

Titre: Effet d'extraits de cannelle et de marc de raisin riches en polyphénols sur le métabolisme, le microbiote intestinal et la barrière intestinale de la souris

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Résumé: Introduction : Les bénéfices de la consommation de polyphénols dans la prévention du syndrome métabolique et comorbidités sont bien documentés. Cependant, peu de données sont disponibles sur l'impact des polyphénols sur le microbiote intestinal et les facteurs de risques cardiométaboliques. Objectif : L'objectif a été d'évaluer les effets de deux extraits végétaux riches en polyphénols (cannelle et marc de raisin) sur le métabolisme, le microbiote intestinal et la barrière intestinale dans un modèle d'obésité induite par le régime. Méthodologie : Des souris C57BL/6 mâles ont été nourries pendant 8 semaines avec un régime contrôle (11% de gras, CT), un régime riche en graisses (60%, HFD), ou un régime riche en graisses apportant un extrait de cannelle (CBE) ou de marc de raisin (GPE) (14 souris/groupe). Le poids et la prise alimentaire ont été mesurés chaque semaine et la composition corporelle estimée par RMN. A 7 semaines, une épreuve d'hyperglycémie provoquée par voie orale a été réalisée. A la fin du suivi, des tissus et des selles ont été collectées pour analyse. Résultats : La consommation de CBE et GPE associée au régime HFD a diminué la prise de masse grasse et réduit l'inflammation du tissu adipeux, sans impacter la consommation alimentaire. Ces effets étaient associés à une réduction de la stéatose hépatique et une diminution des taux d'acides gras insaturés circulants. L'homéostasie du glucose a été améliorée (amélioration de la tolérance au glucose et réduction de l'insulino-résistance). Par ailleurs, l'amélioration du profil métabolique observée après consommation des deux extraits végétaux était associée à un effet significatif sur la composition du microbiote intestinal, notamment pour le groupe GPE. Dans ce groupe, une diminution des *Desulfovibrio* et *Lactococcus*, et une augmentation des *Allobaculum* et *Roseburia* ont été observées. Enfin, l'expression de plusieurs peptides antimicrobiens et protéines de jonctions serrées a été

augmentée dans les groupes CBE et GPE, indiquant une amélioration de la fonction de barrière de la muqueuse intestinale. Conclusion : Les extraits de cannelle et de marc de raisin testés pourraient améliorer le profil métabolique de souris recevant un régime riche en graisse, en agissant notamment sur le microbiote intestinal.

Titre: A polyphenol-rich cranberry extract modulates the virulence properties of *Fusobacterium nucleatum*

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Résumé: Introduction: *Fusobacterium nucleatum* has been associated with various forms of periodontal disease and is a key bacterial species involved in physical interactions between symbiotic and dysbiotic members of the oral microflora. It is also a resident of the human gastrointestinal tract and has been associated with inflammatory bowel disease as well as colorectal cancer. Objectives: The aim of this study was to investigate the effects of a polyphenol-rich cranberry extract on virulence properties of *F. nucleatum*. In addition, the ability of the cranberry extract to modulate the gingival and intestinal epithelial tight junction integrity was evaluated. Lastly, the effects of the cranberry extract on activation of the nuclear factor- κ B (NF- κ B) and TREM-1 signaling pathways in monocytes were assessed. Methodology: The antibacterial and anti-biofilm activities were determined with a microplate dilution assay. A fluorescence assay was used to determine the effect of the cranberry extract on the adherence of *F. nucleatum* to a basement membrane matrix model (Matrigel™) and to oral and intestinal epithelial cells. The protective effect of the cranberry extract on the gingival and intestinal epithelial was evaluated by determination of the transepithelial electrical resistance (TER). The U937-3 κ B-LUC monocyte cell line transfected with a luciferase reporter gene was used to monitor NF- κ B activation. Finally, TREM-1 gene expression and sTREM-1 secretion were assessed by qPCR and ELISA, respectively. Results: Cranberry extract dose-dependently inhibited the growth of *F. nucleatum* as well as biofilm formation. This antibacterial activity appeared to involve iron-chelating activity. The extract reduced the adherence of *F. nucleatum* to the basement membrane matrix model as well as to oral and intestinal epithelial cells. Moreover, a protective effect of cranberry extract on the gingival and intestinal epithelial tight junction integrity breakdown mediated by *F. nucleatum* was demonstrated. Lastly, the cranberry extract reduced the *F. nucleatum*-mediated activation of the NF- κ B signaling pathway and attenuated the TREM-1 gene expression as well as sTREM-1 secretion. Conclusions: In addition to be considered as an etiologic agent of periodontitis, *F. nucleatum* has been recently associated with several extra-oral pathological conditions, including colorectal cancer. This dual anti-bacterial and anti-inflammatory action of a polyphenol-rich cranberry extract suggest that it may represent a promising novel therapeutic agent.

Titre: Valorization of Snow Crab Cooking Effluents for Food Bioproducts Development

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Résumé: Seafood processing generates considerable amounts of solid and liquid wastes in the environment, which causes pollution. These wastes represent a potential source of high-value biomolecules for food, pharmaceutical and cosmetic applications. Valorization of this residual biomass is a possible way to obtain cost-effective depolluting processes. Very few works have considered the wastewater valorization comparatively to the solid by-products. Cooking waters, more specifically, are characterized by a high organic load, which could contain valuable molecules such as proteins, peptides, pigments, as well as taste and aroma compounds. In addition, snow crab processing is among the most important in Canadian fisheries but cooking effluents composition is not very well-known. However, the value-added compounds must be purified in order to convert them into marketable products. Membrane processes are well suited for this because they allow the simultaneous recovery of valuable compounds and water depollution. This investigation aimed to concentrate and valorize the biomass contained in snow crab cooking wastewater for the development of bioproducts for food applications. To do this, a reverse osmosis process has been optimized and applied to the cooking waters. This was followed by a freeze-drying step. The freeze-dried concentrates were then characterized. Their chemical composition was analyzed, including the characterization of flavor profile compounds. The extracts were mainly composed of proteins (59.2 %) and minerals (38.6 %) and contained desirable aroma compounds. Their functional properties (solubility, water-holding capacity), as well as their antioxidant activity (137.6 μmol Trolox equivalent/g), were also assessed, and their microbiological safety was verified. The results obtained show that these concentrates could have potential uses as flavoring agents in the food industry.

Titre: Impact des polyphénols de bleuets sur les désordres métaboliques dans un modèle de souris obèse

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Résumé: La consommation de bleuet a été identifiée comme étant une stratégie afin de contrer les maladies métaboliques liées à l'obésité. Il a été proposé que la teneur en polyphénols des bleuets puisse contribuer à ces effets. Certains de ces polyphénols ne sont pas absorbés et peuvent atteindre le colon et avoir un impact sur le microbe intestinal, un élément clé du métabolisme de l'hôte. La modulation du microbiote par les polyphénols de bleuets pourrait aider à prévenir l'apparition de complications métaboliques associées à l'obésité. L'objectif de ce projet consistait à évaluer les effets bénéfiques et prébiotiques d'une supplémentation en bleuet entier, en extraits enrichis d'anthocyanes ou de proanthocyanines de bleuets contre le développement de l'obésité et de la résistance à l'insuline en plus d'étudier les impacts de ces traitements sur le microbiote intestinal dans un modèle d'obésité induite par l'alimentation. 70 souris mâles C57/BL6 ont été assignées à une des cinq diètes suivantes : deux groupes contrôles ont reçu soit une diète équilibrée (Chow), soit une diète obésogène riche en lipides et en sucrose (HFHS). Trois autres groupes ont été nourris avec la diète HFHS, mais supplémentés avec une poudre complète de bleuets, une fraction enrichie d'anthocyanes (ANT), ou de proanthocyanines (PAC). Après 8 semaines, les souris ont été hébergées dans des cages métaboliques. Au temps 12, un test de tolérance au glucose (oGTT) a été effectué et des échantillons fécaux récoltés puis analysés par séquençage de type shotgun. Après 8 semaines, les souris PAC ont gagné moins de poids que le groupe HFHS sans modulation de leur apport énergétique. Les souris PAC parcouraient une plus grande distance dans les cages métaboliques. Les souris des groupes PAC et ANT ont présenté une meilleure sensibilité à l'insuline lors de l'oGTT. Les analyses de type shotgun ont révélé que le microbiote intestinal des souris PAC présentait une modulation des fonctions géniques associées au métabolisme de l'alanine, aspartate et glutamate et de la phosphorylation oxydative. Ces données suggèrent que les extraits purifiés de proanthocyanines améliorent le profil métabolique et que certains de ces effets pourraient être associés à une modulation du microbiote intestinal.

Title: Long-term effects of a healthy eating blog on the diet of French-speaking Canadian mothers and their children: a randomized controlled trial

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Abstract: Introduction: Social media are increasingly used by registered dietitians to promote dietary behaviour change and improve adherence to dietary recommendations among the population. Objective: This study explored the long-term effects of a 6-month exposure to an evidence-informed healthy eating blog on diet quality and intakes of vegetables and fruit and milk and alternatives of French-Canadian mothers and their children. Methodology: A total of eighty-four adult mothers of children aged between 2 and 12 years living in Quebec City, Canada, who consumed < 7 servings/day of vegetables and fruit and/or < 2 servings/day of milk and alternatives were randomly assigned to a 6-month intervention delivered through a blog written by a registered dietitian (RD) who published weekly posts integrating behaviour change techniques promoting healthy eating (BLOG group) or to a waiting-list control group with no exposure to the blog. Dietary variables were measured at baseline, after the intervention (T=6) and at a 12-month follow-up (T=12). Differences between groups were assessed with mixed linear models for repeated measures. Associations between blog use and diet quality was assessed using logistic models adjusted for socio-demographic variables. Results: Sixty-two mothers (73.8%) completed the intervention and 56 (66.7%) attended the 12-month follow-up. No significant difference in response between the groups was observed for consumption of vegetables and fruit in mothers (group by time interaction effect; $p = 0.071$) and their children ($p =$

0.367) as well as for consumption of milk and alternatives in mothers ($p = 0.084$) and their children ($p = 0.087$). Among the BLOG group, a higher frequency of logins to the blog (i.e. [median value of 25.5] was associated with higher odds of better diet quality [i.e. healthy eating index score \geq median value of 61.2] at T=6 and T=12 (OR adj=21.04, 95% CI=1.15, 383.63). Conclusion: The exposition to an evidence-informed healthy eating blog written by a RD for 6 months had neutral effects on dietary intakes, measured as the amount of food group servings, of mothers and their children after a one-year follow-up; however, higher use of the blog may promote better diet quality in mothers.

The structure and rheological properties of stirred yogurts are modulated by whey protein content and smoothing temperature

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Introduction: Consumers are not always ready to compromise with the loss of texture and increased syneresis that non-fat stirred yogurt displays. **Objectives:** In this study, milk protein composition and smoothing temperature were investigated as a leverage to control the non-fat yogurt microstructure, textural properties and wheying-off. **Methodology:** Yogurts were prepared with different caseins to whey proteins ratios (Y1.5, Y2.8 and Y3.9). Yogurts were pumped through a smoothing pilot system comprising a plate heat exchanger set at 15, 20, or 25 °C and stored at 4°C until analysis (day 1, 9 and 23). Yogurt particle-size (microgels; analysis of microscopic images), and firmness (texture analyzer) were measured. Yogurt syneresis and water mobility were respectively measured by centrifugation and time domain low frequency ¹H-NMR (1H-LF-NMR). **Results:** Increasing the smoothing temperature increased gel firmness and microgel sizes independently of the whey protein content. Also, yogurt microgel sizes evolved with storage time, but the evolution pattern depended on protein ratio. Yogurt Y1.5 showed the biggest particles and their sizes increased with storage time as opposed to Y2.8 and Y3.9. Micrographs showed heterogeneous gel with empty area occupied by serum for Y1.5, while Y2.8 and Y3.9 showed few serum and more disrupted gel embedding microgels. Forced syneresis reduced with increase whey protein content and time of storage. It is in agreement with 1H-LF-NMR showing less serum mobility with increasing whey protein content during storage. However, high spontaneous serum separation was observed during storage for Y1.5 and Y3.9 while it was low and stable for Y2.8. **Conclusion:** Microgels play an important structural role on yogurt textural attributes and they are modulated by whey protein content and smoothing temperature. Optimization of these parameters by the dairy industry may limit the use of additives in non-fat dairy products improving consumer satisfaction.

Title: Impact of a prebiotic cranberry extract on weight loss and glucose tolerance in obese mice exposed to persistent organic pollutants

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Abstract: Introduction: The dramatic increase in the global occurrence of obesity and associated cardiometabolic diseases (CMD) calls for new strategies to promote weight loss. However, while the beneficial effects of weight loss are well known, they often not take into consideration the fate of liposoluble molecules such as persistent organic pollutants (POPs). These pollutants are known to be endocrine disruptors and can contribute not only to CMD but also to the development of certain types of cancer. POPs may exert some of these detrimental effects through perturbations of the gut microbiota. Objective: In this study, we evaluated the impact of a prebiotic on the effects of POPs release in the circulation during weight loss, and on glucose tolerance, inflammation and gut microbiota. Methods: The animals were exposed to a high-fat high sucrose diet containing POPs for twelve weeks, after which they were fed a low-fat low sucrose diet for four weeks to induce weight loss. During the last six weeks of the protocol, they received a polyphenol-rich cranberry extract (200 mg/kg) or vehicle (water) treatment daily. Oral glucose tolerance tests were performed at week 9 and 16, while feces were collected throughout the protocol for metagenomic analyses. At the end of the protocol, tissues were collected, weighted and conserved for subsequent analyses. Results: Our initial results show a significantly greater weight loss in the obese mice treated with the cranberry extract compared to the vehicle. Furthermore, the cranberry extract significantly lowered fasting glycemia and improved glucose tolerance. Conclusions: The administration of a cranberry extract accentuated weight loss and improved glucose tolerance in mice switched from a high-fat high sucrose to a low-fat low sucrose diet. Future analyses are underway to determine whether this extract facilitates the elimination of circulating POPs in association with changes in gut microbiota composition. The use of prebiotics would allow for the development of weight loss programs that are safer and more efficient, which in turn would contribute to the development of novel and accessible treatments as a therapeutic avenue.

