Association of Faculties of Pharmacy of Canada
Poster Presentations

Posters – Friday, June 5, 2009

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Pharmacy Practice Research

PPR-1 Sun Protection Behaviors Among Outdoor Recreation Workers in Nova Scotia

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Objective: Although skin cancer is the most common cancer in Canada (Canadian Cancer Society, 2008), preventative behaviors and regular screening can dramatically reduce the prevalence and severity of this disease. Based on this reality, the objective of this research was to assess the knowledge, attitudes, and sun protection behaviors among Nova Scotia outdoor recreation workers and highlight educational opportunities for pharmacists that assist young workers. **Method**: Using a Theory of Planned Behavior (Ajzen, 1991) framework, and previously validated surveys, we developed a questionnaire that assessed informational sources about risk factors, attitudes toward sun protection and sun exposure, normative influences (e.g., my fellow lifeguards use sunscreen at work), perceived behavioral control, and intention to use sunscreen. **Results**: Seventy-one of 232 outdoor recreation workers responded to the survey. The age range was from 14 to 33 (M = 19.5). Occupations included lifeguards (62%), sailing instructors (17%), and tennis instructors (12%). Forty-five percent of respondents reported applying sunscreen only when it was sunny outside, very few (10%) of respondents examined their entire body for skin cancer, and a health care professional had never checked 82% for skin cancer. Sun protection behaviors frequently performed while at work included 90% wearing sunglasses, 34% wearing lip balm, and 19% staying in the shade. The majority of sunscreen users (56%) wore a sunscreen with an SPF of 30 -59. SPF was a significant predictor of intention to use sunscreen while at work $R^2 = .166$, $p < .001$ with individuals that use higher SPF being more likely to intend to use sunscreen on a regular basis. We also identified barriers to sunscreen use. **Conclusion**: Our study provided information on specific sun protection behaviors; including rationale for behaviors that were performed inadequately. Pharmacists can use this knowledge as they participate in sun-safety lessons and campaigns, develop and provide educational brochures, assist in sunscreen selection, and provide reminders at the point of purchase.

PPR-2 Self-monitoring of Blood Glucose: The Pharmacist's Perspective

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Introduction: Evidence to support the use of regular self-monitoring of blood glucose (SMBG) for adults with type 2 diabetes not using insulin is limited. Despite this, Nova Scotia Pharmacare spends over $6 million/year for SMBG test strips. This study examined health professionals' recommendations for and perceived value of SMBG for adults with type 2 diabetes who are not using insulin and have A1C values ≤ 7 units. **Methods**: One to one interviews were conducted with family physicians, diabetes educators and community pharmacists. Pharmacists were asked about their SMBG recommendations, advice given to patients about abnormal results, trusted sources of information, provision of education for SMBG and their role in patients' selection of SMBG devices. Interviews were audiotaped by permission and participants were provided with an opportunity to review their transcripts for accuracy. All project investigators read the transcripts and contributed to the thematic analysis. **Results**: Seven of the twenty-one health professionals interviewed were pharmacists. Pharmacists recommended SMBG testing ranging from less than once per day up to 4 times a day. SMBG was recommended to provide patient feedback on the effects of diet, when starting new medications, during illness and at other specified times. Pharmacists discussed their role in selecting and providing instruction on SMBG devices, having clinics with nurses and other roles. Trusted sources of information included guidelines from the Canadian and American Diabetes Associations, Therapeutic Choices, MD Consult, research literature and employer newsletters. **Conclusion**: Pharmacists varied in their SMBG recommendations which could be partly due to the lack of clear evidence to support the practice. Further work is needed to determine how pharmacists'

recommendations compare with other health professionals, the role of pharmacists in SMBG and the effect of SMBG practice on patient outcomes.

PPR-3 Benzodiazepine use in Prescription Monitoring Programs: A Review of the Literature

Judith Fisher[1]; Chiranjeev Sanyal[1]; Dawn Frail[2]; and *Ingrid Sketris*[1]
[1]College of Pharmacy, Dalhousie University; and [2]Department of Health (NS), Halifax, NS.

Objective: Benzodiazepines are widely used to treat insomnia and anxiety. However, concern has been expressed regarding the over-prescription of these agents, and their potential for misuse and abuse. The purpose of this study was to review the extant literature examining the impact of adding benzodiazepines to a Prescription Monitoring Program (PMP). **Method**: Studies published in English between January 1, 1980 and February 1, 2009 were identified by searching PubMed, EMBASE and Web of Science using search terms: benzodiazepines; triplicate prescription program; prescription monitoring program; triplicate prescribing; and triplicate prescription policy. The identified articles were reviewed for relevance. Additional papers were identified from references cited in these articles. **Results**: This search strategy identified 18 relevant papers, representing 15 unique studies. All of these articles addressed the impact of adding benzodiazepines to a PMP in New York State in 1989. All studies were retrospective and compared prevalence of benzodiazepine prescribing before and after implementation. Two studies included data from New Jersey, a neighbouring state with no benzodiazepine monitoring program, for the same period. Each study demonstrated an overall decrease in prevalence of benzodiazepine prescribing in the period following implementation of the PMP. However, the findings suggested that decline in use was not consistent across population groups. For example, in one study, the greatest decline was among those with seizure disorders. The findings of three studies demonstrated an increase in the prevalence of non-benzodiazepine sedative-hypnotic use corresponding to the decline in benzodiazepine use. There were no published studies that examined benzodiazepine use after the mid-1990s. **Conclusions**: Taken together, the reviewed studies support the contention that adding benzodiazepines to a PMP decreases overall use of these medications. The findings also suggest that implementation of such a program may have unintended consequences that may differentially impact certain populations. Further research is warranted to better understand the relative costs and benefits, in particular in the long-term.

Basic Science Research Posters

BSR-1 Tumor Apoptosis after STAT3 Knockdown by Nano-sized siRNA Complexes

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Objective: Hyperactive signal transducer and activator of transcription 3 (STAT3) has been shown to impart several oncogenic properties in many solid and blood tumors. In this study, we investigated the potential of polyethylenimine (PEI) modified with stearic acid (StA) to deliver siRNA in order to achieve STAT3 downregulation in B16 murine melanoma cells. **Methods**: B16 cells were targeted with a dose range of siRNA complexes (6.25 to 200 nM) for 36 h and STAT3 was detected by Western blot. Concomitantly, levels of IL-6 and VEGF were determined by ELISA, while tumor cell death was assessed by the MTT assay. Caspase 3 activity was measured as an indicator of apoptosis after treatment of B16 with 50 nM siRNA. **Results:** Our results showed that PEI-StA complexes to have higher association with B16 cells and higher potency of STAT3 silencing as compared to PEI complexes. STAT3 knockdown was accompanied by a significant induction of IL-6 secretion and a reduction of VEGF secretion. Moreover, with PEI-StA, Caspase 3 activity in B16 was found to be 2.5 times higher than that of PEI complexes. Consistently, the calculated LD_{50} of PEI-StA complexes was 60% lower than that for the PEI complexes. In contrast, there was no noticeable cytotoxicity with up to 200 nM complexes of scrambled siRNA using both polymers. When 50 nM of siRNA complexes was given on a daily basis to B16 cells, cancer cell viability was dramatically reduced after the third dose with PEI-StA complexes

reaching only 10% compared to 90% viability observed with PEI complexes at the same dosing period. **Conclusions**: Taken together, we suggest that STAT3 is essential for cancer cell survival and downregulation of STAT3 by siRNA provides a potential therapeutic strategy for cancer treatment. Moreover, chemical attachment of StA to PEI backbone enhances siRNA silencing. CIHR is acknowledged for funding this project.
†Dedicated to the memory of Dr. John Samuel, who initiated a research program encompassing the present study.

BSR-2 A Randomized, Double-blinded, Placebo-controlled Study Evaluating the Efficacy and Safety of Nabilone as an Adjunctive to Gabapentin in Managing Multiple Sclerosis-induced Neuropathic Pain: An Interim Analysis.

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Aims: To determine if nabilone is effective in alleviating symptoms associated with multiple sclerosis (MS) - induced neuropathic pain (NPP) when used as adjunctive treatment to gabapentin. **Methods:** A randomized, double-blind, parallel, placebo-controlled study involving 25 patients diagnosed with MS-induced NPP was initiated using nabilone as an adjunctive therapy to gabapentin. Eligible participants previously stabilized on ≥1800mg/day of gabapentin received an oral upward titration of nabilone or matched placebo over 4 weeks, to a target dose of 1 mg twice daily which they continued for 5 additional weeks. Baseline pain evaluations *prior* to nabilone initiation were comparatively assessed to those at weeks 4 and 9 *post-*nabilone treatment. Outcome measures include the visual analogue scale (VAS), the Short-Form McGill Pain Questionnaire, Short-Form 36 Health Survey, and the Patient-Rated Global Impression of Change. **Results:** Nabilone treatment resulted in an average VAS point reduction of -4.25 at target dose. An average of 2.75 adverse events were noted in the nabilone group. Dizziness & dry mouth were the most frequently reported (75%), followed by drowsiness (50%) and nausea (25%). No patients discontinued treatment due to adverse events. **Conclusion:** Interim results suggest nabilone as an effective, tolerable adjunctive treatment for MS-induced NPP.

