of live animals around the time of weaning demonstrated that 75% of the double mutant

animals died by 7 weeks of age. Serum calcium level in these animals was similar to that of the three control groups while serum inorganic phosphorous was as low as that in Hyp littermates. Serum parathyroid hormone (PTH) and 1,25(OH)<sub>2</sub>D<sub>3</sub> levels were decreased similar to those in the Cyp24-/- littermates while on the other hand, circulating serum FGF23 levels and serum alkaline phosphatase activity were higher than in Hyp littermates. Importantly, ablation of Cyp24 restored the skeletal abnormalities associated with Hyp. These findings support the contention that the enzymatic activity of Cyp24 partakes in the pathogenetic mechanism of Hyp resulting in the profound rachitic alterations observed in these mice. Further research is currently underway to examine the effect of CYP24 on PTH regulation in vitro.

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**Cracking Cancer with CRK**

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Studies have shown that Crk is overexpressed in many breast cancers and is responsible for several key signalling events. As such, the effects of Crk knockdown in breast tumour cells warrants further analysis. This project studied the outcomes of Crk knockdown in MDA-MB-231 human breast adenocarcinoma cell line on cellular adhesion, morphology and intracellular signalling. This was accomplished by establishing cultured cell groups which consisted of tumour cells infected with vesicular stomatitis viruses (VSV) containing a small hairpin RNA (shRNA) against Crk (knockdown), and a control group infected with the empty pSup vector. The cell groups were compared in terms of their efficiency in matrix-binding in adhesion assays on collagen, fibronectin and glass in time intervals of 20, 40 and 60 minutes in duplicates a number of times. Later, immunofluorescence staining, assessed by confocal microscopy, was carried out to identify changes in cellular morphology and immunoblotting was

performed to monitor levels of phosphorylated-TYR in the cell groups. In conclusion, the shRNA- Crk resulted in the significant reduction of cell adhesion and migration and lead to dramatic cytoskeletal rearrangements. Variations in levels of Cas and FAK protein binding interactions were also identified. Further, understanding these protein interactions will help us derive safer anti-cancer treatments and identify potential anti-metastatic therapeutic targets.

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### **The Green Machine**

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The purpose of the project was to design a composter that will create humus in two weeks instead of the usual two years. This design will reduce waste going to landfills, therefore reducing the pollution entering the atmosphere and surface waters.

The Green Machine consists of an outer box made of plywood which acts as a shell to both chambers, an air filter and the electric devices. This composter was built in six general steps: the assembly of the upper mixing

chamber; construction of an outer box; building of an air filter; assembly of an inside of the box; doors and the electric devices. Decomposition begins within the upper mixing chamber, with the help of microorganisms, during the first nine days. The curing process then continues in the lower chamber for the remaining five days.

The Green Machine was a success for it created organic soil in fourteen days. The air filter was effective and there was sufficient microbial activity. The pH, the moisture and the temperature were in the appropriate range during the thermophilic and mesophilic decomposition.

This composter is a major improvement upon traditional composting techniques. It is simple to build, effortless to use, convenient and has both financial and environmental benefits. This composter is economical since it produces organic soil for the garden; therefore, eliminating the need to buy soil. On a larger scale, if organic wastes are no longer being sent to landfills, less garbage will be put out weekly, thereby reducing the amount of workers needed.

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