Titre: Vitamine D plasmatique, déclin cognitif et incidence de la démence : Étude sur la santé et le vieillissement au Canada

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Résumé: Introduction : La vitamine D pourrait présenter un intérêt dans le maintien de la fonction cognitive ainsi que dans la prévention de la démence et de la maladie d'Alzheimer (MA) en raison de ses propriétés neuroprotectrices, antioxydantes et anti-inflammatoires. Objectif : Évaluer l'association entre la concentration plasmatique de 25-hydroxyvitamine D (25(OH)D) et 1) la fonction cognitive, 2) l'incidence de la démence et de la MA chez 661 sujets de l'Étude sur la Santé et le Vieillissement au Canada (ESVC, 1991-2002). Méthodologie : L'ESVC est une étude longitudinale de 3 phases sur 10 ans comprenant initialement 10263 sujets, un échantillon représentatif de la population canadienne âgée de 65 ans et plus. La 25(OH)D a été mesurée par électrochimiluminescence chez un échantillon de sujets cognitivement normaux au moment d'une prise de sang lors d'une évaluation clinique. La fonction cognitive a été évaluée à l'aide du Modified Mini-Mental State (3MS). Les diagnostics de démence et de MA ont été établis par consensus entre un médecin et un neuropsychologue selon des critères diagnostiques publiés. Les co-variables ont été obtenues lors de l'évaluation clinique (âge, sexe, éducation, indice de masse corporelle, comorbidités, allèle e4 sur le gène de l'apolipoprotéine E (ApoE4)) et par questionnaire (habitudes de vie). Les associations entre la 25(OH)D et la fonction cognitive, la démence et la MA ont été évaluées à l'aide de différence de moyennes et de rapports de taux d'incidence ajustés pour les co-variables. Résultats : De façon globale, les données ne montraient pas d'association entre la 25(OH)D, la fonction cognitive et l'incidence de la démence ou de la MA. Toutefois, les analyses stratifiées selon le sexe, montraient une augmentation de l'incidence de la démence et de la MA chez les femmes avec l'augmentation de la 25(OH)D. Conclusion : Cette étude ne permet pas de conclure quant à l'effet protecteur de la vitamine D sur la fonction cognitive ou l'incidence de la démence, mais offre des pistes de recherche future intéressantes, notamment quant à l'effet modifiant du sexe dans la relation entre la vitamine D et la démence.

Title: Capillary Electrophoresis: a fast, cost effective and efficient method replacement for LC-MS when identifying and quantifying small peptides from simulated gastrointestinal digestion of collagen hydrolysate

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Abstract: Peptide analysis for urine or plasma samples have relied predominantly on high-performance liquid chromatography coupled with mass spectrometry with or without laser-induced fluorescence or liquid chromatography-mass spectroscopy. Using these instruments, sample preparation can be laborious with prolonged and expensive method development. Capillary electrophoresis (CE) offers the possibility for a more cost effective, fast and reliable alternative method for peptide analysis due to its sensitivity, ease of use and versatility. Collagen hydrolysates (CH) have been indicated to provide a variety of health promoting benefits attributed to bioactive peptides released during the process of digestion. The present study utilized a simulated human digestion model to identify and quantitate bioaccessible peptides generated via upper intestinal digestion of CH. The identification of bioactive peptides is important towards gaining further understanding of the health properties of CH, and requires high throughput methods for streamlined analysis. An investigation was undertaken to determine the utility of CE for analysis of peptides generated within upper gastrointestinal digesta following CH hydrolysis. A human simulated digestion model was “fed” the CH product alongside enzymes (pepsin then pancreatic amylase with bile extract) at key timepoints, in which the pH was also adjusted, and digesta samples extracted. Methodology was developed for the analysis of CH digests using a CE system (Capel 105M; Lumex Instruments, Fraserview Place, BC) that allowed for sensitive detection and quantitation of three key peptides in the digesta including alanine-hydroxyproline ($156.447 \pm 5.384 \mu\text{g/ml}$); proline--hydroxyproline ($56.041 \pm 4.922 \mu\text{g/ml}$); proline—hydroxyproline-glycine ($58.356 \pm 1.604 \mu\text{g/ml}$). The present study demonstrates the capacity of CE for robust targeted peak analysis on a cost-effective basis that needs a relatively short time frame for method development.

Titre: Projet POLYSALGUE : production d'exopolysaccharides de faible poids moléculaire issus de microalgues pour des applications nutraceutiques.

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Résumé: Introduction : Les polysaccharides sont des polymères osidiques linéaires ou ramifiés, utilisés principalement dans l'industrie comme hydrocolloïdes, gélifiants et/ou épaississants. De plus, les polysaccharides présentent de nombreuses activités biologiques appliquées dans des domaines variés : antioxydants, antiviraux, anti-inflammatoires, etc. Les microalgues sont des microorganismes unicellulaires capables d'excréter dans leur milieu des exopolysaccharides (EPS). Contrairement aux autres espèces comme les bactéries et les champignons, les EPS issus de microalgues sont peu connus dans la littérature. Ces EPS sont des molécules dont le poids moléculaire est compris entre 2 000 et 10 000 kDa. Or des études mettent en évidence que les polysaccharides de faible poids moléculaire, inférieur à 50 kDa présentent des propriétés anti-lipidiques. Il est donc nécessaire de dépolymériser, c'est-à-dire réduire la taille de ces biopolymères afin d'augmenter leur potentiel comme agent anti-lipidique. Le projet POLYSALGUE, financé par l'Agence Nationale de la Recherche, regroupe 5 laboratoires et une entreprise et a pour but de sélectionner 8 nouvelles souches de microalgues productrices d'EPS et de valoriser ces derniers comme hydrocolloïdes et/ou comme actifs biologiques en nutraceutique. Objectif :Le projet vise à mettre en place une méthode de dépolymérisation applicable à l'ensemble des EPS sélectionnés, de caractériser structuralement et biochimiquement les poly- et oligo-mères formés et d'évaluer leurs propriétés nutraceutiques pour la prévention du syndrome cardio-métabolique. Méthodologie : La dépolymérisation s'effectue en deux temps. Les EPS sont tout d'abord prétraités à haute pression, afin d'initier la dépolymérisation et ainsi réduire leur viscosité. La réduction de la taille se poursuit ensuite par catalyse acide solide/liquide hétérogène, au moyen d'une résine cationique forte. La détermination du poids moléculaire moyen (Mw) s'effectue par analyse HPL-SEC et par triple détection (SEC/MALS/DRI). Résultats : La méthode de dépolymérisation est applicable pour l'ensemble des EPS du projet. Le Mw obtenu est compris entre 22 et 140 kDa, pour 61 à 99 % d'oligosaccharides de poids moléculaire inférieur à 10 kDa. Conclusion : La méthode de dépolymérisation est applicable aux 8 EPS du projet POLYSALGUE et permet de générer des oligosaccharides dont les effets sur la lipolyse et la lipogénèse seront prochainement évalués in vitro.

Title: Alteration of the endocannabinoidome in germ free mice: insight into the mechanisms mediating their metabolic phenotype

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Abstract: Introduction: Obesity and its associated complications of hyperlipidemia, NAFLD, type 2 diabetes and cardiovascular disease represent a global healthcare burden. Besides a disequilibrium in energy balance, the development of obesity is influenced by an interaction of genetic, environmental, behavioral and microbial factors. A disturbance in the interaction between nutrition, metabolism and the gut microbiome may constitute an important factor in the deregulation of host homeostasis. Gut microbiota 'interact' with adipose tissue development and metabolism through the endocannabinoidome (eCBome), a complex lipid signaling system with important functions in cardiometabolic health, by modulating the expression of endocannabinoid metabolic enzymes as well as the expression of the cannabinoid receptor type-1 (CB1) in the intestine and adipose tissue of mice. Intestinal microbiome and the eCBome also show differences in sex and age that may affect people's susceptibility to obesity-related complications. Objective: Given the interconnection between the microbiome and eCBome, we aim at understanding how the endocannabinoidome is altered in germ free mice in order to gain deeper insight into their metabolic phenotype, which may also inform on the mechanisms underlying obesity and its complications. Methodology: We measured the basal eCBome gene profiles and lipid levels using qPCR and LC/MS, respectively, within metabolically relevant tissues of germ free and conventionally reared male and female mice at juvenile and adult ages. Results: Our preliminary qPCR and LC/MS results show that the absence of the microbiome is accompanied by modifications in eCBome gene expression and lipid levels in the ileum, colon and BAT of male mice. These results consistent with the phenotype of GF mice and the roles that the eCBome are known to play in regulating BAT activity, gut motility and intestinal inflammation. Conclusion: Our study is providing us with more information on how the microbiome can impact the eCBome, allowing us to better design and perform studies in which we will investigate microbiome changes induced different dietary regimes, and consequent modulation of the eCBome in metabolically relevant tissues

and their impacts on cardiometabolic health.

Title: Fruit Smoothies Incorporating Starch Particles for Moderate and Prolonged Glycaemic Response: Effect of Starch Structure and Food Matrix on Digestibility

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Abstract: Introduction: Control of glycaemia is key to management and prevention of chronic and burdensome conditions such as diabetes, obesity, and cardiovascular disease, but consumer-friendly food options for glycaemic control are lacking. We aim to develop a novel portable fruit smoothie beverage, incorporating starch particles with controlled digestibility for a moderate and prolonged glycaemic response. Starch source, preparation, treatment, and storage of particles can affect starch's supramolecular structure and digestibility. Fruit phenolic compounds are also known to influence starch digestion kinetics. We hypothesize that controlling these factors will enable the application of starch particles with tailored glycaemic response, in consumer-friendly forms. Objectives: The primary objective of this study was to determine the impact of starch particle processing conditions on their supramolecular structure and digestibility, to establish their structure-function relationship. The secondary objective was to determine the impact of model fruit phenolic compounds on particle digestibility. Methodology: Potato (PS) and corn (CS) starches were hydrolyzed with HCl (2-3M, 1-5 days) before or after particle formation (2-3mm diameter). Starch's supramolecular organization was assessed using DSC. Particle digestion kinetics were determined from first-order reaction rate through in vitro digestion. Rapidly Digestible, Slowly Digestible, and Resistant Starch fraction was also determined in vitro. Additional digestion kinetics experiments incorporated model phenolic compounds (3-30 mM). Results: Untreated starch particles were highly retrograded and contained over 89.66% RS and below 5.18% RDS. Acid treatment of particles post-formation increased their digestion rate while not increasing significantly RDS, whereas native starch acid treatment did not have significant impact on particle digestibility. PS particles treated with 3M HCl for 4 and 5 days showed the highest SDS content at 8.65 ± 0.01 and 10.00 ± 0.01 , compared to untreated control (5.16 ± 0.01), suggesting that digestible starch content resulted from hydrolysis of RS. No significant effect from model phenolic compounds was found on starch digestibility, suggesting that digestion was mainly controlled by supramolecular organization via hydrolysis treatment. Conclusion: This work demonstrated the feasibility of making fruit smoothies enhanced by starch particles with controlled digestibility, through processing, with marginal influence from phenolic compounds. These particle beverages are an easily produced, innovative, and consumer-friendly form of preventive nutrition.

Title: Impact of postharvest ultrasound treatment on physiology and primary metabolic profile of the tomato fruit during storage

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Abstract: Tomato is one of the most consumed fruit/vegetable worldwide and its consumption is associated with lower risks of various chronic diseases. However, they are also perishables with limited shelf life. Among various approaches to extend the shelf life and reduce postharvest losses of fresh produce, the use of hormetic doses of abiotic stresses is gaining much interest, because of its potential not only to enhance disease resistance compounds, but also to elevate health-promoting substances. In this work, we examined the hormetic effect of ultrasound (US), a mechano-chemical stress, on tomato physiology and primary metabolic profile during storage. Mature-green tomato fruits were exposed to US (power; 135 W; frequency, 42±6 KHz) for duration of 0 to 90 min at 16° C. Physiological responses (respiration, ethylene production, color change and weight loss), and primary metabolites including precursors of secondary metabolites were monitored during 7 weeks of post-treatment storage. The hormetic dose for delaying fruit ripening was 45 min exposure time. The climacteric peak of ethylene production as well as respiration in tomato treated with hormetic dose showed a lag of 7 days when compared to the control fruit, and the weight loss was also the lowest. During the early hours following US application, the levels of proline, GABA and serine increased up to the hormetic dose, but they decreased above that dose, indicating their protective role as early stress responses. The titers of branched chain AAs (leucine, isoleucine and valine) in tomato, treated with hormetic dose, were lower compared to those of control during storage life while their levels increased with higher US doses. Reduced titers of these AAs with the hormetic dose of US and increased levels of their break down products (isovalerate/iso-caproate) may suggest their role as carbon substrates for overcoming carbon starvation as early stress response and for volatile biosynthesis. Time averaged titers of amino acids, organic acids, sugars and sugar alcohols were substantially affected in US treated tomato. Enhanced titre of phenylalanine and malonic acid may indicate the activation of shikimate-phenyl propanoid and flavonoid pathways. Levels of reducing sugar (fructose and glucose) were lower in tomato, treated with hormetic dose; however titers of sugar alcohols such as myo-inositol, mannitol and erythritol were higher. Reduced levels of phosphoric acid in tomato, treated with hormetic dose, may indicate the activation of the metabolic machinery in response to US. Towards end of storage, titres of asparagine, glutamine, threonine, and mannitol in tomato, treated with hormetic US dose, were significantly higher (>2 fold) compared to those of the control. Results suggest that the delayed ripening behaviour and the changes in the levels of primary metabolites, including precursors of secondary metabolites, by hormetic dose of US has significance from the standpoint of preservation of tomato and its health attributes.