BSR-3 Molecular Mechanism of Neuroprotection Mediated by Immunophilin Ligands.

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Objective: The immunosuppressive agents cyclosporin A and FK-506 have been shown to exhibit neurotrophic and neuroprotective properties *in vivo*. Given that significant clinical expertise exists for both drugs, they represent an attractive starting point for treatment of acute neural injuries. One putative mechanism for neuroprotection relates to calcineurin inhibition. However each drug-immunophilin complex can potentially influence additional signal transduction pathways. Furthermore, several nonimmunosuppressive immunophilin ligands were proposed to possess neuroprotective properties, suggesting that neuroprotection may be separable from calcineurin inhibition. In the present study, we examined the mechanism of this neuroprotection in facial motor neurons following axotomy-induced injury. **Methods:** Facial nerve axotomy was utilized as a model of acute motor neuron injury. We first recapitulated the neuroprotective properties of immunophilin ligands using this model. To examine the mechanism responsible for neuroprotection by these agents, pharmacologic inhibitors of several potential alternate signaling pathways (17-AAG, rapamycin, cypermethrin) were evaluated for their neuroprotective potentials. **Results:** Similar to previous studies in rat, cyclosporin A and FK-506 enhanced motor neuron survival in mice following acute injury. Of the pharmacologic inhibitors examined, only cypermethrin, a direct calcineurin inhibitor not previously associated with neuronal survival properties, was observed to significantly enhance motor neuron survival. We further demonstrated that inhibition of calcineurin functionally alters PCD signaling by maintaining the phosphorylation status of Bcl-2 family protein Bad. **Conclusions:** The results demonstrate for the first time that direct inhibition of calcineurin is neuroprotective *in vivo*. Altogether, these data support a model in which calcineurin inhibition promotes neuronal survival, distinct from effects upon neurite outgrowth.

BSR-4 The Role of CMKLR1 in the Differentiation and Function of C2C12 Myoblasts

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Introduction and Objective: White adipose tissue (WAT) plays a key role in the regulation of energy balance through energy storage/mobilization and the secretion of biologically active factors called adipokines (e.g. leptin and adiponectin). Adipokines function through a combination of autocrine and paracrine actions in fat and endocrine actions within the brain, liver and skeletal muscle to regulate insulin sensitivity, blood glucose and lipid levels, feeding and satiety. We identified a novel adipokine chemerin, which regulates the differentiation and metabolic function of adipocytes via signaling through the chemokine like receptor 1 (CMKLR1). We recently discovered that *CMKLR1* is expressed in mouse skeletal muscle but the function of the receptor in this tissue is unknown. The objective of the present study was to determine if chemerin signaling through CMKLR1 affects the differentiation and metabolic function of skeletal muscle precursor cells (myoblasts). **Methods and Results:** In the present study we show that *CMKLR1* mRNA is expressed in mouse skeletal muscle. In C2C12 mouse myoblasts, the expression of *CMKLR1* increases 3-fold with the differentiation of those cells into multinucleated myotubules. Consistent with the mRNA expression, immunodetectable CMKLR1 is present in the myotubules. Abolishing *CMKLR1* expression using adenoviral-delivered shRNA impairs the differentiation of C2C12 myoblasts into mature myotubules as determined by microscopic analysis of phalloidin-stained cells. The impairment of myogenesis by CMKLR1 knockdown involves the inhibition of the expression of muscle specific transcription factors myogenin and myoD. **Conclusion:** We conclude that CMKLR1 signaling is active in skeletal muscle cells and that this pathway acts as a positive regulator of myogenesis. This work was supported by operating grants from CIHR, NSHRF, PEF and DMRF.

BSR-5 Polymeric Binders: A New Approach for the «control» of Celiac Disease

Maud Pinier[1], Elena F. Verdu[4], Mohamad Nasser-Eddine[1], Chella S. David[3], Anne Vézina[2], Nathalie Rivard[2] and Jean-Christophe Leroux[1*]

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Background & Aims: Celiac disease is a prevalent autoimmune disorder caused by ingestion of gluten-containing grains. Polymeric binders were investigated for their potential to reverse the toxic effects induced by gliadin, the subfraction of gluten triggering the disease. **Methods**: Gliadin was neutralized by complexation to a copolymer of hydroxyethylmethacrylate (HEMA) and sodium 4-styrene sulfonate (SS). The polymer P(HEMA-*co*-SS) was found to sequester gliadin at both gastric and intestinal pHs in a relatively specific manner. The binder's ability to abolish gliadin's effect was first assessed on IEC-6 and Caco-2/15 intestinal cell lines and on primary cultures of human differentiated enterocytes. The efficacy of the polymeric binder in preventing gliadin-induced intestinal barrier dysfunction was assessed using gliadin-sensitive HLA-HCD4/DQ8 transgenic mice. **Results:** P(HEMA-*co*-SS) complexed with gliadin in a relatively specific fashion. Treatment of intestinal epithelial exposed to gliadin triggered profound alterations in cell morphology and cell-cell contacts. Theses changes were all inhibited by complexing the protein with P(HEMA-*co*-SS). More importantly, the copolymer hindered gliadin digestion by gastro-intestinal enzymes, thus minimizing the formation of immunogenic peptides. Intragastric administration of P(HEMA-*co*-SS) together with gliadin to gluten-sensitive HLA-HCD4/DQ8 mice was able to reverse gliadin-induced changes in intestinal barrier and to reduce intraepithelial lymphocyte and macrophage cell counts. **Conclusion:** Polymeric binders can prevent *in vitro* gliadin-induced epithelial toxicity and intestinal barrier dysfunction in HCD4/DQ8 mice. They have a potential role in the treatment of patients with gluten-induced disorders.

BSR-6 Solubilizers for Biopharmaceutical Studies with Respiratory Epithelial Cells: A Focus on Selection Based on Limited Epithelial Perturbation

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Background: Approximately three-quarters of new drug candidates are either insoluble or very poorly water soluble. These compounds pose enormous challenges during preformulation and preclinical screening stages. Their limited aqueous solubility compromise sink conditions during transport studies with epithelial cells and adsorb non-specifically to tissue culture plates. This often leads to inaccurate estimation of permeability. Solubilizers used to improve the solubility of test compounds during preformulation may affect cell physiology including absorption characteristics, mechanisms of absorption, efflux characteristics, epithelial integrity and morphology. **Objectives:** The aim of this study was to test the hypothesis that a certain concentration range exists within which to use selected solubility enhancers for in vitro biopharmaceutical studies with Calu-3 cells without epithelial damage. **Methods:** The effect of commonly used solubilizers {(N, N-Dimethylacetamide (NND), Polyethylene glycol 400 (PEG 400), Methyl-Pyrrolidone/aromatic hydrocarbon (MPH), Cremophor EL and Dimethylsulfoxide (DMSO) on Calu-3 cells was investigated. LDH, MTT, TEER measurement, paracellular marker permeation and confocal microscopic methods were used to screen cell perturbation. **Results:** The level of mitochondrial dehydrogenase activity (MDH) was comparable for cells incubated with DMSO and Cremophor EL. DMSO, up to 8% had no significant effect on MDH activity ($p>0.05$, n= 3). Similarly, 1-8% Cremophor did not significantly affect the MDH activity ($p>0.05$, n= 3). However, both DMSO and Cremophor EL at concentrations higher than 8% significantly reduced MDH activity ($p<0.05$). Unlike DMSO and Cremophor, much lower concentrations of PEG 400 had detrimental effect on the cells. Among the five compounds that were investigated, MPH and NND significantly reduced MDH activity at concentrations lower than 0.5%. Comparable results were obtained with respect to the tested compounds for TEER, LDH, sodium fluorescein permeation and confocal microscopy studies. **Conclusions:** From a toxicity perspective, this study showed that NND and MPH are not ideal as solubilizers for Biopharmaceutical studies with Calu-3 cells. However, Cremophor EL, PEG 400 and DMSO may be used at concentrations ≤ 5%.

BSR-7 Assessment of the Bitter Taste of Epinephrine and the Masking Effects of Non-Medicinal Ingredients: Role of an Electronic Tongue.

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Objectives: An epinephrine (E) tablet is under development for sublingual (SL) administration for the first-aid treatment of anaphylaxis (Biopharm Drug Dispos 2006;27(9):427-435). The inherent bitterness of E may hinder patient acceptability, especially in children. Our objective was to assess the degree of E bitterness and predict the masking effect of sweetening and flavoring non-medicinal ingredients (NMIs) using an electronic tongue (e-Tongue). **Methods**: An e-Tongue (Alpha MOS, France) equipped with a 7-sensor array designed for bitterness prediction was used. Sensors were conditioned, calibrated, and tested for taste discrimination. A bitterness model was built and validated using 6 standard active pharmaceutical ingredients (APIs) each at two different concentrations. Results were compared with standardized measurements provided by Alpha MOS from human sensory panels. The bitterness model was used to assess three E solutions of 0.3, 3, and 9 mM. Taste masking efficiency of aspartame (ASP), acesulfame potassium (ASK), and citric acid (CA) each at 0.5 mM was evaluated. Data were analyzed using the bitterness prediction module software provided by Alpha MOS. **Results**: All 7 sensors of the e-Tongue passed the conditioning, calibration, and taste discrimination tests. A bitterness model was successfully built and validated using the 6 standard APIs. The bitterness score of 9 mM E was 20 (in a bitterness scale of 1 to 20). It was masked by 13.7%, 29.7%, and 54.2% after adding ASK, ASP, and both ASK and ASP, respectively. The addition of all NMIs (ASK, ASP, and CA) resulted in a masking effect of 64.9%. CA alone was able to mask the bitterness of E by more than 80%. **Conclusion**: The incorporation of sweetening and/or flavoring NMIs into a SL tablet formulation of E masked its bitter taste by up to 80%. The e-Tongue is a potential analytical tool to assess the masking effect of NMIs on the bitterness of APIs.

BSR-8 Cladribine Inhibits the Effect of Diltiazem to Increase RBC Concentrations of ATP in a Zebrafish Model

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Purpose: To study the effect of cladribine (CdA) on the cardiovascular effects of diltiazem (DTZ) using a zebrafish model. **Methods**: Zebrafish (*Danio rerio*) weighing approximately 1 g were used and they were housed in the Aquatic Laboratory in the IWK Health Centre. Zebrafish were divided into 4 groups ($n = 6 – 10$ in each group). They were each given saline, DTZ (5 mg/kg), or a combination of DTZ (5 mg/kg) and CdA (1, 2, or 5 mg/kg) twice daily for 3 doses by peritoneal (ip) injection. Blood samples (1 – 5 uL) were collected at 1 hr after the last injection for measurement of ATP and other purine nucleotides by a validated HPLC assay. Data between groups were compared by ANOVA and difference considered significance when $p < 0.05$. **Results**: DTZ increased RBC concentrations of ATP, ADP, AMP, GTP and GDP, although only the increase of the adenine nucleotides reached statistical significance ($p < 0.05$). Cladribine inhibits the cardiovascular effects of DTZ to increase adenine nucleotide concentrations at the 1 mg/kg dose ($p < 0.05$). The inhibitory effect was not further increased when dose was increased to 2 or 5 mg/kg of cladribine (Table 1). **Conclusion**: DTZ increased RBC concentrations of adenine nucleotides (ATP, ADP and AMP) at a therapeutic dose in zebrafish model *in vivo*. The cardiovascular effects were inhibited by cladribine at low dose (Supported in part by a NSHRF Innovation Grant and a IWK Health Center Summer Studentship to Lauren Klein-Rygier)

Table 1. Effect of DTZ and CdA on RBC concentrations of purine nucleotides in zebrafish

Treatment	ATP (mM)	ADP (mM)	AMP (mM)	GTP (mM)
Control	0.48 ± 0.22	0.14 ± 0.072	0.043 ± 0.019	0.16 ± 0.093
DTZ (5 mg/kg)	0.75 ± 0.24*	0.32 ± 0.10*	0.093 ± 0.047*	0.20 ± 0.071
DTZ + CdA (1 mg/kg)	0.31 ± 0.16**	0.062 ± 0.049**	0.048 ± 0.0086**	0.070 ± 0.080
DTZ + CdA (2 mg/kg)	0.32 ± 0.082**	0.073 ± 0.025**	0.027 ± 0.0098**	0.12 ± 0.039
DTZ + CdA (5 mg/kg)	0.40 ± 0.17**	0.14 ± 0.039**	0.067 ± 0.030	0.056 ± 0.028**

*$p < 0.05$ vs control, **$p < 0.05$ vs DTZ

BSR-9 Design and Syntheses of Benzoquinolines as Potential Topoisomerase Inhibitors

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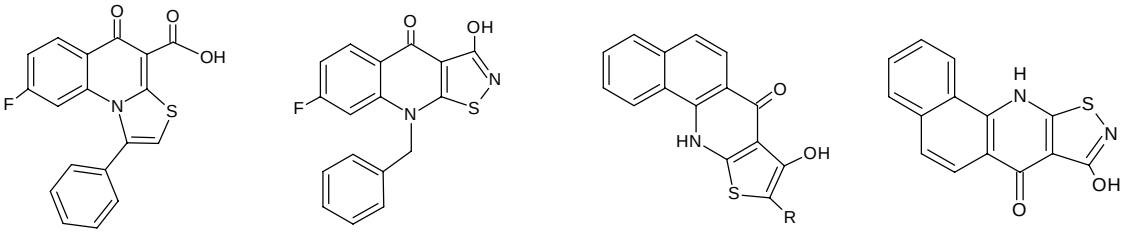
Study Objectives: Based on the previously reported topoisomerase-II inhibitory and antineoplastic activity profile of thiazoloquinolonecarboxylic acid derivative [A], and by the application of structure-based molecular modeling, 3-hydroxy-7-fluoro-4,9-dihydrothieno-[2,3-*b*]quinolin-4-one (compound B) was designed, synthesized and evaluated for in vitro cytotoxicity against several solid and leukemic cell lines. The encouraging results from this study prompted us to explore the possibility of further structural modifications in this class of compounds. In this respect, we designed and synthesized compounds C and D series, the details of which are presented in this poster. **Methods:** Two classes of substituted thieno[2,3-*b*]benzoquinolone derivatives were successfully synthesized as potential DNA topoisomerase I and II inhibitors via modified Gould-Jacobs reaction and Grey-Heitzer method. The cytotoxic properties of the synthesized compounds were evaluated using Brine-Shrimp Lethality Assay method.



A B C D

Results: Preparation of compound C was achieved by either conventional synthesis of the relevant 2-mercaptobenzoquinolone carboxylic acid followed by cyclization or through convergent synthesis starting with appropriate naphthoylacetoacetate intermediate and further cyclization. The synthesized compounds were evaluated for their cytotoxic activity. In order to study the effect of different substituents (R=COOEt, CN, CONHOH) on the overall Topo-II inhibitory and cytotoxic activities of this class of compounds, several new analogues of structures C&D were synthesized and evaluated for the targeted activities. **Conclusion:** Our structure-based design approach for synthesizing novel tetracylic quinolines with potential topoisomerase I and II inhibitory activity has successfully resulted in two classes of thieno[2,3-*b*]benzoquinolone derivatives(linear and angular). Both classes of compounds exhibited cytotoxic effects in a Brine-Shrimp Lethality Assay. Further studies on structural optimization of both classes of compounds is ongoing in our laboratory.

BSR-10 Pharmacokinetics and Hemodynamic Effects of Amlodipine in a Rat Model Following Repeated Subcutaneous Injections *in vivo.*

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Purpose: To determine the pharmacokinetics and hemodynamic effect of amlodipine in a rat model following repeated subcutaneous injection. **Methods:** Male SD rats (Charles River Laboratories, n = 8 – 12 per group) weighing between 300 - 450 g were used. Each rat received either saline (control) or 5 mg/kg of losartan s.c. twice daily for 5 doses (Merck & Co., West Point, PA, USA). Hemodynamic measurements were recorded continuously for each animal before and following treatment for up to 6 h. Plasma concentrations of amlodipine were determined by a previously published HPLC. **Results:** The SBP, DBP, and HR in control SD rats were 130 ± 14 mmHg, 103 ± 17 mmHg, and 462 ± 30 bpm. Amlodipine significantly decreased the SBP to 101 ± 9 mmHg (-22%), and DBP to 74 ± 9 mmHg (-28%) ($p < 0.05$), but the effect on HR was minimal (-6%) ($p > 0.05$). Maximum hemodynamic effects were observed at 1.5 hrs after the injection. Plasma concentrations of amlodipine before the last dose were 0.11 ± 0.06 ug/ml. The apparent Cmax and tmax of amlodipine were 0.47 ± 0.17 ug/ml and 0.53 ± 0.38 hr, respectively. **Conclusion:** Amloidpine significantly decreased SBP and DBP, but not HR after repeated 5mg/kg subcutaneous injections. The hemodynamic effects were mainly attributed to the parent drug amlodipine.
(Supported in part by a grant-in-aid from CIHR/NSHRF/PEF Regional Partnership Program).

BSR-11 siRNA-induced Down-regulation of Matrix Metalloproteinase-25 Inhibits Palatal Fusion During Mouse Secondary Palate Development.

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Objectives: To determine the spatial and temporal expression pattern of matrix metalloproteinase-25 (Mmp-25) in mouse secondary palate (SP) formation; to determine if Mmp-25 has a functional role in mouse SP formation; to begin to describe the transcriptional regulation of Mmp-25 in the mouse SP. **Methods:** To determine the spatial and temporal expression of Mmp-25 in mouse SP formation we used real-time quantitative PCR (qPCR), western blot analysis and immunohistochemical staining from embryonic day (E) 12.0 to E15.5, which is the window of development for the SP in mice. To determine if Mmp-25 has a functional role in mouse SP

formation we used *in vitro* palatal cultures incubated with Mmp-25-specific siRNA to knockdown Mmp-25 gene expression. To begin to describe the transcriptional regulation of Mmp-25 in the mouse SP a TGFβ3-neutralizing antibody was added to the *in vitro* palatal cultures. **Results:** Mmp-25 mRNA and protein are expressed in the mouse SP with highest expression at E13.0 followed by a significant down-regulation by E15.0. Immunofluorescence analysis indicates Mmp-25 protein is found in the epithelium of the palatal shelves and apical mesenchyme underlying the epithelium. *In vitro* palatal cultures treated with Mmp-25-specific siRNA exhibit a significant reduction in shelf fusion and persistence of the midline epithelium seam. On a scaling standard for palate shelf fusion the scores for wild-type, scrambled control siRNA and Mmp-25-specific siRNA were 4.14, 4.13 and 2.50 respectively where 1 indicates no contact and 5 indicates complete fusion. Mmp-25 mRNA and protein expression is significantly decreased in *in vitro* palatal cultures treated with 5 μg/ml of a TGFβ3-neutralizing antibody. **Conclusions:** Mmp-25 mRNA and protein is expressed in the mouse SP at all developmental stages and has a direct, functional role in mouse SP formation. Mmp-25 gene expression is downstream of the growth factor TGFβ3. Our results are the first to demonstrate a direct functional role for a single matrix metalloproteinase in mouse SP development.