Title: Screening of *Lactobacillus plantarum* strains according to their potential to transform gallotannins into bioactive metabolites

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Abstract: The health effects of polyphenols are influenced by how they are transformed by the gut microbiota. The use of probiotics might be a valuable strategy to increase the colonic production of bioactive metabolites in individuals harboring an unfavorable microbiota. For instance, *Lactobacillus plantarum* has demonstrated the ability to hydrolyze and decarboxylate gallotannins (a type of tannin commonly found in mango fruit and nuts); however, this metabolic capacity is strain-dependent. In order to identify potential probiotic strains able to transform gallotannins, a screening of 77 environmental *L. plantarum* isolates from milk, grass, as well as from straw and maize silages, was performed. First, the strains containing the extracellular tannase gene (*tanA*) were identified by PCR. Secondly, *tanA* positive strains were tested for the presence of genes encoding gallate decarboxylase (*lpdB*, *lpdC*). Simultaneously, the tannase activity was analyzed by a quantitative spectrophotometric method (n=5), while the gallate decarboxylase activity was confirmed using a qualitative colorimetric method. *tanA* gene was detected in 8 out of 77 isolates. The presence of this gene in *L. plantarum* strains was not associated with their source of isolation. On the other hand, five of the *tanA* positive strains showed a high tannase activity (RKG 2-690 [3.15 mU/mL ± 0.17], 1-500 [2.56 mU/mL ± 0.14], 1-613 [2.27 mU/mL ± 0.27], 1-473 [2.27 mU/mL ± 0.29] and 1-474 [1.39 mU/mL ± 0.30]), comparable to the reference strain (ATCC 14917 [2.48 mU/mL ± 0.26]) (P>0.05). However, the tannase activity of RKG 1-219 (0.81 mU/mL ± 0.25) and RKG 1-611 (0.57 mU/mL ± 0.35) strains was significantly lower (P<0.05). The RKG 2-439 strain exhibit no quantifiable tannase activity using the quantitative spectrophotometric method. *lpdB* and *lpdC* genes were identified in all *tanA* positive strains. Nevertheless, only five strains (RKG 2-690, 1-473, 1-474, 2-219 and 1-611) presented gallate decarboxylase activity. In conclusion, only three strains (RKG 2-690, 1-473 and 1-474), isolated from grass and maize silage, presented the expected metabolic functions. Furthermore, *tanA* gene screening followed by quantitation of tannase activity and determination of gallate decarboxylase activity is a practical approach for the identification of gallotannin-metabolizing strains.

Titre: Occurrence of food allergens in products with precautionary labeling in Canada

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Abstract:

Background: The use of precautionary allergen labeling (PAL) to indicate the potential presence of priority food allergens as a result of cross-contamination is increasing [1]. These statements are often overused by industries and misunderstood by consumers and can lead allergic patients to adopt risky behaviors, resulting in potential adverse reactions [2]. The aim of this study is to quantify for the first time the risk for Canadian allergic individuals exposed to pre-packaged products that may contain allergens due to cross-contamination. Objectives: The objectives of this study are the followings:

1. To elaborate on a sampling plan strategy;
2. To collect occurrence data;
3. To conduct a complete allergen risk analysis;
4. To propose options to better manage food allergens.

Methods: Foodstuffs with PAL have been analysed for the possible presence of milk, eggs and peanuts. Products were chosen according to a sampling plan based on the recalls done by the Canadian Food Inspection Agency (CFIA) from 1997 to 2017. Sandwich ELISA kits from r-biopharm and Morinaga were used for allergens' detection and quantification. For each food product, the allergic risk associated with its consumption will be estimated using the "consumption estimates per eating occasion" data held in the Canadian Community Health Survey (CCHS-2015). The occurrence of adventitious allergens in foods and the dose-response relationship will be estimated with a probabilistic approach like those already published in the literature [3]. Results: Three allergens have been investigated (milk=253, eggs=91, peanuts=48). Considering all food product categories and the allergens together, only 17% of the products with PAL had detectable amounts of allergens. As an example, dark chocolate has the highest occurrence of milk with 88% of positive products, with a milk protein content range of 10.5 - 6231ppm (mg/kg). Besides, no consistency was shown between the different lots (n=5). Conclusion: More data must be acquired to undergo risk assessments on the probability of occurrence of allergic reactions in Canadian allergic individuals consuming products with PALs. Allergen management guidelines linked to industry and regulation stakeholders will be proposed following the results of the risk assessments.

Titre: Dissecting the beneficial effects of dietary vitamin A in the prevention of Alzheimer's disease pathology in two mouse models.

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Résumé: Vitamin A (vitA) is a crucial molecule for the maintenance of memory processes in the adult brain, via its active metabolite, retinoic acid. There is evidence of a downregulation of vitA metabolism during aging, but also in the early stages of Alzheimer's Disease (AD), associated to memory deficits. Thus, we hypothesize that an age-associated deficit of vitA contributes to the development of AD, and that maintaining an optimal availability of retinoic acid in the brain during aging could prevent or delay the onset of AD. We sought to evaluate whether a vitA-enriched diet prevents memory deficits and curb A β and tau neuropathology in two different mouse models of AD: the 3xTg-AD mouse and the intra-cerebro-ventricular (ICV)-injected A β 25-35 mouse. 3xTg-AD mice develop both A β and tau neuropathology with age, and thus model the timeline occurring in humans. The ICV-injected mice develop A β -pathology, allowing the study of AD pathogenesis, without the aging component. VitA-enriched (20 IU/g) or vitA-control (5 IU/g) diets were administered to both models. From 8-month-old (before frank neuropathology and behavior deficits, which start at 12-month-old) to 14-month-old in 3xTg-AD mice; and from 5 to 14-week-old in ICV-injected A β 25-35 mice (before and after the injection at 8 weeks of age). We evaluated hippocampal-dependent-memory, metabolic status, and neuropathology after 6 months and 9 weeks of diet, respectively. VitA-enriched diet exposure prevented memory impairment in both 14-month-old 3xTg-AD mice and 11-week-old A β 25-35-injected mice, as evaluated in the Y-maze. In both models, locomotion was similar between groups. 3xTg-AD mice anxiety-like-behavior was unaffected by vitA whereas it was reduced in A β 25-35-injected mice. VitA had no effect on body weight in 3xTg-AD mice while it was associated to lower body weight in A β 25-35-injected mice. Overall, vitA avoided spatial memory deficit in two different AD models, alluding different pathways may be involved. The analysis of vitA metabolism and neuropathology is currently ongoing to better understand how this micronutrient can trigger such memory protection in each case. These preclinical data suggest that dietary vitA preserved memory and could be used as a nutraceutical tool in the prevention of AD.

Titre: The involvement of the gut microbiota and the endocannabinoidome in the establishment of an insulin resistance state in mice

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Résumé: Obesity, insulin resistance and their cardiometabolic comorbidities along with mental health disturbances are disproportionately observed in Northern Canadian populations. This could be reflective of an incompatibility or dysbiosis between bacterial species lining the gut and the recently modified nutritional habits of these populations. The endocannabinoid system is a regulator of the biological and metabolic processes altered in obesity and impacts on mental health as well. Recent studies have identified cross-talk between these systems in adapting host homeostasis in response to change in host environmental factors. We postulate that dietary modifications result in metabolic alterations via gut dysbiosis and consequent local and systemic modulation of the endocannabinoid system's tone, including related lipid mediators, their receptors and several converting enzymes, known as the endocannabinoidome. The main objective of this project is to establish the chronology of disturbances of the microbiome-endocannabinoidome axis in response to an obesogenic high-fat, high-sucrose (HFHS) diet. Six-week old C57BL/6J male mice fed a low-fat, low-sucrose diet (10% fat, 20% protein and 70% carbohydrate [7% sucrose]) were sacrificed at baseline or at 3, 10, 21 and 56 days following the initiation of a HFHS diet (45% fat, 15% protein and 35% carbohydrate [17% sucrose]). Oral glucose tolerance (OGTT) and lipid tolerance (OLTT) tests were performed at each time point. Upon sacrifice, plasma and metabolically-active tissues were harvested (e.g. intestinal segments and luminal content, liver and adipose tissue). Ileal and caecal microbiota composition was assessed by 16S rRNA sequencing (IBIS, Laval University). Endocannabinoidome mediators and endocannabinoidome gene expression were measured using LC-MS/MS and a qPCR array (TaqMan), respectively. As expected, significant weight gain and glucose intolerance (increased post-OGTT iAUC_{glucose}) were observed during the HFHS diet. Ileal and caecal microbiota compositions showed distinct profiles and were differentially influenced by the HFHS diet. Expression of several endocannabinoidome genes (e.g. *Abhd5*, *Cbr1-2*, *Faah*) in the ileum, the liver and visceral adipose tissue was modified with subsequent variations in levels of some ileal endocannabinoids (e.g. 2-AG and AEA). These data highlight several concomitant gut microbiota and endocannabinoidome modulations in response to a HFHS diet, which suggest that these systems are involved in the establishment of HFHS-induced metabolic disturbances. The observations made to date suggest increased gut permeability, immune response and inflammation as early alterations.

Titre: The science of gamification and serious gaming: a promising strategy for family nutrition education?

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Résumé: Despite the application of the French national nutrition program (“Plan National Nutrition Santé” or “PNNS”), it remains poorly effective with many goals that are still to be reached. Evaluation reports show that French consumers have difficulties to respect the national recommendations provided despite the communication tools and strategies set up to take action. Reports especially highlight that the program is not innovative, engaging or collaborative enough. Yet, it is important to help people to tend towards the recommended levels for each food categories to decrease risks for chronic diseases such as obesity or diabetes. Further investigations have demonstrated that in terms of nutrition education, it is essential to increase awareness and enhance motivation to change people’s beliefs and attitudes first, before providing a social and environmental support with specific action guidelines to change. Behavior change theories such as the Health Belief Model (Becker, 1974; Rosenstock, 1974), the Theory of Planned Behavior (Fishbein & Ajzen 1975) or the Self-Determination Theory (Deci & Ryan, 1985) provide a useful background about which determinants can generate intention of behavior first and turn it into action. A very promising strategy to increase consumers’ motivation to change could be the application of gamification and serious gaming science to nutrition education components. Some studies have shown that gamified systems such as serious games or mobile applications can both intrinsically and extrinsically motivate the initiation of a specific behavior and be easily applied to different audiences. Considering this current state of evidence, The KOAM Initiative has been designed as the first family online platform for nutrition education using a global gamified and collaborative approach to collectively motivate dietary behaviors change. The KOAM Initiative seems a promising intervention for global nutrition education, and further research will have to be done to assess the sustainability of our approach with a pilot experiment. This upcoming study will first focus on assessing whether gamification and family inter-personal influence could enhance individual motivation towards positive and sustainable food behavior change according to national nutritional recommendations. All measures will be performed by both researchers and subjects through quantitative questionnaires, family logbooks, and 24-Hour recalls.

Title: Small intestine microbiome aspiration (simba) capsule: a new autonomous and minimally-invasive device for continuously monitoring microbiota-food interaction in-vivo

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Abstract: INTRODUCTION. Our current understandings about small intestine (SI) microbiota and its roles in nutrient absorption are limited due to its inaccessibility. Invasive and expensive catheter-based sampling methods are not suitable for large-scale studies. Small Intestine MicroBiome Aspiration (SIMBA) capsule is a new device to collect small intestine (SI) fluid sample autonomously. Without using expensive MEMS technologies, SIMBA utilizes a novel and elegant enteric-dissolvable two-gate mechanism equipped with controlled-release technology to achieve precise regional sampling in SI. OBJECTIVE. To evaluate the feasibility of SI luminal contents sampling by the SIMBA capsules. METHODOLOGY. Six volunteers (3 IBS & 3 Control) ingested the SIMBA capsule (D12.5mm x L24mm) with 150mL distilled water on their empty stomach in the morning. Each capsule has an outer hard gelatin shell with an SI-targeted coating that was able to keep the main capsule body intact in the stomach. Once the outer shell dissolved in SI, SI fluid flowed into a capsule compartment via four wide channels on the capsule wall. The compartment contained hydrophilic fibers to wick and retain the fluidic luminal sample. A piston was fixed by a dissolvable spring-loaded latch to keep the channels open initially. The latch gradually dissolved in its thickness until its structure collapsed to release the spring, which pushed the piston to close the channels and seal the samples. The subjects underwent x-ray scan every 30 minutes after oral intake of the capsule to monitor the sampling status until the spring was found released in x-ray. RESULTS. All six capsules completed sampling in SI, as confirmed by x-ray. Capsules were collected by the volunteers after their bowel movements in the following 1-2 days and sent for sample weighing. On average, the capsules collected 74mg of SI luminal contents. In comparison, Intellicap, a MEMS-based electronic capsule, collected an average of 70mg (range: 1-190mg) of SI luminal fluid on ten volunteers. The fecal samples and the samples in the capsules were sent for 16s rRNA sampling. The SI and fecal microbiota in both IBS and healthy patients have different composition and diversity at the species level and show clear clustering on the PLS-DA map. CONCLUSION. The SIMBA prototype proves the concept of "MEMS-free" SI-targeted microbiome sampling technology, a critical step towards personalized microbiome monitoring. The technology offers a safe and reliable solution of capsule-based GI contents sampling while significantly reducing the costs per operation. New designs of large-scale human studies become possible to reveal temporal and spatial alteration of gut microbiota by various probiotics and health food for better understanding its influence on nutrition absorption and various digestive diseases.