BSR-12 Expression, Localization and Activity of Organic Cation Transporters in Human Nasal Epithelium

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Background: Most drugs cross epithelial cells either by passive diffusion or via carrier-mediated drug transporters. Not much is known about the expression, functional regulation, and factors affecting carrier-mediated drug transport in human nasal epithelium. Alterations in drug transporter characteristics and expression may affect drug disposition and therapeutic response. **Objectives:** Based on the potential of organic cation transports (OCT) to be targeted for drug delivery; we investigated the expression and localization of the transporters in human nasal epithelial cells. **Methods:** Nasal epithelial cells were extracted from tissues obtained from patients that underwent endoscopic trans-nasal skull laser surgery. The expression, localization and drug uptake characteristics of the transporters were investigated using drug permeation (uptake of 4-Di-ASP) and molecular biology (reverse transcriptase polymerase chain reaction, immuno-histochemistry, confocal microscopy) methods. **Results**: Gene transcripts for OCT1, OCT3, OCTN1 and OCTN2 were successfully obtained by PCR from RNA extracted from the human nasal epithelial cells. Immunohistological studies displayed staining of OCT3, OCTN1 and OCTN2 antibodies in the nasal tissue specimens. The antibodies were localized on the apical side of ciliated epithelial cells. Uptake of 4-Di-ASP was temperature (37 vs. 4ºC) and direction-dependent (apical→basolateral vs. basolateral →apical). Uptake was inhibited by both classical organic cation transporter and organic cation/carnitine transporter substrates (verapamil, tetraethyl ammonium). **Conclusions:** The RT-PCR, immunohistochemical and uptake data suggest that OCT 1, OCT 3, and OCTN1 and OCTN2 are endogenously expressed in the human nasal epithelium. Although the physiological roles of the transporters in the epithelium is yet to be elucidated, their localization on the apical side of ciliated epithelial cells supports the idea and potential of these transporters for targeted drug delivery.

BSR-13 Synthesis of Novel C8-substituted Purine Derivatives and their Connection to PRMT6: A Search for Anti-HIV Molecules

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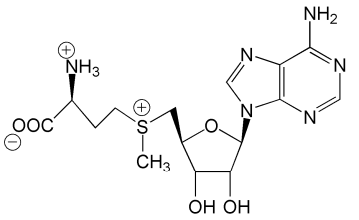
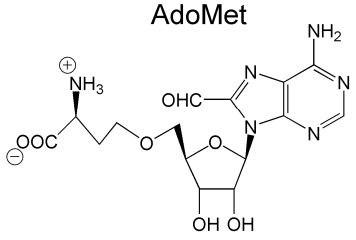
Background: The human enzyme protein arginine *N*-methyltransferase 6 (PRMT6) plays a key regulatory role in signal transduction, transcription, and protein interactions, including inhibition of HIV-1 gene transcription via methylation of the HIV-1 Tat protein. Its active site is well-defined due to its strong homology with the characterized PRMT1. Of particular interest, the PRMT6 active site has a conserved Met residue positioned in close proximity to the purine C-8 of *S*-adenosyl-□-methionine (AdoMet), a substrate. This suggests that the C-8 CHO function in the proposed analogue **1** can be induced with cyanide to react with the nucleophilic side chain in the active mutants of PRMT6 Met 166 Lys, Ser, and Cys produced in Dr. Frankel's laboratory. The formation of this covalent bond is the first step in a "fragment-based" approach to generate a specific inhibitor of PRMT6,

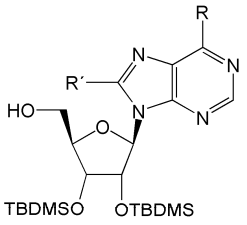
leading to possible drug candidates targeting HIV latency. **Methods:** The chlororiboside **2a** was selected as the starting material to avoid a competing intramolecular reaction during the formation of the C-5′ ether linkage in **1**. The three crucial synthetic operations are 1) the creation of the C-5′ ether; 2) the C6-amination without concomitant reaction at C-8; and 3) synthesis of a C-8 aldehyde from a C-8 Br atom under Pd(0) catalysis conditions. Products were identified by NMR or mass spectroscopy. **Results:** For the ether synthesis, model studies with **2b** yielded dialkylation, while monoalkylation of **2c** remains difficult to optimize. The C-6 Cl atom on the model compound **3a** and the fully protected chlororiboside **3b** was aminated in good yield. The C-8 bromination of **3a** and **3b** was also achieved. **Conclusions:** Several key synthetic reactions were characterized by exploratory work toward the AdoMet analogue and on model compounds. In addition, the C6-amination on **3a** and **3b** using the weak base Cs_2CO_3 and CF_3CONH_2 is a promising reaction that could lead to a generalized methodology on purine amination.



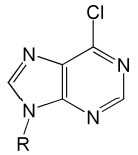
AdoMet



1 AdoMet analogue



2a R = Cl R´= Br
2b R = OH R´= H
2c R = Cl R´= H



3a R = tetrahydro-2H-pyran-2-yl
3b R = 2,3,5-tris-*O*-TBDMS-ß-D-ribofuranosyl

BSR-14 Serum and Adipocyte Chemerin Levels are Regulated by TNFα and are Elevated in Obesity.

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Objective: White adipose tissue (WAT) is an endocrine organ that secretes a number of biologically active molecules (adipokines) including leptin, adiponectin, interleukin-6 (Il-6) and tumour necrosis factor α (TNFα) In obesity, increased WAT secretion of inflammatory mediators (IL-6 and TNFα) contributes to local and systemic inflammation, a precursor to vascular dysfunction and insulin resistance. Chemerin is a novel adipokine with roles in inflammation and metabolism. In humans, serum chemerin levels modestly correlate with body fat and markers of metabolic syndrome suggesting a role for chemerin in obesity related diseases. However, little is known regarding the regulation of chemerin secretion from WAT. The objective of this study is to investigate whether TNFα, which is increased in obese WAT, regulates secretion of chemerin from adipocytes. **Methods and Results**: 24 hour treatment of 3T3-L1 mouse adipocytes with varying concentrations of TNFα produced a dose- and time-dependent increase in chemerin mRNA expression, measured by quantitative PCR. In a similar fashion, TNFα increased adipocyte secretion of biologically active chemerin as identified by cell-based reporter assays. To determine if there was a corresponding response *in vivo*, wild type or TNFα receptor knockout mice were treated with 0.5 μg of TNFα, or an equivalent volume of vehicle. Blood serum chemerin levels were elevated 12-24 hours following TNFα injections in wild type but not the TNFα receptor deficient mice. In agreement with these findings, the leptin-deficient and leptin-receptor deficient

mouse models of obesity, which demonstrate elevated WAT expression of TNFα, had corresponding elevated circulating chemerin levels. **Conclusions:** TNFα potently regulates chemerin secretion from adipocytes *in vitro* and circulating chemerin *in vivo* via a TNFα receptor specific mechanism. Given that chemerin has pro-inflammatory properties, TNFα-induced secretion of chemerin may contribute to the chronic-low-grade inflammatory state in obese individuals. ***Funding: NSHRF, CIHR, DMRF, DPEF.***

BSR-15 Genetic Factors Affecting the *in vitro* Metabolism of the Pure Antiestrogen Fulvestrant (Faslodex®)

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Introduction: The pure steroidal antiestrogen fulvestrant (Faslodex®) is an antagonist of the estrogen receptor (ER) with no agonist effects. Indeed, this drug blocks the ER ligand-binding as well as the ER-mediated downstream signalling, which indicates that fulvestrant might overcome resistance driven by the agonist properties of other antiestrogens. It is actually used for treatment of locally advanced or metastatic hormonal-dependent breast cancer in postmenopausal women, representing a possible option after failure to response to aromatase inhibitors. An advantage over other endocrine therapies is its administration once a month, intramuscularly. However, although it is well tolerated, intersubject variability in fulvestant plasma levels has been noted during the first 28 days of treatment as well as in the delay to reach a steady state. This variability may limit the benefits of fulvestrant treatment, especially at short-term. Fulvestrant is reported to be inactivated by UDP-glucuronosyltransferases (UGTs) into fulvestrant-glucuronide (fulvestrant-G); the UGT isoenzymes involved are primarily UGT1A3 and UGT1A4. **Objective**: In this study, we sought to determine the influence of common genetic variations upon the metabolism of fulvestrant *in vitro*. **Methods**: Using a heterologous expression system, we analyzed the fulvestrant-G formation by human UGT1A3, UGT1A4 and six of their coding variants commonly found in the Caucasian population. The fulvestrant-G was detected by liquid chromatography-tandem mass spectrometry. **Results**: Compared to the UGT1A4 reference protein *1 ($R^{11}P^{24}L^{48}$), the *2 (T^{24}) allozyme had a significantly lower V_{max}, whereas *3 (V^{48}) and *4 (W^{11}) had similar affinity and V_{max}. In contrast, the UGT1A3*2 ($R^{11}A^{47}$) and *3 (R^{11}) variants did not demonstrate any difference in intrinsic clearance (V_{max}/K_m) when compared to the reference protein *1 ($W^{11}V^{47}M^{270}$). However, UGT1A3*6 ($R^{11}A^{47}V^{270}$) had a 900-fold lower intrinsic clearance as a result of a significantly altered affinity and capacity. **Conclusion**: Additional studies are required to assess the clinical relevance of these low activity alleles (UGT1A4*2 and UGT1A3*6), present in 7 and 2 % of the population, respectively.

Education and Teaching Posters

ET-1 Increasing Practical Experiential Training Capacity: The Design of a Student Pharmacist Clinical Teaching Unit

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Background: Requests for student pharmacist experiential placements have been increasing both in number and length. New models for experiential education are needed to increase capacity without compromising patient care or education quality. We propose a model which incorporated peer assisted learning and a student to preceptor ratio higher than the traditional 1:1. **Objectives**: To increase hospital training capacity of student pharmacists through the creation of a student pharmacist clinical teaching unit (CTU), where students mentor one another in the provision of direct patient care. Other objectives include providing a quality educational experience for students, preceptors and other health professionals, without compromising the level of pharmaceutical care delivered to patients. **Methods**: The CTU was designed to accommodate 6 final-year

students, each for a 9-week rotation. Students started at staggered times to provide continuous student coverage on the unit, and allowed the more experienced students to mentor the newer students. Students cared for individually assigned patients and participated in peer assisted learning by reviewing the care plans, chart notes and answers to drug information questions of their peers. Daily pharmacy team rounds allowed students to present their patients and care plans to the CTU pharmacy team. Three pharmacists rotated precepting activities in 3-week blocks as per the usual pharmacist schedule and jointly completed student evaluations. **Results**: Outcome measures include: number of student placements; student, preceptor, patient and other health professional satisfaction with the CTU; and participant workload. Data collection, including surveys, focus groups, and workload statistics from students and preceptors, is currently underway. **Conclusion**: Preliminary results suggest that by increasing the student to preceptor ratio and utilizing peer assisted learning, the development of a student pharmacist CTU increases clinical training capacity while enhancing the quality of the educational experience for students and staff, and expanding the level of pharmaceutical care for patients.

ET-2 Experiential Rotations at Family Health Teams – Perspectives of Students, Preceptors, and Other Team Members.

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[1]University of Toronto, Toronto, [2]Elisabeth Bruyere Research Institute, Ottawa

Objectives: In Ontario the establishment of family health teams (FHTs) support inter-professional team-based primary care practice. These sites provide valuable teaching settings for students. In 2006/07, fourth year University of Toronto pharmacy students were placed at FHTs for the first time, under preceptorship of pharmacists. We explored the learning by, and experiences of these students to enable improvement in future FHT rotations. **Methods**: With ethics approval and consent, fifteen semi-structured individual interviews with students (5), preceptors (5), and a health care professional from each site (2 MD, 2 RN, 1 Dietitian) were conducted following end of term. Interviews took place at a site convenient to the interviewee, and were audiotaped and transcribed. Investigators used immersion and crystallization to identify codes and descriptive analysis to determine process and content themes. NVivo software facilitated transcript coding and summation. **Results**: Thirteen one-on-one and two telephone interviews were conducted (ranging on average of 40 minutes). Key challenges experienced by students were: i. learning to document extensively in charts, ii. conducting comprehensive interviews, especially with gathering information, and iii. adjusting to a steep learning curve due to the complexity of patients. Students that were open-minded, flexible, motivated and communicated well with others fit in better with the team. Previous pharmacy experience also helped during the rotation. The role of the student was viewed differently between the preceptor and other health care providers. The environment of the FHT was also a factor in the student's role at the site. **Conclusions**: FHT rotations provide practical exposure to students on how pharmacists can shape primary care practice. The results provide insight on how to: a) prepare students within the formal curriculum for these new placements; b) integrate activities into the rotation and c) identify criteria for selecting students for FHT placements. Acknowledgement: portions of this work were previously presented to Family Health Team conference for Pharmacists, June 23, 2008.

ET-3 A Review of the Psychometric Evidence for the Use of Admissions Interviews in Health Professional Degree Programs

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Leslie Dan Faculty of Pharmacy, University of Toronto

Objective: To determine whether the use of interviews to assess nonacademic attributes leads to better selection of applicants to health professional degree programs. **Methods:** Five electronic databases, 4 pharmacy and medical education journals, and reference lists from review articles and studies meeting inclusion criteria were searched from 1980 to 2008. Inclusion criteria were: interview used to select students for health professional, entry level degree program; reliability and/or validity assessed; published 1980 or later; English language. Exclusion criteria were: inadequate description of interview; interview score included assessment of academic performance; abstract, letter to the editor, or research brief; group interview. One team member screened articles on the basis of title or abstract, seeking confirmation from the lead author as needed. Two team members reviewed retrieved articles, obtaining consensus on inclusion and data extraction. **Results:** The database search yielded 2078 citations, 40 of which met selection criteria. Another 26 eligible studies were obtained from the

secondary search. Overall, 4 studies were in pharmacy, 41 in medicine, 8 in dentistry, 6 in physical therapy, and 7 in other professions. Most reported one interview per applicant (56%); 50% used a panel interview format; 9% used multiple mini-interviews. Standardized questions (36%) and behaviorally anchored rating scales (20%) were not common. Validity, predictive (n=45) and/or construct (n=11), was assessed in 55 studies; 38 studies assessed reliability, usually interrater. Only 24% of the reliability studies reported coefficients above 0.75. Validity coefficients were modest (median correlation with an appropriate criterion was 0.24). Only 6 studies reported the incremental prediction in academic performance from adding interview scores to traditional admissions criteria; variance added was 3-7%. **Conclusions:** Most research on admissions interviews has been done in medicine and little in pharmacy. The array of interview structures and criterion measures assessed makes it difficult to draw firm conclusions regarding how much interviews enhance student selection. The reliability and validity of structured interviews, particularly multiple mini-interviews, appears superior.

ET-4 Asthma Project: Exploring Students' Roles in Practice Change

Lisa M Guirguis, Faculty of Pharmacy & Pharmaceutical Sciences, University of Alberta, Edmonton, AB

Objective: Asthma affects 8.4% of the population. Research has shown that pharmacists' services can improve the health of patients with asthma. Despite encouraging evidence and models for pharmacists' practice, many pharmacists have not implemented new programs and interventions into routine care. To address this need, an elective pharmacy option (The Asthma Project) was offered to pharmacy students in their final year. Planning templates were created to help pharmacy students to learn how to plan and implement a new asthma service in a community pharmacy setting. This research aims to explore pharmacist preceptor and pharmacy students' perceptions and experiences with the Asthma Project. **Methods:** Qualitative methods will be used to examine pharmacy preceptors and pharmacy students' perceptions and experiences with the asthma project. Data for this project was compiled from three sources: 1) completed asthma projects, 2) course materials including the course manual and communications between pharmacy students and the course coordinators, and 3) telephone interviews with pharmacist preceptor and pharmacy students. As this is a small optional clerkship course, there are only 4 student participants and subsequently 4 pharmacist preceptors. We will include all as our study sample. **Results:** Complete Analysis Pending. Three of four students consented. Overall, students were able to implement four unique asthma projects in community pharmacists. We will present a summary of the students' projects, and perceptions of this project. **Conclusions:** The analysis of the Asthma Project will help researchers learn if a practical planning process can help support the implementation of new practice models in asthma. More concretely, this project will help us at the Faculty of Pharmacy and Pharmaceutical Sciences decide on the best way to structure pharmacy students' learning and implementation of new practice models in pharmacy practice.