Titre: Activity and physic-chemical properties of Nisin A produced by Lactococcus species

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Résumé: The present study aimed to screen of lactic acid bacteria for their potential to produce anti *C. tyrobutyricum* components and to examine the efficacy of culture and their components using a Cheddar cheese model. 341 strains, biochemically identified as *Lactococcus lactis*, obtained from STELA culture collection were screened for their potential antimicrobial activity against *C. tyrobutyricum*. Strains were grown in skimmed milk or M17 broth medium for an overnight at 30°C. Neutralized skim milk and M17 supernatants were tested for their possible inhibitory effect against *C. tyrobutyricum* using agar diffusion technique(2). Then molecular identification was done for bacteriocin- producing strains using 16s r-DNA gene and specific primers to differentiate subsp. *Cremoris* from *lactis*, also specific primers were used to confirm the presence nisin A gene(3,4). The stability of nisin was determined against different proteolytic enzymes, pHs and under different time at 100°C .The growth kinetics and bacteriocin production of bacterial strains was determined in skim milk media during 30h of incubation. Only eight strains can inhibit the growth of *C. tyrobutyricum* in skim milk. Three bacteriocin-producing isolates belonged to subsp. *lactis*, have been found positive for the presence of nisin A gene. Nisin A activity was reduced under pH8 and totally inhibited after protenase K treatment. The antibacterial activity appeared to be pronounced between late logarithmic phase and early stationary phase.

Titre: La réutérine un antifongique naturel à fort potentiel en remplacement de la natamycine pour le secteur laitier.

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Résumé: Les moisissures sont des microorganismes provoquant souvent l'altération des produits laitiers. L'utilisation de cultures lactiques bioprotectrices et leurs métabolites représentent une solution naturelle prometteuse pour contrer la contamination fongique. La réutérine, un aldéhyde produit par *Lactobacillus reuteri* à partir du glycérol, a démontré une activité antibactérienne à large spectre. Cependant, le potentiel antifongique de cette molécule a été rarement étudié. L'objectif de ce travail était de produire, purifier et évaluer l'activité antifongique de la réutérine contre des microorganismes indésirables pouvant contaminer les produits laitiers. La réutérine a été produite par fermentation du glycérol en condition anaérobique avec *L. reuteri* ATCC53608. La purification a été effectuée par HPLC. Son activité antifongique dans le lait a été évaluée sur quatre souches d'altération (*Aspergillus niger*, *Mucor racemosus*, *Penicillium chrysogenum* et *Rhodotorula mucillaginososa*) par diffusion en gélose et en milieu RPMI. Son activité antifongique a également été évaluée dans des échantillons de yogourt commerciaux. Finalement, l'utilisation de la réutérine comme ingrédient dans la fabrication de yogourt brassé et son impact sur un ferment lactique ont été évalués en comparaison avec la natamycine et une culture protectrice commerciale. Les concentrations minimales inhibitrice (CMI) de la réutérine étaient de 3.83 mM pour *P. chrysogenum* et *R. mucillaginososa* et de 1.91 mM pour *A. niger* et *M. racemosus*. Les résultats dans le yogourt commerciaux ont révélé une réduction entre 0.5 et 1.5 log pour les trois souches fongiques, ainsi que l'inhibition complète de la levure sur 21 jours. L'incorporation de 5 mM de réutérine dans le yogourt à l'étape du brassage a permis l'inhibition complète d'*A. niger* pendant 15 jours à 21 °C. Cependant, la viabilité du ferment lactique a également été affectée. De plus, la concentration de réutérine dans les yogourts a diminué durant l'entreposage du yogourt. Ces résultats préliminaires montrent le potentiel antifongique de la réutérine, mais une encapsulation de la molécule ou l'utilisation de souches thermophiles résistantes à la réutérine devra

être étudiée pour diminuer l'impact de la molécule sur les ferments lactiques.

Title: Human alpha defensin 5 treatment reverses dyslipidemia and improves glucoregulatory capacity in high fat diet-fed mice

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Abstract: Background & Aims: Overnutrition, often associated with intake of high fat diets (HFD), is the principal cause of insulin resistance (IR) and dyslipidemia, which drives non-alcoholic fatty liver disease (NAFLD). It is further linked to disrupted bowel action with microbiota alterations and change-of-function in several gut-lining cell populations including Paneth cells of the small intestine. Paneth cells are key regulators of microbial diversity through expression of antimicrobial peptides, particularly human alpha-defensin-5 (HD-5) and have shown repressed secretory capacity in human diabetes. We aimed to treat metabolic abnormalities by therapeutic oral administration of HD-5 to diet induced obese mice. **Methods:** Mice were fed a 60% HFD for 13 weeks and subsequently treated with physiologically relevant amounts of either HD-5 or vehicle for 10 weeks. The glucoregulatory capacity was determined by glucose tolerance test and the corresponding insulin concentrations both before and during intervention allowing for paired analyses. Gut microbiome composition were examined by 16S rDNA sequencing. Colon samples were collected immediately before and after intervention allowing for paired analyses. Small intestine samples were harvested at necropsy. Plasma and liver lipid and protein profiles were determined by biochemical analyses. **Results:** HD-5 treated mice exhibited improved glucoregulatory capacity along with an ameliorated plasma and liver lipid profile. This was accompanied by changes in gut microbiota composition and specific modulations of bacterial abundances, in particular Bifidobacterium, in colon of HD-5 treated mice. Bifidobacterium abundances were inversely associated with metabolic abnormalities, suggesting that HD-5 exerts its metabolic improvements through precision editing of the gut microbiome. **Conclusion:** The study provides proof-of-concept for the use of human defensins to improve host metabolism by mitigating the triad cluster of dyslipidemia, IR and NAFLD.

Titre: Prebiotic potential of Jerusalem artichoke in young rats submitted to a Western diet

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Résumé: The gut microbiota is a key mediator of metabolic functions. Alterations in its microbial ecology are closely associated to obesity and ensuing disorders. It is, therefore, critical to develop novel dietary interventions to maintain normal gut microbiota. The present study was designed to investigate the beneficial effects of whole Jerusalem artichoke tubers (JA; enriched in inulin prebiotic fibers) in a rodent model of diet induced-obesity. Young rats were submitted to: 1) a Western diet (WD); 2) a WD supplemented with whole JA powder (10 %); or 3) a conventional CHOW diet for 8 weeks. Body weight, food consumption, fecal energy content and glucose disposal were analyzed. Muscle, liver and fat pads were weighted, intra-organ fat accumulation was analysed in liver and muscles, and triglycerides and cholesterol levels were quantified in plasma. Fecal short chain fatty acid (SCFA) production and metataxonomic analyses were also performed. As expected, body weight, fat accumulation (intra-organ and fat pads), plasma triglycerides and cholesterol concentrations were increased ($p < 0.05$) in WD-fed rats vs. CHOW-fed rats. However, no difference in glucose disposal was noted. Energy intake and fecal energy excretion were not different in WD vs. JA animals. On the other hand, plasma triglyceride levels and intra-organ fat accumulation were significantly reduced in JA-supplemented rats. SCFA profiles were modified and the microbial production of propionate was increased in feces of the JA group ($p < 0.05$). Such an upregulation of propionate synthesis was previously associated to normalized gut microbial ecology of rodents and humans. Therefore, the

present results highlight the promising prebiotic potential of JA. This further supports the importance to consider JA for food-based interventions against obesity and the onset of metabolic disorders in Northern populations.

Titre: Projet NEURONALG « Développement d'actifs nutritionnels algo-sourcés ciblant la neuroinflammation liées aux troubles métaboliques »

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Résumé: Introduction : Le milieu marin constitue une diversité de vie et d'environnement ouvrant de nombreuses perspectives pour le développement de nouvelles molécules bioactives. Les macroalgues marines illustrent ce potentiel par la variété de biomolécules originales qu'elles synthétisent. C'est dans ce contexte que le projet NEURONALG propose le développement d'actifs nutritionnels algo-sourcés, ciblant l'inflammation et les mécanismes d'altérations du comportement émotionnel liés aux troubles métaboliques. Objectifs : Le projet vise à évaluer la possibilité de cibler spécifiquement l'inflammation et la résistance à l'insuline sous-tendant les troubles émotionnels cérébraux par une supplémentation en actifs algaux. Méthodologies : Ce projet ouvre la voie à une synergie inter-établissements de la Région Nouvelle Aquitaine (les laboratoires LIENSs CNRS 7266 et NutriNeuro INRA 1286) et à une coopération internationale sur le thème du développement économique lié à la mer avec l'Institut sur la Nutrition et les Aliments Fonctionnels de Québec. Le premier lot de travaux concerne le fractionnement, la caractérisation (constitution biochimique, analyses structurales LC-MS/GC-MS) et la transformation d'extraits (dépolymérisation des fractions polysaccharidiques et protéiques) de macroalgues marines grâce à un procédé breveté provenant de la société Seprosys basée à La Rochelle. Le deuxième lot de travaux concerne le criblage in vitro des activités anti-inflammatoires (macrophages murins et cellules de la microglie), antioxydantes et insulino-régulatrices des fractions/digestats. L'activité anti-inflammatoire est évaluée au travers de mesures de médiateurs clés des voies de signalisation de la réaction inflammatoire après stimulation des cellules par des facteurs pro-inflammatoires. Par la suite, les fractions seront testées par une approche préclinique sur modèles murins de diabète permettant d'évaluer les effets des fractions sur la neuroinflammation, l'insulinosensibilité cérébrale et les comportements anxio-dépressifs. Résultats : Le procédé de dépolymérisation nous permet d'éliminer les propriétés inflammatoires et cytotoxiques des échantillons natifs. De plus, certains digestats ont montré des activités anti-inflammatoires prometteuses. Conclusions : Certaines fractions montrent des résultats encourageants en tant qu'actif anti-inflammatoire. Il reste maintenant à évaluer leur activité insulino-régulatrice afin d'étudier le potentiel d'un mélange d'actifs algo-sourcés comme supplémentation nutritionnelle anti-inflammatoire et régulatrice de l'homéostasie énergétique contribuant à une meilleure santé cérébrale.

Titre: La microcine J25 : une alternative fort prometteuse aux antibiotiques contre des sérotypes de salmonella enterica spp. Enterica multirésistants.

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Introduction: Dans le secteur de la production animale, des faibles doses d'antibiotiques sont utilisées dans l'alimentation des animaux pour favoriser leur croissance, accroître la rentabilité et lutter contre les infections microbiennes. Malheureusement, l'utilisation abusive des antibiotiques a conduit à l'émergence spectaculaire de bactéries multirésistantes dont les impacts économiques et sanitaires sont majeurs. Face à cette situation, il s'avère de plus en plus urgent de développer des alternatives à l'utilisation des antibiotiques parmi celles-ci, les bactériocines suscitent de plus en plus d'intérêt.

Objectif: Déterminer qualitativement et quantitativement l'activité antimicrobienne de la Microcine J25 contre des sérotypes multirésistants aux antibiotiques de *Salmonella enterica* spp. *enterica*.

Méthodologie: Soixante-quinze souches de *Salmonella enterica* spp. *enterica*, y compris *S. Newport* (n=39), *S. Typhimurium* (n=13), *S. Senftenberg* (n=13), *S. Enteritidis* (n=6) et *S. Choleraesuis* (n=4) ont été utilisées dans cette étude. Dans un premier temps, le profil de sensibilité aux antimicrobiens de ces souches a été réalisé par la méthode de diffusion sur gélose, tandis que le séquençage du génome entier a été utilisé pour identifier les gènes codant pour cette résistance. Dans un deuxième temps, les valeurs de la concentration minimale inhibitrice (CMI) et bactéricide (CMB) de la microcine J25 contre ces mêmes souches de salmonelles ont été déterminées en utilisant un test de dilution sur microplaques.

Résultats: Sur les Soixante-quinze souches, vingt-et-une souches de *Salmonella Newport* présentaient un phénotype de multirésistance aux antibiotiques incluant l'ampicilline, la céfoxitine, le chloramphénicol, la streptomycine, les sulfamides et la tétracycline. Les souches restantes de *S. Newport* (n=18) ainsi que toutes les *S. Typhimurium*, *S. Senftenberg*, *S. Enteritidis* et *S. Choleraesuis* étaient sensibles à tous les antibiotiques testés. Les valeurs des CMI pour Microcin J25 contre ces souches variaient entre 0,06 µg / ml et 0,4 mg/ml alors que les valeurs des CMB étaient quatre, huit ou seize fois supérieures à celles des CMI, ce qui indique un effet bactériostatique.

Conclusion: La Microcine J25 a démontré une activité antimicrobienne significative contre toutes les souches de salmonelles testées incluant celles présentant un profil de multirésistance aux antibiotiques, suggérant un potentiel élevé en tant qu'alternative aux antibiotiques.