ET-5 Medication Management in Universal Design: Pharmacy Students in the Interprofessional Design of the SMART CONDO

Lisa M Guirguis, Cheryl A. Sadowski
Edmonton, AB Faculty of Pharmacy & Pharmaceutical Sciences, UofA

Objectives: Function, including medications use, is an important consideration in the design of a living space. Because most individuals with functional impairment or health problems live in the community, it is important for health professionals and designers to consider these issues in developing living space. Because function and design require interdisciplinary collaboration, a course has been designed at the University of Alberta. **Design and Methods**: For over 10 years, Occupational Therapy (OT) and Industrial Design (ID) students have collaborated on Universal Design projects. In 2008, collaboration expanded to include the pharmacy and computing science (CS) students. Forty-eight students (17 OT, 25 ID, 4 Pharmacy and 2 CS) collaborated on the Smart Condo. **Results**: The teams negotiated a family persona to include a mother, father, and child living with multiple sclerosis and diabetes. Each of the four pharmacy students collaborated with interprofessional teams to design items that facilitated safe medication use and monitoring. In Play and Connect, a live videoconference system was designed to support patient-pharmacist communication. In Rest & Sleep, an integrated blood pressure and blood glucose monitoring system supported medication monitoring. In Bathing & Grooming, a foot and weight monitor as well as a waterproof medication storage system were added. Finally, Cooking & Eating design included monitored automated dispensers for glucose tablets and routine medications. While pharmacy

students lead the design of these devices, OT and ID students contributed to functionality, aesthetics and design to enhance the final product. **Conclusions:** Pharmacy, OT, CS, and ID students successfully participated in interprofessional design of the SMART Condo. Universal design, with the incorporation of medication management, will help to support individuals with functional limitations who live in the community. Pharmacy students, in greater numbers, will continue to participate in the smart condo project. The condo will be built on the University campus and will be used for teaching in the health professions and industrial design programs.
Encore Presentation:
Sadowski C, Guirguis L. Medication Management in Universal Design: Pharmacy Students in the Interprofessional Design of the SMART CONDO. Strengthening the Bond Conference. Banff, Alberta. May 21 -23, 2009

ET-6 Assessing, Monitoring and Supporting the Development of Generic Competencies Within the Pharm.D. Program at the Faculty of Pharmacy at the Université de Montréal.
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Objectives: This poster describes and discusses the system and global process for assessing, monitoring and supporting the development of generic competencies in the Pharm.D. program at the Faculty of pharmacy at the Université de Montréal. Selected competencies are as follows: 1. professionalism; 2. communication; 3. team and interdisciplinary work; 4. scientific reasoning and critical thinking; 5. learning-to-learn; 6. leadership. **Methodology**: Since literature is scarce on how generic competencies should be assessed, we more or less had to build our own system and process from scratch. Consequently, a special committee (the "CECT") was established and entrusted with the following mandate: to define policies and methods of assessment of generic competencies, to foster and monitor their development across the program, and to propose remediation strategies and activities as needed. **Results**: The process was successfully implemented as of the Fall of 2007 and its evolution was closely monitored by the CECT. Results from assessments performed in relevant courses were integrated into the students' electronic generic competencies profile. Extracurricular assessment has also been integrated into it. This profile is assessed on a regular basis by the CECT. Relevant learning activities are proposed to students as needed. So far, about 200 students have received their profile. Remedial activities have been proposed to about 35 students. **Conclusions**: After experimenting with our system and process for 1 ½ year, we estimate that these have globally met our expectations and objectives. We definitely think that our system and process are truly innovative and result-oriented both for our students, our program and the profession. It should indeed make a difference in the development of future pharmacists, contributing to make them more conscious of social and professional realities which they invariably will have to face.

ET-7 Updating Online Pharmacy Resources: Moving the Drug Information Resources (DIR) and Internet Tutorial for Pharmacists (ITP) Websites Forward
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Objectives: To refresh and move forward with the College's Drug Information Resources (DIR) and Internet Tutorial for Pharmacists (ITP) websites. **Methods:** The order of review of DIR's categories was prioritized using data generated by Google Analytics®. Within categories, links to resources were checked, current websites/texts evaluated, and new websites/texts located and evaluated. Input on content was sought from subject experts. PubMed dynamic searches were formulated for topics within categories that would benefit from this tool. Current tutorials and format for delivery of ITP were reviewed and found to need updating. A method of creating interactive webpages was chosen and new, unique topics were determined. **Results:** Almost half of DIR's 62 categories, including the 20 with the highest traffic, were thoroughly reviewed resulting in many additions and deletions determined by ourselves and our consultants. Nineteen categories were populated with over 70 dynamic searches. These give users the ability to find up-to-date journal literature. The revised website can be accessed at: http://dir.pharmacy.dal.ca/index.html. Scenarios in ITP were discarded and two new tutorials, "Drug Identification and Availability" and "Finding Clinical Practice Guidelines" were written and formatted using Wimba Create®. The tutorials are interactive and the topics are modern and are not duplicated

in other web-based resources. The ITP website has been removed and the new tutorials are available through the Dalhousie College of Pharmacy Preceptor Development Program. They can also be accessed at: http://www.library.dal.ca/How/LibCasts/, under the Subject Specific category "Pharmacy". **Conclusions:** DIR has been refreshed and includes many new links and the ability to perform PubMed dynamic searches. The newly developed tutorials provide a new interactive dimension for learning how to use the Internet to access specific information useful to pharmacists.

ET-8 A Model for Measuring Co-op Learning Outcomes: A Tracker, Work Term Reports and E-portfolio

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Objective: The University of Waterloo has created Canada's first and only co-op Pharmacy program, bringing Waterloo's entrepreneurial, outwardly-focused and dynamic culture to the health sector. While such work-integrated learning is logical for a professional program, current models are structured, academically-prescribed learning with trained preceptors. Co-op, therefore, presented challenges for national accreditation and licensing. **Method:** UW took this as an opportunity to develop a student-driven, reflective, self-assessment model that would allow for evaluation of learning outcomes, be respectful of the employer/employee relationship, enhance student selection of future work terms and emphasize the integration of classroom and workplace learning. This poster will provide details of the model components, and the co-op work term structure and the process. **Results:** The Professional Learning Outcome Tracker (PLOT), work term reflective reports and e-portfolio are the keys to outcome mapping. Elements of the PLOT include: required competencies, an experience log and evidence summary, a student self-rating, and an employer rating and an optional response to the employer rating. The work term reports take specific outcomes (i.e. communication, patient safety, interprofessional practice) and ask students to conduct an in-depth assessment of both the integration of classroom and workplace learning, and their future learning needs. The e-portfolio is the integrating tool, allowing students to showcase their professional development through their professional mission statements, reports, evaluations, etc. Data on student versus employer assessment, and student progress through work terms will be presented. **Conclusion:** Response to the model from students, employers and faculty has been positive. Continued refinement and expansion to capture additional outcomes are part of future plans.
This abstract has been accepted for poster presentation at the upcoming World Association for Cooperative Education Conference June 23 – 26, 2009.

ET-9 Co-operative Education: Experiential Capacity Building at the University of Waterloo

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Objective: The School of Pharmacy at the University of Waterloo accepted its first class in January 2008 and adopted a co-operative model of education. The pharmacy model of requiring students to complete four by four months of work term experience was a challenge considering the concerns about limited pharmacy practice site capacity. Additional factors such as providing students with diverse experiences, students being paid for work terms, and co-op needing to be integrated with the didactic curriculum also needed to be considered. **Methods:** A marketing strategy for employers was developed and deployed with various approaches taken to engage potential employers. In addition, the co-op hiring process within the university was reworked to capitalize on its strengths and meet the needs of the pharmacy employers and students. **Results:** The jobs posted exceeded our expectations in number, types and quality of work experiences for our students. Employers, while unfamiliar with the co-op concept and process, were open-minded and creative about how to fund the positions and the work term student responsibilities. The poster will detail the co-op process developed and the number, types and geographic locations for the first two work terms. For the first work term in the fall of 2008, 73 students participated in the interview process and a total of 117 jobs were posted. Despite the harsh economic environment, 150 jobs were posted for 70 students participating in our January 2009 interview process. To date

about sixty percent of our job postings have come from community pharmacy practice, with a strong showing from hospital practice. In addition we have attracted postings from industry, government, family health teams, consultant companies, academia, professional associations and others. **Conclusions:** A highly successful innovative approach was taken to engage the pharmacy practice community in providing the experiential component of our curriculum. Employer support has demonstrated their interest in training future colleagues and untapped creativity within our practice community.

ET-10 Enhancing the Cultural Competency of Pharmacy and Nutrition Students Through Interprofessional Community-based Learning and Engagement

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Objectives: Research on promoting cultural competency within the curricula has consistently shown that multicultural/diversity experiences positively influence the academic development and psychosocial growth of university students. Interventions are most effective at the initial stage of health professions education with the implementation of a culturally competent curriculum that addresses cultural sensitivity and cultural awareness. This project sought to: a) design, deliver and evaluate a cultural competency module integrated into Pharmacy and Nutrition curricula; b) describe the experiences of participating students; and c) communicate lessons learned. **Methods:** The module was delivered over five weeks (January 7- March 6, 2008). The Pharmacy and the Nutrition students each received a separate didactic presentation and an interprofessional tutorial to the combined student groups. This was followed by field work consisting of interviews and site observations with one of several Saskatoon community-service organizations. The module ended with a final community engagement exercise where students presented the outcomes of their field work experience in the form of posters and personal reflections to the faculty and representatives of the community-service organizations. **Results:** One hundred and thirty-eight students enrolled in PHAR 365 (n=90) and NUTR 221 (n=48) participated in the project. In addition to nutrition students, NUTR 221 included some students from kinesiology, arts and science and food science. The thirty (30) interprofessional teams (5-6 students) each observed and interviewed one of fourteen (14) Saskatoon community-service organizations. In presenting the results of their interviews and observations, student teams demonstrated a greater awareness and appreciation of the needs and challenges faced by various individuals and groups in the community. **Conclusions:** A pedagogical framework that reflects culturally responsive teaching though community-based learning can help prepare health care providers to better serve their communities. This project serves as a prototype for a model of cultural immersion experience, exemplifying how faculty, staff, business and community stakeholders may collaborate to facilitate and support students as they become more culturally competent.

ET-11 Why Should I Care?: Exploring Pharmacy Students' Experience of Learning Medicinal Chemistry

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Background: Today there are palpable tensions within pharmacy education and practice as the profession continues to adapt to and legitimize itself within the increasingly complex Canadian health care system. For pharmacy educators and administrators making decisions about curricular composition, finding the balance between the foundational pharmaceutical sciences and the enhanced experiential training necessary for practicing pharmaceutical care has led to considerable curriculum debate and restructuring efforts. In particular, medicinal chemistry faculty have experienced intense pressure to justify what and how much medicinal chemistry content and instruction is appropriate for contemporary pharmacy education. This pressure has been exacerbated by limited understanding of and research into: 1) the place of medicinal chemistry in contemporary pharmacy education and practice, 2) the impact of traditional teacher-centered approaches to medicinal chemistry instruction which frequently do not connect medicinal chemistry to pharmacy practice in meaningful ways, and, 3) the students' often negative experiences of learning medicinal chemistry in pharmacy programs including long standing perceptions of irrelevance of medicinal chemistry in their education and training. **Objective:** This study, representing part of a larger research program addressing the issues exacerbating the plight of medicinal chemistry in contemporary pharmacy programs, explores student's experiences of learning medicinal chemistry in the first-year physicochemical properties of drugs course in the UBC pharmacy program. **Methods:** Based on cognitive theories of novice and expert learning, action research methodology was used to

collect a range of quantitative and qualitative data to examine student's experiences of learning medicinal chemistry. Data sources included student midterm and final exams, office hour discussions, and written personal statements. **Results:** Students' experiences of learning medicinal chemistry were indicative of novice learning. Functional group recognition, particularly related to pattern recognition in larger drug structures, provided the greatest difficulty for students. Relying on previous chemistry knowledge, approaching chemistry learning as memorization, and not recognizing time-on-task as critical to developing expert-level knowledge led to student difficulties. Most students felt medicinal chemistry was important for their training as pharmacists. **Conclusions:** Understanding students' experiences of learning may have important implications for curriculum decisions, design and teaching practice regarding medicinal chemistry in contemporary pharmacy programs.

ET-12 Providing Pharmaceutical Care - Academic Development of a Professional Competency

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Objectives: One of the main professional competencies that a pharmacy student must acquire throughout his pharmacy program is the ability to provide pharmaceutical care. In the context of transforming our bachelor's degree into a professional doctorate in pharmacy (PharmD), it was decided that this competency would be the "pivot" or at the center of the 14 Pharmaceutical Care courses integrating different disciplines (pathophysiology, biopharmaceutics, pharmacology, pharmacotherapy, etc.) In order to provide a uniform language amongst faculty and students, the pharmaceutical care process was reviewed, mapped and used to create an interactive teaching tool for all Pharmaceutical Care courses. **Methods**: A team of 5 community and hospital pharmacists, along with an instructional designer, first undertook a systematic analysis of the competency. A detailed map of the cognitive process involved in providing pharmaceutical care was then developed using software specifically designed for that purpose (MotPlus®). **Results**: Mapping of the cognitive process in providing pharmaceutical care resulted in 295 knowledge units. To facilitate the implementation of this active learning strategy, the prototype was first made into a paper "road map" and provided to all students. This map allows students to "travel" throughout the process while resolving a case. Students were taught how to read the map and had several opportunities to use it to resolve cases in the Pharmaceutical Care courses. The prototype will also be used to develop a Web tool that will allow students to "travel" throughout the process on their computer, to listen to audio capsules or to watch videos attached to the different knowledge units. **Conclusions**: By making explicit this complex pharmaceutical care process by the use of a validated knowledge map and applying it throughout the different courses of the new program, the students' learning process will be facilitated and allow a better development of the competency.

This abstract was presented at the European Society of Clinical Pharmacy, May 2007.

ET-13 An Enhanced Advanced Pharmacy Practice Experience (APPE) Community Model to Improve Patient Care

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Objective. To quantify the benefits of an enhanced advanced pharmacy practice experience (APPE) community pharmacy model compared to the traditional program by comparing basic and comprehensive pharmaceutical care (PC) care provided by students and by assessing the enhanced arm preceptors' perspectives of the APPE. **Methods.** A pilot study consisting of one treatment (enhanced) arm and two control (traditional) arms was used. The enhanced APPE consisted of a preceptor education program, a 5-day onsite student orientation and an 8-week experience completed at one rather than 2 community sites. **Results.** The level of interventions provided by students in the treatment arm significantly surpassed that of the control arms. In addition, preceptor questionnaires indicated overwhelming support for the enhanced model over the traditional APPE. **Conclusions.** The study's findings demonstrated that the enhanced APPE model enabled the participating pharmacies to provide increased level of patient care (as compared to the control sites) and improved preceptor satisfaction with the APPE.

ET-14 Curriculum Exit Survey

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Objective: UBC's Faculty of Pharmaceutical Sciences introduced an abilities-based curriculum in 2003. Individual courses in the new curriculum were designed to teach and assess certain general and specific abilities. The curriculum implementation over four years was extensively evaluated. One part of that evaluation cycle was yearly exit surveys of first through fourth-year students in 2005, 2006, 2007 and 2008. **Methodology:** All students (students part of the "old" and "new" curriculum) registered in the B.Sc. (Pharm.) program were asked to complete a web-based questionnaire each year, concerning their experience with that year's curriculum. The general context the students were asked to consider was: "The Faculty has been attempting to move from a focus on teaching facts and memorization to a focus on ability-related learning outcomes. We would like to know how well we have done in the past year in helping you develop the following abilities. Please answer each item in terms of how well we did for YOU." This statement was followed by a list of nine general abilities and eight specific abilities. For each ability the respondent used a 5-point Likert-type scale (very poorly = 1; poorly = 2; neutral = 3; well = 4; very well = 5). A set of four hypotheses guided the research and focused upon the differences in students' ratings of how well the Faculty taught the general and specific abilities as they progressed through the curriculum. **Results:** Each of the 2005, 2006, 2007 and 2008 data sets were combined to create two scales (General and Specific Abilities). (The 9 General Abilities items together had a Chronbach's Alpha reliability of 0.858, and the 8 items in the Specific Abilities set had an Alpha of 0.885.) ANOVA revealed that the scale values varied according to the student's membership in the old or new curriculum. **Conclusions:** From the students' perspective, the new curriculum was achieving the specified educational outcomes.

ET-15 Evaluation of the First-year Entry-level Pharm.D. Community Pharmacy Rotation at Université de Montréal

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Introduction: The first community pharmacy rotation is an introduction to pharmacy practice after the first year of the entry-level Pharm.D. Each student is assigned to an accredited site with a trained preceptor for a four-week rotation. **Objective:** To evaluate the clinical community pharmacy rotation for first-year entry level Pharm.D. students. **Study Methods:** A web-based questionnaire was sent to all students and preceptors after the rotation. Student preparedness and ability to perform tasks, and tools developed for the rotation were evaluated. Two separate focus groups were also held with preceptors and students. **Results:** In May or June 2008, 193 students completed the rotation and were supervised by 133 pharmacists. The questionnaire was completed by 123 (64%) and 81 preceptors (61%). The preceptors and students found that students were most prepared to create a patient database and to prepare drugs and less prepared to manage follow-ups. Most preceptors agreed that the evaluation tools are adequate to evaluate transverse and specific competencies; however their format could be more practical. The patient data collection sheet was the least adapted for this rotation. The majority of students (92%) would return to the same site for a rotation and 93% of preceptors would repeat the experience. During the focus groups, students mentioned that the first rotation was a good means to apply knowledge and to interact with patients. Preceptors found the students well prepared and the tools useful. **Conclusion:** Both students and preceptors appreciated the first-year community rotation. Adjustments to improve certain aspects will be made.

ET-16 Collaborating for Education and Practice: An Interprofessional Newborn Care Module on Breastfeeding. Anne Drover[1,2], M.D., FRCPC; Marilyn Jacobs[1,3], BN, BVocED, MN; Paula Kelly[1,3], BScN, MSN; *Rebecca Law*[1,4], BScPhm, PharmD; Janet Murphy Goodridge[5], BNSc, MN, IBCLC; Gladys Schofield[1,6], RN, BSc, Bed, BN, Med
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Introduction: An interprofessional education module about collaborative teamwork in the care of the newborn was created for medical, nursing, and pharmacy students. **Methods:** Faculty identified common curricula in the care and support of the newborn. Breastfeeding was chosen as a focus, as it demonstrates the importance of collaborative care for a successful outcome. A case-based module incorporating both electronic and face-to-face learning was used. Nursing, medicine and pharmacy students participated in small groups and a panel discussion. **Results:** Two hundred and nineteen (N = 219) students participated: 62 medicine, 16 pharmacy, and 141 nursing. Two hundred students completed an evaluation of the module (response rate of 91.3%). Eighty-three percent (83.0%) of respondents felt the learning experience enhanced their understanding of inter-professional teamwork. Students appreciated the roles and expertise of other health professionals. Both small group learning and panel discussion were rated highly: 84.4% and 83.9% of students respectively considered these activities useful. Over 80% of students said the learning objectives were clear, the module was well organized, and the workload was fair. Eighty-five percent (85%) of students indicated the case studies were more useful in facilitating learning, followed by the small group learning experience. Overall, 76% of respondents agreed or strongly agreed that this module was a meaningful learning experience. **Conclusion:** The module enhanced students' understanding of interprofessional teamwork and the subject area of breastfeeding. We have demonstrated that it is possible to develop curricula in breastfeeding education for undergraduate health professional students that has high satisfaction and meets educational outcomes. This work was presented at the conference **Breastfeeding: The Smart Choice - Stepping Up to Baby-Friendly** on February 12 - 21, 2009 in Vancouver, BC.