Title: Comparison of the effects of non-fermented vs fermented dairy peptides on metabolic syndrome and hepatic steatosis in a murine model of obesity and dyslipidemia

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Abstract: *Laís Rossi Perazza^{1,2}, Noémie Daniel^{1,2}, Marie Julie Dubois^{1,2}, Geneviève Pilon^{1,2}, Patricia Mitchell¹, Khai Le Quang¹, Dominic Lachance¹, Eric Plante¹, Thibault Varin², Rihab Bouchareb¹, Patrick Mathieu¹, Claude Asselin³, Mylène Blais⁴, Martin Lessard⁴, Yves Pouliot², Sylvie Gauthier², Denis Roy², André Marette^{1,2}

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Introduction: Visceral obesity, insulin resistance and dyslipidemia are key features of metabolic syndrome leading to cardiometabolic diseases (CMDs). Recent meta-analyses suggest that fermented dairy products reduced CMD risk, but the mechanisms remain unclear. Objective: We tested whether fermented dairy peptides could influence the development of obesity-related CMDs in high-fat high-sucrose (HFHS)-fed LDLr^{-/-} ApoB100/100 mice. Methodology: Animals were fed for 24 weeks with diets in which half of the dietary protein was substituted for milk peptides (MP), fermented milk peptides (FMP), yogurt peptides (YP) or not (HFHS). Weekly food intake and body weight gain were registered. Insulin (ITT) and oral glucose tolerance test (OGTT) were conducted at week 17 and 19, respectively. Lean and fat mass were quantified at week 24. Echocardiography (ECHO) was performed at week 0, 12 and 24. Post-prandial lipid profile was measured in plasma collected at week 12. Aortic atheroma lesions were quantified according to the en face technique. Cytokines were assessed in fasted-plasma, epididymal white adipose tissue (eWAT) and liver lysates. Results: Body weight and adiposity were not different among dietary groups. However, glucose tolerance tests revealed that glucose-induced insulin response was improved in YP vs MP-fed mice. Interestingly, while MP-fed animals had reduced plasma triglyceride (TG) levels vs untreated HFHS fed mice, they showed elevated TG levels in the liver, which was significantly reduced in mice fed YP vs MP-fed animals. These metabolic effects of YP were associated with lower circulating levels of the chemokine RANTES, and the adhesion molecules ICAM-1 and VCAM-1. FMP-fed mice also exhibited decreased systemic levels of adhesion molecules (e.g. PAI-1, MMP-9, VCAM-1) as compared to MP-fed or untreated HFHS-fed mice. Additional histological and echocardiography studies did not reveal further effects of the treatments on atherosclerosis and cardiac function. Conclusion: These results show that fermented dairy peptides have a major influence on inflammatory and adhesion markers in obese dyslipidemic mice and that yogurt-based dairy peptides exert further beneficial effect on glucose/ lipid homeostasis and alleviates hepatic steatosis.

Titre: Early cross-fostering transfer of gut microbiota reveals sex-specific effects of cranberry polyphenols in a mouse model of diet-induced obesity

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Résumé: Introduction. The postnatal obesogenic environment in which children evolve has been suggested to predict the long-term risk to develop metabolic disorders associated with obesity in adulthood. Moreover, multiple studies have highlighted the beneficial effects associated with the consumption of rich-polyphenol fruits extracts to prevent obesity-associated metabolic disturbances. Objective. The objective of this project was to evaluate the preventive effect of a rich-polyphenols cranberry extract (CE) administered to high-fat high sucrose (HFHS) diet-induced obese dams during the preconceptional, gestational and lactation period, on the metabolic health of their offspring, and the potential role of the gut microbiota using a cross-fostering approach. Methodology. Dams were fed an HFHS diet and were daily gavaged with the rich-polyphenol CE (CE-Dams) or water (Veh-Dams) for 14 to 19 weeks. Dams were mated after 8 to 12 weeks of treatment and gave birth after 11 to 15 weeks of treatment. In the first 48 hours after birth, approximately half of the litter was exchanged by cross-fostering i.e. from Veh-Dams to CE-Dams or from CE-Dams to Veh-Dams and weaned by their adoptive mother. The other half was weaned by their biological mother. After the weaning period, offspring were individually caged and fed an HFHS diet for 8 weeks. Body mass analyses and an oral glucose tolerance test were performed after 8 weeks of treatment. Results. CE administration in HFHS-fed dams was associated with an improved metabolic phenotype by reduced adiposity, liver weight and liver triglycerides accumulation. Glucose homeostasis was also improved in CE-Dams. However, CE treatment of dams was associated with a deleterious phenotype in female offspring, mainly observed by increased body weight, adiposity and impaired glucose metabolism. No effect was observed in male offspring. Interestingly, microbiome analyses reveal that male and female offspring born and weaned by CE-Dams cluster differently on the principal component analysis. Conclusion. We have demonstrated for the first time the beneficial metabolic effects of the administration of a polyphenol-rich CE in preconceptional, gestational and lactating dams. Moreover, these results show that CE promote sex-specific metabolic alterations in offspring that may be transferred by the gut microbiota.

Titre: Impact des polyphénols de pelure de pommes (dapp) dans la dyslipidémie postprandiale et l'homéostasie du cholestérol chez le psammomys obesus

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Résumé: Le syndrome métabolique (SM), de prévalence élevée, est caractérisé par la conjonction de désordres souvent d'origine glucidique, lipidique, radicalaire et inflammatoire qui prédisposent au diabète de type 2 (DT2) et à l'athérosclérose. Les bénéfices des extraits de polyphénols contenus dans les pelures de pommes (DAPP) sont reportés dans plusieurs études in vitro et in vivo. Les DAPP ont des effets prometteurs: la réduction de la résistance à l'insuline, la diminution de l'inflammation et pour combattre le stress oxydant. De plus, les DAPP peuvent prévenir contre l'hypertension et les maladies cardiovasculaires. Le *Psammomys obesus* constitue un modèle animal du syndrome métabolique pour étudier le diabète, et les maladies cardiovasculaires. Objectifs: Comme nos travaux ont récemment mis en évidence les effets antioxydants et anti-inflammatoires remarquables des extraits de polyphénols contenus dans les pelures de pommes (DAPP), nous avons émis l'hypothèse que ces derniers peuvent réduire la dyslipidémie postprandiale induite par l'insulino-résistance (IR). Méthode: Dans le but d'examiner l'impact des DAPP sur la perte de l'homéostasie lipidique au niveau de l'intestin, nous avons administré les DAPP (200 mg/kg/jour par gavage durant 8 semaines) à des animaux *Psammomys obesus* qui, en captivité et en présence d'abondance nutritionnelle, développent séquentiellement l'obésité, l'IR et le DT2. Résultats : En utilisant des traceurs radioactifs, nous avons pu démontrer la grande efficacité des DAPP à limiter la synthèse des lipides, la biogenèse de l'apolipoprotéine (Apo) B-48, et la production des lipoprotéines riches en triglycérides, concomitamment à l'allègement du stress oxydant, de l'inflammation et de l'IR au niveau intestinal. Parmi les mécanismes sous-jacents, les DAPP abaissent la lipogenèse via la régulation de l'acetyl-CoA carboxylase, diminuent l'activité des enzymes MGAT et DGAT menant à l'estérification des triglycérides, agissent sur le protéasome pour stimuler la dégradation de l'Apo B-48, et activent l'AMPK dans l'entérocyte. En outre, les DAPP ont le potentiel de freiner l'absorption intestinale du cholestérol en modulant à la baisse les transporteurs du cholestérol (NCP1L1, SR-BI) via de puissants facteurs de transcription. Conclusions: Nos résultats révèlent le rôle bénéfique des DAPP à corriger les désordres lipidiques postprandiaux qui favorisent généralement la formation des plaques d'athérome et les maladies cardiovasculaires.

Title: Isolation, screening and characterization of reuterin-producing bacteria as a probiotic potential from Canadian indigenous chickens

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Abstract: Introduction: Antibiotics have been widely used as animal growth promoters at sub-therapeutic levels for many decades. They have improved growth and feed conversion in animal production. However, recently the appearance of antibiotic resistant bacteria, residual antibiotics and customer needs for organic production have increased interest in searching for alternatives to antibiotics. Reuterin, which is water soluble, effective in a wide range of pH, resistant to proteolytic and lipolytic enzymes, is a potent antimicrobial agent active against Gram positive and Gram negative bacteria. Reuterin is also believed to play a role in the probiotic effects of *Lactobacillus reuteri*. Only a few researches have explored the application of reuterin-producing bacteria of intestinal origin in the poultry industry. Objective: The objectives of this research were isolation, screening and characterization of reuterin-producing bacteria isolated from chicken gastrointestinal tract. Methodology and results: Reuterin-producing bacteria were isolated and characterized from the gastrointestinal tract of Canadian indigenous broiler chickens. In total, 800 bacterial strains were isolated from broilers and screened for reuterin-producing ability. Three strains producing reuterin were identified as *Lactobacillus reuteri*. The reuterin produced by *L. reuteri* 3108, 3114 and 3118 displayed strong inhibitory activity against indicator strains such as *Clostridium perfringens*, *Escherichia coli*, *Campylobacter jejuni*, *Salmonella enterica* and *Listeria monocytogenes*. And these *L. reuteri* showed a wide range of inhibitory spectrum against food-borne pathogens when studied by microtitration method. Strain 3108 and 3114 exhibited the highest level of activity (1024 AU/ml) after 1 h anaerobic fermentation in the glycerol solution at 37 °C. All of these *L. reuteri* survived simulated stomach and intestinal juice condition. *L. reuteri* 3114 showed susceptibilities to penicillin G, erythromycin and chloramphenicol. We selected *Lactobacillus reuteri* 3114 by probiotic selection criteria including inhibition activity against pathogens. Conclusion: To our knowledge, this is the first to report isolation and screening for reuterin producing probiotic of chicken origin from Canada. Based on the characteristics of *L. reuteri* 3114 and biological properties of reuterin, this strain may be used as probiotics for poultry. Future research on poultry performance, production of selected strain tested in vivo and application in the food/feed need to be undertaken.

Title: The impact of edible seaweeds *Palmaria palmata* and *Saccharina longicuris* on a Camembert-type cheese microflora.

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Abstract: Seaweeds have been part of Asia's culinary culture for centuries, but the interest for their consumption in western countries is much more recent. Numerous researches have investigated the nutritional and functional potential of seaweeds and, even though they are now widely recognised as a sustainable and healthy food source, their consumption is still very limited in North America. The addition of seaweeds to various food matrices is a good way to introduce them to new consumers and can also impart flavor, health benefits and techno-functional properties. In fermented foods such as cheese, seaweeds could also have an impact on the microbiological flora, which is a key element to every cheese's identity. This work aims to evaluate the impact of adding two edible seaweeds, *Palmaria palmata* and *Saccharina longicuris*, on a Camembert-type cheese microbial ecosystem during a 21-day ripening period. To assess the impact of seaweeds on the cheese ecosystem, the growth potential of both seaweeds' indigenous microflora in a soft-curd model cheese matrix has been studied by classic microbiological methods at 0, 4, 10 and 21 days of ripening along with the evolution of the main physicochemical properties (pH, Aw, moisture). The results showed that the addition of 2% seaweed powder had no significant impact on the cheese's main physicochemical parameters and that no significant microbial growth happened until day 10 of ripening. Further steps will include monitoring the growth dynamics of some representative bacteria and fungi involved in the ripening process of a Camembert-type model cheese enriched with seaweeds using qPCR. Finally, the contribution of seaweeds to the total microflora of a model Camembert-type cheese will be evaluated throughout the ripening by a metabarcoding approach to assess the seaweed's impact on the overall microbial ecosystem of the cheese.

Title: Fiber-free polyphenol-rich blueberry and cranberry powders selectively prompt *Akkermansia muciniphila* and improve gut microbial richness in HFHS-diet induced obese mice

Presenter Name: Maria Carolina Rodriguez Daza

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Gut microbiota structure and diversity are considered potential indicators of host health. Low microbial richness and alterations in gut microbiota composition has been widely linked to inflammatory bowel disease (IBD), obesity and type 2 diabetes. Dietary functional ingredients are subject of interest to study their promoting action on gut microbial communities with a potential contribution on host metabolic and intestinal immune homeostasis. The present study aimed to evaluate the microbial modulatory action of polyphenol-rich cranberry and blueberry powders and their polyphenol-free fiber fractions on gut beneficial bacterial species. Six-week-old C57BL/6J male mice (n=72; n=12/ group) were fed either a standard (Chow) or HFHS diet. HFHS-diet was enriched with a polyphenol-rich cranberry powder (CP), cranberry fibers (CF), polyphenol-rich blueberry powder (BP), and blueberry fibers (BF) for 8 weeks. Fecal samples were analyzed by sequencing the 16S rRNA gene V3-V4 region using the Illumina MiSeq platform. The HFHS-diet significantly altered the composition of the gut microbiota. The Chao1 microbial α -diversity index was reduced in HFHS-fed mice compared to the Chow group. Interestingly, the CP, CF and BP-enriched diets showed increased microbial richness (p<0.05). Dysbiosis induced by HFHS-diet was improved by CP and BP supplementation (p<0.05). The principal Coordinates Analysis (PCoA) exhibited community composition dissimilarities between CP, BP, and Chow groups, compared to HFHS, BF and CF (PERMANOVA R-squared 0.55305; p<0.001). An important increase of *Akkermansia muciniphila* abundance was found in CP and BP-fed mice (37.8% and 29.8% respectively, q=0.0017 and q=0.0165) compared to HFHS-fed mice (14.7%). The abundance of *A. muciniphila* was confirmed by qPCR analysis and validated through Spearman correlation coefficients compared to 16S rRNA sequencing (p<0.01). The CP and BP diets increased the relative abundance of polyphenol-degrading family Coriobacteriaceae (13.9% and 10.75%, p<0.01) compared to HFHS-fed mice (5.8%). Polyphenols-free fibers favored a significant increase of butyrate-producing unassigned genus of Clostridiales. The results demonstrate that the polyphenolic fraction of the berry powders contributes largely to modify the gut microbiota. The present study underlines the promising potential of polyphenol-rich berries to prompt beneficial gut bacterial taxa associated with the amelioration of metabolic diseases.