ET-17 Reconceptualizing Curriculum in Pharmacy Education
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Background: The pharmacy profession is attempting to shift from a product to a patient focus and similarly contemporary pharmacy curricula are shifting to incorporate patient-centred care. The field of Curriculum Studies is moving in new directions of curriculum inquiry. Curriculum viewed as discourse questions the ways in which language is used, the modes of reasoning, styles of meaning making and knowledge orientations. **Objectives**: Of interest in this curriculum inquiry is how it is that students and preceptors come to their way of understanding patient-centred care. **Methods**: Based on Gadamer's principles of philosophical hermeneutics, conversation was used to explore the "practice" experiences of 3 students and 3 preceptors within the pharmacy curriculum at the University of Alberta. The conversations were recorded and transcribed and specific situations were revisited with the study participant to further explore how it is that the participant came to that understanding of the experiences. **Summary of Results**: An important finding of this study was the instrumental reasoning embedded in the way patient-centred care was understood. Students expected to "fix" the patient and they were responsible if the "fix" failed. Preceptors struggled to achieve a "perfect" world of pharmaceutical care for their students. Aoki suggests that an instrumental orientation leads to expectations of control and a rule governed view of "practice" which contradicts attending to the individual's situation. An instrumental orientation fails to address the messiness of lived situations, the uncertainty and the unpredictability. These findings challenge the taken for granted assumption of practice as the "application of theory". **Conclusions**: Curriculum research such as this contributes to reconceptualizing curriculum as a more complex phenomena. Curriculum discourse built on the dominant views of knowledge in pharmacy education can lead to understanding practice as instrumental action. The Blueprint for Pharmacy suggests the need for a cultural shift within the profession. I propose that the "cultural shift" needs to originate within the curricula of pharmacy education and the ways in which curriculum informs the understanding of practice and patient-centred care.

Social and Administrative Research Posters

SAR-1 Antipsychotic Prescriptions to Children: A Canadian Population-based Study

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Objectives: To report the prescribing of antipsychotic agents (AA) to the youth population of the Canadian province of Manitoba over the course of the last decade. **Methods**: Utilization of antipsychotic agents in children and adolescents (18 years old or younger) was described using data collected from the administrative databases of the Manitoba Health Data Repository and the Statistics Canada census. **Results**: The youth population has been stable over the last decade at approximately 300,000 in the province of Manitoba (27% of the total population), but the prevalence of antipsychotic use in this segment of the population increased significantly (from 0.14% to 0.64%) with the introduction of the second generation agents (SGAs). The male to female ratio increased from 1.5 to 2.6 as the male youth population represented the fastest growing subgroup of antipsychotic users in the entire population of Manitoba. Stratifications by income quintile showed that the highest percentages of AA use was reported for children living in low income urban neighbourhoods with approximately 30% of all children belonging to the two lowest income quintiles. Total number of prescriptions also increased significantly despite the lack of approved indications in this population. The number of distinct prescribers also increased. The most common diagnoses linked to antipsychotic users in recent years were Attention Deficit Hyperactivity Disorder (ICD-9-314) at more than 60% and Conduct Disorders (ICD-9- 312) at more than 50% in recent years while the prevalence of autism fluctuated between 19 and 20%. **Conclusion:** It appears that since their introduction to the market the SGAs have been used off-label in the youth population as adjunctive treatments for aggressive behaviours across a range of diagnoses. The dramatic increase in antipsychotic prescribing to children is alarming especially as more reports of significant adverse events associated with the use of these agents become available.

SAR-2 The Economic Analysis of the Price Drivers on Statin Drugs Under the Nova Scotia Pharmacare Programs

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Objective: This paper studies drug price differentials under Canadian healthcare policy and legislation. It focuses on one class of antilipemic drug, the HMG-CoA reductase inhibitors (statins), which are reimbursed under the NS Pharmacare Programs, as the sample cohort. The study analyzes the factors associated with drug price changes. In particular, it addresses the following questions: Are me-too drugs (patented drugs in the same class as the first-in-class drug) drivers of the overall drug price level? Do more generic substitutes create increased downward pressure on brand-name drug prices? How much more would the NS provincial drug plan have spent, assuming no generic drugs were available? **Methods:** Data related to drug products, including: patent information, WHO anatomical-therapeutic classification (ATC), strength, dosage form, and manufacturer list price, were used in the analysis. The dataset represented 105 statin drug products in different strengths from 6 ATC sub-groups. The quarterly observations span from April, 2000 to June 30, 2008. The whole panel contains 2,082 observations in an unbalanced manner. A multilevel random-effect panel regression model was employed to examine the statistical relationship between drug price dynamics and the changes of drug market structure. **Results:** The regression analysis shows a weak association between the number of generic drugs and the decrease in drug prices. Assuming there were no generic substitutes available in the market, an estimated $2.3 million extra would have been spent by the NS Pharmacare Programs for statins during the study period. **Conclusions:** The lack of drug pricing regulations regarding off-patent brand-name drugs at the Federal level and limited policies applying to these drugs by public drug plans have important implications on nationwide

drug cost containment. Further cost savings would be dependant on large price drops in generic drugs and a shift of drug utilization in favour of generic drugs.

SAR-3 Utilization Patterns of Statins in Nova Scotia Seniors' Pharmacare Program

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Objectives*:* The study looks at the change in utilization patterns over time for the use of statins in the Nova Scotia Seniors' Pharmacare program. The associated change in costs and, factors causing costs to change are identified. **Methods***:* The study uses claims data residing on the Nova Scotia Seniors' Pharmacare Decision Support System covering the January 1, 2005 to November 30, 2008 time period. The measures of change are unique monthly beneficiary counts for utilization and annual drug ingredient costs. A measure of average defined daily dose (DDD) on a per molecule basis is calculated to compare costs between molecules. The products are grouped at the molecule level. The changes related to cost are identified as demographic (population aging, growth), price, and quantity (change in number of tablets, strength, and molecule mix). **Results***:* Increased use on a unique beneficiary basis is observed for atorvastatin and rosuvastatin. The other molecules indicate flat to declining patterns. Atorvastatin has the largest share of beneficiaries; however, growth in the use of rosuvastatin is at a higher rate compared to atorvastatin. Higher numbers of beneficiaries are observed over the time period; however, the rate of cost growth is slowing in each year from 10.4% in 2006 to 7.3% in 2008. Quantity change has the greatest impact on cost growth in terms of comprising the largest component of overall price change. A breakdown of the quantity variable reveals the largest factor in the slowing cost increase is related to the impact of the change in product mix which indicates a decline of -3.5% in 2008. **Conclusions***:* On a per DDD basis rosuvastatin is the least costly molecule in its chemical/therapeutic subgroup. Although a definite link cannot be firmly established, it is possible that the observed change in molecule mix and associated decreased rate of cost growth is related to the increased use of rosuvastatin.

SAR-4 Identifying Early Prescribers of Cycloxygenase-2 Inhibitors (COX-2s) in Nova Scotia, Canada: Considerations for Targeted Academic Detailing

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Objectives: The purpose of this study was to describe physician prescribing patterns, and establish criteria by which various prescribing profiles may be segmented and identified. Gaining insight into the profiles of prescribing physicians would serve to better target detailing and continuing medical education resources, which would potentially lead to a reduction in health-care (prescription drugs) related expenditures. **Methods:** A sample of 925 physicians practicing in Nova Scotia was characterized by age, sex, rural/urban nature of their practice and specialty. They were subsequently evaluated relative to all prescriptions filled by their patients in a publicly funded drug plan (seniors Pharmacare). **Results:** This analysis established the profiles of two key groups of physicians: (1) those most likely to comprise the early, high volume COX-2 prescribing universe (profiles based on the absolute number of prescriptions written over a given period). These individuals were likely to be older (than the mean), experienced male general practitioners operating in a rural practice, and (2) those most likely to comprise the early, high relative COX-2 prescribing universe (prescribing of COX-2s relative to COX-2s and non-selective non-steroidal anti-inflammatory drugs (NS-NSAIDs)). These individuals were likely to be younger (than the mean); less experienced female general practitioners, operating in an urban practice. **Conclusion:** This research has identified unique physician segments that account for either the largest volume of prescriptions for new drugs, or the largest relative volume of prescriptions, in this one therapeutic area. As pharmacists expand their medication management roles, they can tailor educational messages to take into account physician prescribing characteristics.