Title: Synergistic Interactions of Natural Antioxidants and Improvement of their Efficiencies

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Abstract: Consumers are increasingly becoming more health-conscious, pushing the food industry to develop more clean label products. The rejection of artificial preservatives has promoted the investigation of natural alternatives with comparable antioxidative capacities. On top of assessing individual hydrophilic and lipophilic antioxidants, there is great interest in exploring their interactions. Indeed, combining antioxidants, such as essential oils (EOs) and polyphenols, can lead to synergistic effects, which can significantly increase their efficiency and ultimately reduce the amount needed. Two main categories of methods exist to measure total antioxidant capacity: (1) methods based on hydrogen atom transfer, such as the ORAC (oxygen radical absorbance capacity) assay and (2) methods based on electron transfer, such as the DPPH (2,2'-diphenylpicryl hydrazyl free radical) assay. The objective of this study was to investigate the combinatorial effects of selected EOs (white thyme, Ceylon cinnamon, oregano, pimento berry, clove, and sage) enriched with selected polyphenols (rutin hydrate, chlorogenic acid, rosmarinic acid, quercetin, epicatechin, catechin, and p-coumaric acid) and plant extracts (grape seed, rosemary, apple, green tea). Each selected essential oil was enriched with each selected polyphenol at a 1:1 ratio (w/w) to determine their combined ORAC value as well as their combined IC50 (Inhibition Concentration). Blends with the greatest antioxidant capacities exhibiting synergistic actions in both assays were: catechin & Ceylon cinnamon oil, chlorogenic acid & clove oil, quercetin & Ceylon cinnamon oil, catechin & oregano oil, catechin & white thyme oil, epicatechin & Ceylon cinnamon oil, and epicatechin & oregano oil. Blends with the lowest antioxidant capacities exhibiting antagonistic effects in one or both assays included: all oils enriched with rutin hydrate as well as all polyphenols (except chlorogenic acid) enriched with clove oil. These results suggest that Ceylon cinnamon and oregano essential oils have the greatest potential to improve their efficiencies when enriched with polyphenols, while clove, pimento berry, and sage essential oils have the lowest potential.

Titre: Impact of an extract of brown algae and a moderate weight loss on glycemic control among overweight prediabetic subjects

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Résumé: Impact of an extract of brown algae and a moderate weight loss on glycemic control among overweight prediabetic subjects

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Abstract: Background: Moderate weight loss is recommended for overweight/obese subjects to reduce glycemia and prevent type 2 diabetes. Recently, in vitro studies have demonstrated beneficial effects of brown algae rich in polyphenols on glucose metabolism. So far, there are few trials combining weight loss and brown algae on glycemic control in humans. Objective: The current study examined glycemic effects of an extract of brown algae rich in polyphenols (InSea2[®]) at 12 weeks of treatment, using randomised, placebo-controlled, double-blind, parallel clinical trial combined with individualized nutritional counseling to promote weight loss, in free-living overweight prediabetic subjects. Methods: A total of 56 men and women between 18 and 70 years old were recruited. All subjects were overweight (waist circumference ≥ 80 cm for women and ≥ 94 cm for men) and insulin resistant (insulin fasting ≥ 60 pmol/l). They also display impaired glucose tolerance (a 2-h plasma glucose level between 7.8 and 11.0 mmol/l after a 75-g oral glucose load) or fasting hyperglycemia (fasting blood glucose between 5.6 and 6.9 mmol/l). Participants were randomised into either a control (placebo + daily negative energy balance of ~ 500 kcal/day) or treatment (500 mg of brown algae extract + daily negative energy balance of ~ 500 kcal/day) group. Food intake was assessed using an auto-administrated validated Food Frequency Questionnaire (FFQ). Different metabolic parameters will be evaluated at baseline and 12-week post-intervention: fasting glycemia, fasting insulin, glycemia, insulin and C-peptide during a 2h-Oral Glucose Tolerance Test (OGTT), glycated hemoglobin (HbA1c), hepatic enzymes (AST, ALT) and blood lipids (total cholesterol, LDL, HDL and TAG). HOMA-IR will be calculated to estimate insulin sensitivity. Anthropometric measurements, including DEXA body composition and blood pressure, will be also performed. Additionally, anti-oxidant (Isoprostane 8-iso-PGF2a), anti-inflammatory (IL-1 β , IL-6, TNF-alpha, hsCRP), endothelial (ICAM-1, sVCAM-1, sE-Selectin), and intestinal integrity (LPS, LBP, zonulin) biomarkers will be measured. Expected results: We expect a greater weight loss and glycemic control among subjects consuming brown algae extract rich in

polyphenols. An improvement of insulin secretion, insulin sensitivity, oxidative status, inflammatory status, endothelial function and gut barrier integrity is also expected in these subjects. (Funded by MAPAQ Innov-Action Agri-Food Program with Innov-Activ, and MITACS)

Titre: Glycomacropeptide, a milk-derived bioactive peptide, improves intestinal oxidative stress and inflammation, while limiting the production of intestinal lipoproteins

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Résumé: INTRODUCTION Obesity and obesity-related disorders have reached epidemic proportions worldwide and constitute frightful threats to health. In particular, lipid disorders and postprandial dyslipidemia are well-known comorbidities associated with excess body weight given their close link to cardiovascular diseases. Therefore, it is the crucial time for uncovering new predictors to assure prevention and developing new effective and combative tools. In this context, milk-derived peptides and especially glycomacropeptide (GMP), display beneficial bioactivities against cardiometabolic disorders. HYPOTHESIS AND OBJECTIVES As GMP is one of the most promising milk bioactive compounds endowed with favourable metabolic, immune and prebiotic actions, we hypothesize that GMP has a great potential to maintain intestinal homeostasis through alleviation of oxidative stress, inflammation and lipid disorders. Therefore, the central aim of this work is to determine the anti-oxidant, anti-inflammatory and hypolipidemic effect of GMP. METHODS To this end, GMP were incubated with intestinal Caco-2/15 cells, which were challenged with iron/ascorbate and LPS, to induce oxidative stress and inflammation, respectively, or with radiolabelled ¹⁴C-oleic acid for the assessment of lipid and lipoprotein synthesis. RESULTS At a concentration of 2mg/mL, GMP decreased the formation of malondialdehyde, a biomarker of lipid peroxidation/oxidative stress. Moreover, GMP reduced TNF- α gene expression induced by LPS-mediated inflammation. When lipogenesis was evaluated through specific enzymatic markers, no differences were noted in the protein expression of acetyl CoA carboxylase and fatty acid synthase in the presence or absence of GMP. On the other hand, GMP was able to down-regulate the production of chylomicrons (vehicles for alimentary fat), very-low-density lipoproteins (VLDL) and low-density lipoproteins (LDL) by intestinal Caco-2/15 cells. CONCLUSION Findings from the present investigation demonstrate the powerful effects of GMP on oxidative stress and inflammation, two key components believed to play a major role in the induction of insulin resistance and metabolic syndrome. In addition, GMP was effective in lowering the secretion of triglyceride-rich lipoproteins, suggesting its potency to prevent postprandial dyslipidemia

and

cardiovascular

diseases.

Titre: Gut microbiome k-mer analyses with Ray Surveyor

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Résumé: Les analyses de métagénomique traditionnels se base sur le séquençage de l'ARN ribosomal 16S pour quantifier les abondances taxonomiques des échantillons. Maintenant avec le séquençage de génome entier, nous obtenons un aperçu beaucoup plus détaillé des microbiomes séquencés. Avec la quantité massive de données que génère une expérience de séquençage de génome entier sur un métagénome, il est important d'avoir des outils simples et efficaces pour comparer ces échantillons. Nous avons développé un logiciel, Ray Surveyor, pour permettre la comparaison de métagénomes à partir de k-mers. Les k-mers permettent une comparaison rapide de métagénomes sans avoir a préalablement aligner les séquences. Nous avons comparé, avec Ray Surveyor, des métagénomes provenant d'études de trois différentes maladies (diabète de type 2, maladie chronique inflammatoire intestinale et cancer colorectale) pour obtenir une classification de leur métagénome basé sur les k-mers.

Titre: Couplage des hautes pressions hydrostatiques et des procédés baromembranaires pour la production d'un concentré protéique de lait maternel

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Résumé: La prématurité est la première cause de mortalité chez les enfants au Canada. La survie des prématurés est corrélée à leur croissance qui est elle-même principalement due à l'apport en protéines. Les protéines du lait humain sont les plus adaptées à promouvoir la croissance des prématurés en même temps que leur survie. Cependant, le lait humain ne contient pas une concentration en protéines suffisantes et nécessite d'être supplémenté en ce type de macromolécules. La production de concentrés de protéines de lait humain est quasi inexistante et nécessite du lait provenant de banques de dons. Ce lait doit être décontaminé. Actuellement, la méthode la plus répandue est la pasteurisation. Ce traitement thermique entraîne toutefois une diminution de la bioactivité des composants. Pour une meilleure préservation des composants, le procédé utilisant les hautes pressions hydrostatiques (HPH), représente une alternative intéressante. Cette technologie émergente et éco-efficace permet une inactivation des microorganismes végétatifs du produit à traiter sans application de chaleur. Cependant, ce procédé ne permet pas l'inactivation des spores bactériennes, contaminant d'importance majeure dans le lait maternel et ayant un impact extrêmement significatif sur la santé des prématurés. L'utilisation des procédés de filtration baromembranaires, systèmes très communs en industries laitières, pourrait largement limiter les problématiques reliées à la présence de spores. L'utilisation combinée des HPH et des procédés baromembranaires pourrait ainsi permettre la production d'un concentré protéique de lait maternel tout en préservant les composés bioactifs et en assurant le respect des normes sanitaires liées à ces produits. Pour atteindre cet objectif, chaque étape du procédé devra être optimisée à l'aide des expertises développées dans l'industrie laitière, en prenant en compte les spécificités des composants du lait humain. Le développement d'un tel produit peut améliorer les conditions de vie des prématurés, leur chance de survie et leur développement futur.

Development of Predictive Models for the Antioxidant Properties of Natural Ingredients

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Consumers' concern regarding the safety of synthetic ingredients prompted the food industry to look for natural alternatives. Oxidation is a major cause of food quality deterioration, leading to the formation of undesirable off-flavours as well as harmful compounds. Plant extracts and/or their essential oils are well known for their antioxidant activities, which are mainly attributed to the presence of some major bioactives, including phenolic compounds, terpenes, aldehydes and flavonoids. However, because of the high variability of plant extracts and essential oils depending on their origin, variety and the season, their uses in food application remain challenging. There is great interest in developing tools for the selection of the appropriate natural antioxidants. The study aimed at investigating the interactive effects of the bioactive compounds of natural ingredients on their antioxidant properties and at developing mathematical models that can be used to predict the antioxidant property based on the chemical composition. It was determined that polyphenol, flavonoid, and procyanidin contents all have a positive correlation with the antioxidant properties of the plant extracts. A two-factor model was statistically significant, and adequate to represent the relationship between the inhibitory concentration (IC_{50}) and polyphenol/flavonoid content and pH of extracts, showing that polyphenol and flavonoid content was the only significant variable interaction. Higher antioxidant activity was obtained at increased polyphenol and flavonoid contents, though antagonistic effects were seen when both values were high. For essential oils, phenols, aldehydes and sulfur-containing compounds showed strongest correlations with antioxidant properties and a linear model showed that higher phenol content correlated with better antioxidant activity while aldehyde content was less significant. In conclusion, the prediction of the antioxidant properties of natural ingredients based on their composition can facilitate their selection and use for specific product applications in the food industry.

Title: Effect of pre-storage ozone treatment on health-beneficial phytochemicals of stored carrots

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Summary: In Canada, the carrot is an economically and nutritionally important horticultural crop. Carrots supply a rich diversity of health-beneficial phytochemicals such as polyacetylenes, terpenoids, isocoumarins, coumarins, phenylpropenes, phenolic acids, and sterols. Some groups of these metabolites also have potent antimicrobial properties. However, postharvest diseases are a major limiting factor in the long-term storage of carrots. Exposure to ozone is known to elicit various responses in plants, including biosynthesis of defensive secondary metabolites with antimicrobial as well as antioxidant activity. The objective of this work was to investigate the potential of pre-storage treatment with ozone to enhance health-beneficial and disease-resistance phyto-compounds in carrots. The exposure of carrots to atmospheres containing ozone (5.0 ppm), was carried out in a sealed plexiglass chamber for periods of 0.0 to 12 hours and stored at 4° C. The titers of four targeted phyto-compounds phytoalexin 6-methoxymellein (6-MM), preformed antimicrobial and health-beneficial polyacetylenes falcarinol and falcarindiol, potential insecticidal and health-beneficial myristicin; and the GC-MS secondary metabolite profiles of the treated carrots were monitored at regular intervals during 6 weeks of storage. All doses of ozone elicited 6-MM above inhibitory concentration with a maximum accumulation of about 200 mg.kg-1 and 640 mg.kg-1 FW by the two extreme doses respectively. Falcarindiol was enhanced modestly by higher doses of ozone. Ozone treatment did not enhance falcarinol and myristicin levels. Furthermore, the treatment improved the levels of phytochemicals, including phenylpropanoids, terpenoids, and isocoumarins. The enhancement of simple phenolic compounds was significant in response to ozone (about 8-10 fold). Scopoletin, a phenolic phytoalexin was enhanced by seven folds. A very substantial enhancement of about 30 folds for eugenol and 40 folds for eugenin (a polyketide) was observed in response to ozone exposure. Ozone also was effective in elevating the levels of terpenoids by 6-8 fold. Sterols were also modestly enhanced 3-5 folds by ozone treatment. The results suggest that there is a strong potential for pre-storage treatment with ozone to increase the levels of health-beneficial phytochemicals and plant-protective compounds.

Title: Estimating the safety and tolerability of the probiotic Bio-K+ based on clinical results, preclinical experiments and manufacturing controls

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Abstract: Introduction: Although health authorities and consumers accept that probiotics are safe, commercial products rarely specify their safety controls, tolerability is untested and there is insufficient data documenting the risks of use. Bio-K+ is a probiotic comprised of 3 strains, *Lactobacillus acidophilus* CL1285, *L. casei* LBC80R and *L. rhamnosus* CLR2 that has been studied in a variety of clinical settings and is manufactured with strict quality controls. Objective: To compile and summarize the safety controls for this probiotic and the observed effects with its use, from clinical studies and in real-world applications. Methodology: The genome sequence for each strain was analysed in silico against databases of known harmful elements, including virulence factors and antimicrobial resistance. Each strain was tested for its susceptibility to antibiotics in vitro. The manufacturing controls used to ensure the absence of contaminants and potential allergens are listed. Adverse effects from 4 randomized, controlled trials were compiled and comparisons were made between active and placebo treatments. The methodology used to collect serious adverse effects (SAEs) and the incidence in 7 observational studies is described. Results: Virulence factors were not detected for any strain. Each strain is sensitive to multiple, but not all, antibiotics in vitro. Resistance motifs were not found on transferrable genetic elements. The identity, purity and absence of unwanted microbes is verified on each batch of working culture. Food allergen contaminants are avoided by using traceable ingredients and validated cleaning methods. Surfaces are confirmed allergen-free with testing. There were no statistically important differences in the frequency of adverse events between Bio-K+ treatments and placebo in 894 subjects and no product-related SAEs. There were no product-related SAEs or cases of *Lactobacillus* bacteremia from these probiotic strains observed in over sixty-thousand hospitalized patients taking Bio-K+ with antibiotics. Conclusion: These findings confirm that Bio-K+ does not carry the potential risks of ingesting bacteria and is well tolerated. The likelihood of experiencing a non-serious adverse event with Bio-K+ was equivalent to placebo in clinical trials. No serious adverse events were observed in tens of thousands of documented patient experiences.

Titre: Distinct impact of low dietary fiber and increased dietary fat on features of the metabolic syndrome: role of hepatic bile acids and gut microbiota modulation

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Résumé: Selecting the most relevant control diet is of critical importance for nutritional intervention studies. The so-called chow diet used in many rodent studies is low in fat but also rich in fibres as compared to purified diets and their strong effect on metabolic outcomes has been established. The aim of this study was to compare the impact of 12-week feeding C57BL/6J male mice (n=12) with either chow, low-fat (LF) or a high-fat (HF) diet on metabolic outcomes, and their potential link which changes in the gut microbiota and bile acid (BA) profiles. HF-fed mice gained more weight compared with chow and LF-fed mice, but interestingly, the latter also showed increased body weight and adiposity as compared to chow-fed counterparts. Glucose intolerance and insulin resistance were observed in HF-fed mice while only fasting insulinemia was found to be increased in LF-fed vs chow-fed animals. Both LF and HF feeding strongly decreased caecal and fecal contents of major short-chain fatty acids (SCFAs) and excreted less fecal energy as compared to chow-fed mice. Intestinal integrity, determined in vivo using lactulose-mannitol and sulfonic acid permeability tests, revealed impaired gut integrity in HF-fed mice compared to chow-fed mice, with an intermediate integrity profile in LF-fed mice. Analysis of the fecal microbiota using 16S rRNA gene Illumina MiSeq Sequencing revealed higher Shannon diversity index, and enhanced abundance of several bacterial families (Lachnospiraceae –Anaerostipes-, Ruminococcaceae) in chow-fed mice, whereas fecal microbiota from LF- and HF- fed animals were similar and could only be discriminated by the increased presence of Anaeroplasm genus in the former group. Importantly, both LF and HF purified diets promoted hepatic lipid accumulation compared to chow-fed mice. Interestingly, increased 7 α -hydroxylase levels strongly correlated with higher hepatic cholesterol content, suggesting an impairment of BA intestinal reabsorption in HF-fed mice, while liver BA profiles revealed more specific differences between chow and LF-fed animals that are potentially related to insulin clearance. Further analyses are underway to analyse intestinal inflammation and microbiota function in order to further elucidate the underlying mechanisms by which chow and truly controlled purified diets selectively impact the gut-liver axis and metabolic health.

Titre: Effet de la consommation des aliments riches en AGEs sur le transport inverse du cholestérol

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Résumé: Le transport inverse du cholestérol (TIC), l'une des principales fonctions des HDL, constitue l'unique voie d'épuration du cholestérol excédentaire. Il a été démontré que la PON1, une protéine associée aux HDL, est impliquée dans la régulation du TIC. Il est aussi connu chez les diabétiques que cette protéine est altérée par des produits de glycation avancés (AGEs) contribuant au développement de maladies cardiovasculaires. Toutefois, très peu d'études ont démontré l'effet de la consommation des aliments riches en AGEs sur la fonctionnalité des HDLs. Notre Hypothèse stipule que la formation des AGEs lors des traitements à haute température serait à l'origine de l'altération de la paraoxonase. Objectifs : (i) Déterminer l'effet de la diète riche en AGEs sur le TIC et (ii) comment le TIC peut être affecté en présence de diabète. Méthodes : Des souris transgéniques (PON1+/+) et des souris sauvages ont été soumises à une diète normale ou riche en AGEs traitées à haute température (160°C/1h) pendant 4 mois. Le TIC est déterminé par l'injection intra péritonéale de macrophages radio-marqués et la mesure 48 h plus tard de la distribution de la radioactivité dans les différents compartiments (plasma, foie et excréments). Résultats : Les souris sauvages et transgéniques soumises à la diète riche en AGEs présentent une diminution significative du TIC ($P < 0.0006$). Cette diminution est plus importante chez les souris sauvages comparées aux souris transgéniques ($P < 0.0001$). Nous avons aussi montré que la diète riche en AGE altère significativement le TIC chez les souris diabétiques ($P < 0.001$) et aggrave les complications vasculaires chez les souris sauvages diabétiques comparées aux souris transgéniques diabétiques ($P < 0.0001$). Conclusion : Une alimentation riche en AGEs peut favoriser la formation de cellules spumeuse en altérant la fonctionnalité des HDL et des protéines qui leur sont associées ; notamment la PON1. Cette altération contribue à l'accumulation du cholestérol dans les cellules périphériques entraînant la formation de plaques athérosclérotiques vasculaires. Nos résultats suggèrent que la PON1 protégerait contre l'altération du TIC telle qu'induite par les AGEs.

Titre: Combined neurorestorative effects of docosahexaenoic acid (DHA) and voluntary exercise in a mouse model of Parkinson's disease

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Résumé: Introduction: Parkinson's disease is characterized by a loss of dopamine (DA) neurons in the substantia nigra pars compacta (SNpc) and a decrease of their projections to the striatum. Previous studies in our laboratory have shown that a n-3 polyunsaturated fatty acids (n-3 PUFA) enriched diet prevents DAergic denervation in the MPTP mouse model. More recently, we found that n-3 PUFA dietary intake also exerts partial neurorestorative effects after an extensive 6-hydroxydopamine(6-OHDA)-induced lesion of the DAergic system. Objectives: Since preclinical and clinical studies hint towards benefit of exercise in PD, we investigated whether the neurorestorative action of n-3 PUFA synergistically interact with exercise to induce recovery of the nigrostriatal pathway. Methods: Male C57/BL6 mice were unilaterally lesioned by stereotactic injection of 6-OHDA, a toxic analog of dopamine, to induce dopaminergic denervation, as confirmed with HPLC and TH-immunochemistry. 4

weeks following the lesion, animals were fed either a docosahexaenoic-acid (DHA) enriched or a control diet. At the same time, half of the mice underwent an exercise regimen (a free-access wheel). The treatments lasted 7 weeks until sacrifice. Results: The mice performed an average number of 7823±236 wheel revolutions in 12h at night. No significant difference was observed between lesioned and non-lesioned animals. Neither DHA or exercise altered the total travelled distance in the open-field test, nor the percentage of unclockwise rotations following apomorphine administration. In the stepping test, however, an increase in the use of contra-lateral paw (vs. ipsilateral) was observed in lesioned animals exposed to both DHA and voluntary exercise compared to lesioned animals under either one of the treatments only. Although the combination of DHA and exercise did not improve the number of tyrosine-hydroxylase (TH)-positive cells in the SNpc, HPLC analysis revealed that DHA intake led to higher DA content in the striatum of 6-OHDA-lesioned animals. Furthermore, the striatal rise in DOPAC/DA ratio observed in 6-OHDA-treated mice was prevented by exposition to both DHA and exercise. Conclusion: Our results support our previous report of partial neurorestorative effects of dietary DHA and suggest that the combination of voluntary exercise and DHA may improve additional motor behavioral components and reduce dopamine turnover.

Titre: Associations among Timing of Food Intake, Eating Behavior Traits and Psychobehavioral Factors in Overweight and Obese Individuals

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Résumé: Introduction: Late distribution of food intake has recently been recognized as a determinant of obesity and few studies have observed that late eating is associated with a higher energy intake (EI). However, the mechanisms by which timing of food intake impacts body weight are not well understood. Objective: The aim of this study was to assess the associations among distribution of food intake, eating and psychobehavioral traits. Methods: Overweight and obese individuals (n=304; age 38.7±8.4 years; BMI 33.2±3.4 kg/m², 55.3% women) who participated in four weight loss studies were included in this cross-sectional study. EI was assessed using a three-day food record. The distribution of EI was assessed by calculating the percent of total EI from period 5 (5:00 pm to 7:59 pm) and period 6 (8:00 pm until bedtime). Eating behavior traits were assessed with the Three-Factor Eating Questionnaire and the Binge Eating Scale whereas psychobehavioral factors were evaluated using the Pittsburgh Sleep Quality Index, Body Esteem Scale, Beck Depression Inventory, State-Trait Anxiety Inventory and Perceived Stress Scale. Pearson correlations were used to assess the associations between distribution of EI and those variables among men and women. Results: Among women, percent EI from combined values of periods 5 and 6 was positively associated with disinhibition (r=0.26, p=0.001) and with habitual and situational susceptibility to disinhibition (r=0.22, p=0.005 and r=0.18, p=0.03, respectively). Percent EI from period 6 was positively associated with strategic dieting behavior (r=0.17, p=0.03) in women. In men, percent EI from periods 5 and 6 was negatively associated with susceptibility to hunger (r=-0.19, p=0.03) whereas percent EI from period 6 was positively correlated with susceptibility to hunger (r=0.18, p=0.0496). Percent EI from period 6 was also positively associated with depressive symptoms (r=0.22, p=0.02), perceived stress (r=0.23, p=0.01) and with state and trait-anxiety (r=0.22, p=0.02 and r=0.32, p=0.001, respectively) in men. Conclusions: The results of this study suggest that a higher proportion of EI consumed later in the day is associated with suboptimal eating and psychobehavioral traits and could contribute to explain the association between a delayed distribution of food intake and obesity.

Titre: Bioavailability and biological activity of microcin J25: metagenomic and metabolomic analysis of its impact on the porcine microbiome in a continuous culture model

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Résumé: Recrudescence of resistance among *Salmonella* spp. and other pathogens increasingly prevalent in swine is spurring the search for alternatives to antibiotics added to pig feed. Natural antimicrobials, particularly bacteriocins, appear to hold promise. Produced by *Escherichia coli*, microcin J25 (MccJ25) is a potent inhibitor of several pathogenic bacteria including *Salmonella enterica*. We aimed in the present study to evaluate in vitro the inhibitory activity of MccJ25 against *Salmonella enterica* subsp. *enterica* serovar Newport ATCC 6962 (*Salmonella* Newport) and its impact on the composition and metabolic activity of the colonic microbiota of pigs. The PolyFermS in vitro continuous fermentation model was used with modified Macfarlane medium to simulate the porcine proximal colon. During 35 days of fermentation, a first-stage reactor containing immobilized fecal bacteria fed two second-stage test reactors in which the anti-*Salmonella* activity of MccJ25 and its impact on the microbiota were monitored. Reuterin and rifampicin were tested for comparison. Propidium-monoazide-coupled quantitative PCR (PMA-qPCR) was performed to evaluate inhibition of *Salmonella* Newport and the effluent bacterial metagenome. Agar diffusion assays were also performed. Sequencing of 16S rRNA was performed using the Illumina MiSeq platform to evaluate microbial diversity. Liquid chromatography coupled to mass spectrometry (LC-MS) followed by multivariate analysis of the generated data. MccJ25 was a strong inhibitor of *Salmonella* Newport growth compared to reuterin or rifampicin. However, MccJ25 did not show any significant effect on the microbiota composition while it induced variations in the metabolic activity. Although this finding needs to be validated in vivo, our results suggest that MccJ25 could be an interesting alternative to antibiotics for veterinary applications.

Title: Synergistic interaction between natural antimicrobial compounds against gram (-) and gram (+) bacteria

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Summary: Introduction: Combinations of bacteriocins with other antimicrobial agents may strengthen their antimicrobial potency. According to recent investigations, it was found that the mixture of bacteriocins and organic acids may pose synergistic effects and increase their antimicrobial efficacy at lower concentration. Objective: Therefore, this study targets to detect synergistic effect of natural antimicrobial compositions against gram (-) and gram (+) bacteria. Methods: Bacteriocins, including microcin J25 (active against gram (-) bacteria), pediocin PA-1 (active against gram (+) bacteria) and nisin (active against gram (+) bacteria), in addition, reuterin 3-HPA (by-product of *Lactobacillus. Reuteri*) with activity against broad spectra of microorganisms; gram (+), gram (-) bacteria and fungi were tested in combination with lactic and citric acid. Interactive effect among these antibacterial compounds investigated by checkerboard assay. Concentrations were selected based on predetermined MIC values. *S. Newport* as a gram (-) and *L.ivanovii* as gram (+) bacteria were used. Results: According to the results, mixture of microcin J25, citric acid and lactic acid tested against *S.Newport* showed additive effect (FIC index 0.75). In addition, Microcin J25 and reuterin showed additive interaction (FIC index 1). Mixture of PA-1, citric acid and lactic acid and mixture of reuterin, citric and lactic acid against *L.ivanovii* showed additive interaction (FIC index 1). While nisin showed indifferent effect in different combinations with acids, reuterin and PA-1 against *L.ivanovii*. Conclusion: Different mixture has been developed (i) Mixture of microccin J25 and organic acids against gram (-) (ii) mixture of pediocin, reuterin and organic acids against gram (+) gram (-) and fungi.

Title: Characterization and identification of anti-inflammatory peptides from Atlantic mackerel (*Scomber scombrus*) proteinic hydrolysate separated based on the molecular weight, charge and hydrophobicity

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Abstract: Food and land scarcity, over-exploited fishery resources and greenhouse gas emission issues as well as increase in chronic cardio-metabolic syndrome (CMS) have directed many researches in the direction of utilizing processing proteinaceous by-products and waste along with under-utilized species (e.g. Atlantic Mackerel (*Scomber scombrus*)) for extraction of nutritionally valuable bio-molecules offering preventive or treatment health benefits. Systemic and or chronic inflammation, though not well understood, in many cases is the cause or the effect of CMS (defined as the co-occurrence of several cardiovascular and renal risk factors, insulin resistance, abdominal obesity, systemic arterial hypertension, and atherogenic dyslipidemia) that would ultimately develop into CVD and diabetes. Conventional prevention and treatment of inflammation by medicine have its drawbacks and side effects while findings from numerous in-vitro and in-vivo studies suggest that fish protein/peptides could treat, prevent or improve inflammation and its related complications. Thus, we have hypothesized that Mackerel Peptide Fractions (MPF) possess beneficial biological activity on inflammation. The aim was to fractionate and identify MPF with anti-inflammatory activity on lipopolysaccharide (LPS) stimulated macrophages (J774A.1 ATCC® TIB-67™), in-vitro. MPF were obtained using chromatographic technique (SPE-C18), pressure driven-Ultra Filtration (UF) and Electrodialysis with UF membrane (EDUF) under experimental conditions of pH 3, 6 and 9 with MWCO of < 1 kDa and < 20 kDa, respectively. Results suggest that separation technique plays an important role in the isolation efficiency of anti-inflammatory bio-peptides since all the fractions, except peptides extracted by chromatography method, had only negligible anti-inflammation effects. Hydrophobic C18 fraction inhibited the LPS, 2.5 ng mL⁻¹, induced inflammation by ~17% at 10 µg mL⁻¹ of concentration with no cytotoxicity in comparison to positive control, Phenformin, with ~22% effect at 100 µM. In conclusion, polarity of a peptide regardless of charge and size is the outmost important factor for the anti-inflammatory activity of a fraction as is for the other types of biological activities reported in the literature. Accordingly, understanding the mechanism of action and characterization of the

fraction obtained by liquid chromatography-mass spectrometry (double mass analyzer) ion mobility quadrupole-time-of-flight would be required for concrete conclusions.

Titre: Influence Of Dietary Habits And Food Behaviour On The Gut Microbiome– Endocannabinoidome Axis

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Résumé: Gut bacteria contribute to nutrient digestion and interact with the host biological processes by producing nutrient-derived metabolites that mediate for instance energy metabolism, intestinal functions and inflammation. At the same time, polyunsaturated fatty acid-derived endocannabinoids interact with central and peripheral membrane receptors and also regulate these biological processes along with food behaviour and reward mechanisms. Endocannabinoids can be produced by certain gut bacterial species and their concentration can thus be influenced by gut microbiota composition; this relationship being at the heart of the novel gut microbiota – endocannabinoidome Axis. Dysregulation of the Axis - elevated endocannabinoid-tone and gut dysbiosis - were associated with obesity, inflammation and associated comorbidities. The general objective of this project is to investigate the influence of dietary habits and food behaviour on the gut microbiota composition and circulating endocannabinoids in the Axis and their relationship with host metabolic status. We posit that particular nutrients and/or dietary patterns of lesser dietary quality and/or unhealthy food behaviour will be associated with dysregulated Axis and altered metabolic health. Plasma endocannabinoids profiles were obtained by LC-MS/MS from a cohort of 204 free-living male and female volunteers along with their anthropometric and metabolic statuses, dietary habits and food behaviours. Participants were aged 40.8 years (± 17.0 years) on average, had an average BMI of 25.1 m/kg² [13.3 - 42.0 m/kg²], an average waist circumference of 87.1 cm [60.0 – 130.8 cm], and metabolic parameters (e.g. arterial pressure, fasting glycaemia and lipid profiles) both within and outside of normal ranges. Participants also exhibited various dietary patterns averaging a Healthy Eating Index of 60.7 [25.6 - 97.2], which is representative of habitual Canadian dietary habits. Analysis of food behaviours and characterisation of circulating endocannabinoids are ongoing and results will be available shortly.

Title: Impact of curcumin on gut microbiota in Huntington disease

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Abstract: Introduction The human gut microbiota plays protective role in health and diseases and can influence brain functions. Its composition can be modulated using natural antioxidant such as polyphenols. It is emerging the existence of a strong connection between the effectiveness of natural products and the composition of gut microbiota/metabolites. Objective(s) Huntington disease (HD) is the most common dominantly inherited neurodegenerative disorder characterized by the progressive neurodegeneration and associated motor, cognitive and behavioural disturbances. Gastrointestinal dysfunctions are described in HD patients and enteric neurons show mutated huntingtin. Presymptomatic HD subjects display microbiota shifts and serum profiles that reflect gut dysbiosis and HD patients show impaired gut motility and malabsorption. To date no human microbioma analysis has been reported in HD patients. In HD mouse model we investigated gut microbiota modulation following curcumin administration. Curcumin has been reported to be effective against neurodegeneration in cerebral ischemia by protecting blood-brain barrier integrity in Parkinson and Alzheimer diseases. Methodology Wild type (WT n=8) or HD (n=8) R6/2 mouse model of HD mice were daily treated with Curcumin C3 complex/Bioperine (C3) or with vehicle (DMSO) starting from the birth for 10 weeks. Fecal pellets were collected at the same time from each mouse and bacterial DNA was extracted using the FastDNA SPIN Kit. Microbial communities were analysed with meta-barcoding 16S rRNA sequencing analysis using the Illumina MiSeq platform. QIIME was used for pre-processing and OTUs picking and PICRUSt was used for functional profile prediction. Results HD samples showed slightly decreased bacterial diversity. WT and HD mice showed differences in community composition and diversity. Differences were also highlighted between HD mice treated or untreated with curcumin. These results well agree with the gut motility recovery evidenced in HD mice treated with C3 and suggests that C3 could affect microbiome composition. Conclusion Understanding the mechanisms by which curcumin act on HD gut microbiome will provide new insights that may pave the way for alleviate at least gastrointestinal dysfunction and develop a valuable dietary supplement. The connection between HD and gut-microbiota could be fundamental for HD onset and progression and for the development of novel therapeutic strategies.

Title: Development and characterization of silver nanoparticles containing bilayer (kitchen waste-corn starch/ casein) film

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Abstract: INTRODUCTION: Biodegradable and edible films prepared from natural-polymers offer alternatives to conventional synthetic packaging, as they are excellent in biodegradability, biocompatibility and edibility, and the range of their potential applications. Kitchen waste is defined as left-over organic matter from restaurants, hotels and households. Silver nanoparticles (AgNPs) show excellent antimicrobial properties when combined with either non-degradable or edible polymers for active food packaging. In our present work, we explored a route for the synthesis of AgNPs containing bilayer film using various sophisticated instruments, chemicals and analytical techniques. OBJECTIVES: 1. To develop and characterize a monolayer kitchen waste-corn starch biodegradable film and its bilayer film with the incorporation of Casein. 2. To study the effect of incorporation of AgNPs on physico-chemical properties of the bilayer film. METHODOLOGY: Autoclaved kitchen waste (cooked rice and pulses) was dried and powdered through 0.5 μ m sieve through 100 mesh size sieve. Silver nanoparticles (AgNPs) were prepared from 0.001M Silver oxide by chemical reduction method. Single (corn starch: kitchen waste) layer composite films were prepared in four ratios-80:20, 70:30, 60:40, 50:50 and a pure corn starch control film. AgNPs, glycerol and CaCl₂ were added to both composite and control films. Bilayer films were prepared by casting casein solution on the monolayer composite film and dried. RESULTS: Moisture content of 70:30 bilayer film least (21.3%), while that of the control film highest (32.5%). Thickness of that bilayer film was highest (0.54mm), hence least moisture retention and extensibility and highest tensile strength (0.214 MPa). The WVTR (4.66 x10⁻⁵g H₂O mm h⁻¹ cm⁻²) and hygroscopicity (3.8%) of that bilayer film are less compared to the control film and single layer films. The thermal analysis of films resulted in 70:30 bilayer film being the most heat stable. The film exhibited a microbial inhibition zone of 10 mm. CONCLUSION: 70:30 corn starch-kitchen waste/casein bilayer film was the most effective, having good water and light barrier properties, and tensile strength. Addition of casein made the bilayer films heat sealable, heat stable and enhanced its tensile strength. Incorporation of nanoparticles significantly improved the antibacterial properties of the developed film.

Titre: The expression of iNOS in adipocytes contributes to insulin resistance and deterioration of energy metabolism in obese mice.

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Résumé: Introduction: Obesity and insulin resistance are well known to be associated with a low-grade but chronic proinflammatory state. Expression of the inducible nitric oxide synthase (iNOS) is increased in insulin target organs including adipose tissue in diet-induced and genetic models of obesity. Whole body invalidation of iNOS has established its central role in promoting insulin resistance in a model of obesity-linked diabetes triggered by high-fat diet. Objective: Clarify whether targeted disruption of iNOS in adipocytes can alleviate insulin resistance in mice fed high-fat high-sucrose (HFHS) diet. Method: Using the CRE-lox approach (adipo-Cre), the *nos2* gene (encoding iNOS) was selectively deleted in adipocytes of mice (adKO). adKO mice and their wildtype littermates were kept either on a standard chow diet or a HFHS-diet (65% fat, 15% protein, 20% carbohydrates) for 10 weeks. Insulin and glucose tolerance tests were performed and mice were sacrificed for further plasma and tissue analyses. Results: Adipocyte-specific deletion of iNOS did not affect food intake or body weight gain but increased oxygen consumption of obese animals as measured via whole body indirect calorimetry. Loss of iNOS in fat cells also triggered a systemic reduction of triglyceride levels. HFHS diet-induced glucose tolerance was not improved in adKO mice as compared to control littermates. Nevertheless, AdKO mice were specifically protected against HFHS-diet induced development of insulin resistance and showed significant improvement in systemic insulin sensitivity and complete normalization of hyperinsulinemia compared to their wild-type littermates while chow-fed AdKO were undistinguishable from control littermate mice. Conclusion: Our results reveal a role of iNOS in adipocytes in the development of systemic insulin resistance and triglyceride metabolism, suggesting that NO and/or its nitrosated derivatives locally produced in adipose tissue contribute to the metabolic alterations in obesity.

Titre: Optimization of a colorimetric method for indole-3-acetic and indole-3-butyric acids in macroalgae

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Résumé: The East coast of Canada is rich in brown and green seaweeds that grow in very dense seagrass beds, which are an abundant, undervalued and underutilized biomass resources. Macroalgae are currently used in organic farming for their biostimulant properties. They are attributable mainly to phytohormones and nutrients. Phytohormones, such as auxins, are secondary metabolites that are composed of aromatic heterocyclic rings. The aim of this study is to develop a colorimetric quantification method for auxins, which is simple and cost efficient. This method will be applied to four macroalgae species collected in Quebec (Canada) in order to follow the preparation of algae extracts. The four macroalgae species that have been selected for this study are *Ascophyllum nodosum*, *Fucus vesiculosus*, *Laminaria Saccharina* and *Alaria esculenta*. Main auxins found in macroalgae are indole-3-acetic acid and indole-3-butyric acid, which are characterized by their indole moiety. The indole group reacts with p-dimethylaminobenzaldehyde (Ehrlich's reagent; PDAB) in a 2:1 ratio where the reaction occurs at the β -position. This reaction gave a compound that absorbs in the visible spectrum. The two auxins react at different temperatures. Indole 3 butyric acid (IBA) reacts at room temperature whereas indole 3 acetic acid (IAA) reacts at 70°C, allowing the differentiation of the two compounds. The kinetics and the effect of the PDAB, hydrochloric acid and sodium dodecyl sulfate concentrations on the Ehrlich's reaction for IBA and IAA were studied. From a kinetics study, the best reaction times for IBA and IAA were 18 h and 3 h, respectively. This analytical method will be applied to IBA-IAA quantification in an algal matrix and could be apply to many other food products.

Titre: Pressurized low polarity water (PLPW) extraction of polyphenols pigments from apple, blueberry and cranberry pomace with potential use as natural colorants in functional food

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Résumé: Polyphenol pigments are high-value products that can be recovered from pomace. These natural colorants and antioxidants can substitute synthetic dyes to enhance the aesthetic value (appealing food color and aroma), extend the shelf-life (protective effect), or delay the formation of off-flavors and rancidity (stabilizing effects) of products. The color space was determined on extracts from blueberry pomace, cranberry pomace and apple pomace. The color space was determined using chromameter and color segmentation of their imaged representations with MatLab. The pomaces were extracted using pressurized low polarity water (PLPW) using subcritical water under different conditions and compared to microwave assisted extraction using aqueous ethanol. The extracts were characterized using chemometric methods for polyphenol groups and profiles of polyphenols by UHPLC-Q-TOF-MS. The scale-up using the optimal conditions at pilot scale allowed to validate the model and contribute to knowledge and know-how for large-scale PLPW techniques for applications in the food industry and the natural colorant sector.