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RESEARCH AWARD
(USRA)
POSTER
PRESENTATIONS**

September 8, 2010
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MACDONALD-STEWART MS2-022
(FACULTY LOUNGE)
Macdonald Campus

Posters will also be available for viewing on
Thursday, September 9 from 09:00 - 16:00

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Faculty of Agricultural and Environmental Sciences

Table of Contents

Poster 1	PLANT RESPONSES TO CATERPILLAR HERBIVORY: CELLULAR REDOX-RELATED RESPONSES Amirizian, A., Bede, J. Department of Plant Science	6
Poster 2	SEDIMENT CONTROL USING ECOLOGICAL ENGINEERING IN THE LAKE DELIGNY WATERSHED Armstrong, S., Adamowski, J., Department of Bioresource Engineering	6
Poster 3	VITAMIN D DEFICIENCY IN MATERNAL DIET MAY BE LINKED TO GESTATIONAL DIABETES MELLITUS Babar, A., Weiler, H., School of Dietetics and Human Nutrition	7
Poster 4	TAXONOMIC REVISION OF THE GENUS <i>DICRAEUS</i> (DIPTERA: CHLOROPIDAE) Barrie, C., Wheeler, T., Department of Natural Resource Sciences	7
Poster 5	AN INVESTIGATION OF HABITAT USE BY THE SHORT-EARED OWL ACROSS SEASONS ON AMHERST AND WOLFE ISLANDS Cloutier, C., Bird, D., Department of Natural Resource Sciences	8
Poster 6	CHARACTERIZING THE INTRACELLULAR SIGNALING PATHWAY REGULATED BY THE ADIPOSITY HORMONE LEPTIN IN THE MURINE OVARY Cohen, T., Kalaiselvanraja, A., Duggavathi, R., Department of Animal Science	8

Poster 7	THE INFLUENCE OF FOOD ABUNDANCE ON THE BODY MASS OF FEMALE RED SQUIRRELS (<i>TAMIASCIURUS HUDSONICUS</i>) IN KLUANE NATIONAL PARK, YUKON Doucet, C., Fletcher, Q., Humphries, M., Department of Natural Resource Sciences	9
Poster 8	GREENHOUSE CULTIVATION: REDUCING RESOURCE CONSUMPTION WHILE MAINTAINING OPTIMAL YIELDS Fullerenger, M., Lefsrud, M., Department of Bioresource Engineering	9
Poster 9	EFFECTS OF CAPTIVE BREEDING ON SKIN COLOURATION AND PLASMA CAROTENOIDS IN AMERICAN KESTRELS (<i>FALCO SPARVERIUS</i>) Gagnon, M., Bird, D., Department of Natural Resource Sciences	10
Poster 10	VITAMIN D, FOLATE, AND B12 STATUS IN PANAMANIAN INDIGENOUS MOTHERS AND CHILDREN Ham, Y., Koski, K., School of Dietetics and Human Nutrition	11
Poster 11	DIVERSITY AND CULTIVATION OF A CRYPTOENDOLITHIC COMMUNITY FROM GYPSUM HILL, AXEL HEIBERG ISLAND Johnson, H., Whyte, L., Department of Natural Resource Sciences	11
Poster 12	PROTEIN MALNUTRITION DECREASES VISCERAL PROTEIN SYNTHESIS IN A PIGLET MODEL OF COLITIS Jones, J., Wykes, L., School of Dietetics and Human Nutrition	12

- Poster 13 **THE GENE FOR FATTY ACID BINDING PROTEIN 6 IS EXPRESSED IN MURINE OVARIES** 12
Ménard, I., Duggavathi, R., Agellon, L.B.,
Department of Animal Science and School of
Dietetics and Human Nutrition
- Poster 14 **MODULATION OF NUCLEAR HISTONE DEACETYLASE ACTIVITY BY PCB CONGENERS AS A POSSIBLE MECHANISM OF PCB-MEDIATED NEUROTOXICITY AND THE POSSIBLE NEUROPROTECTIVE EFFECTS OF PHYTOCHEMICALS.** 13
Munoz-Nieva, S., Kubows, S., School of Dietetics
and Human Nutrition
- Poster 15 **CHARACTERIZATION OF C-REPEAT BINDING FACTOR GENES IN *BRACHYPODIUM DISTACHYON*** 13
Nicole, T., Charron, J.-B., Department of Plant
Science
- Poster 16 **COMPARING METHANE EMISSIONS AND PHOTOSYNTHESIS LEVELS IN TWO BOREAL PEATLANDS** 14
Stewart, H., Strachan, I., Department of Natural
Resource Sciences
- Poster 17 **GLP-2 INFUSION IN A PIGLET MODEL OF COLITIS TO PROMOTE INTESTINAL HEALTH** 14
Viola, M., Wykes, L., School of Dietetics and
Human Nutrition
- Poster 18 **EVALUATION OF A SCHOOL-BASED PROGRAM TO IMPROVE PHYSICAL ACTIVITY, DIETARY HABITS, AND PSYCHOSOCIAL WELL-BEING IN CHILDREN/ADOLESCENTS** 15
Wang Y.L., Gougeon L., Gray-Donald K.
School of Dietetics and Human Nutrition

POSTER 1

PLANT RESPONSES TO CATERPILLAR HERBIVORY: CELLULAR REDOX-RELATED RESPONSES

Amirizian, A., Bede, J., Department of Plant Science

Both wounding and caterpillar herbivory change plant cellular redox potential by affecting levels of reactive oxygen species (ROS), particularly hydrogen peroxide (H_2O_2). In biological systems, H_2O_2 plays a dual role. At excessive concentrations, this reactive molecule leads to cell damage by reacting with DNA, protein and lipids leading to mutations and impaired functions. However, at lower concentrations, H_2O_2 is an important signaling molecule involved in plant development, physiology and stress responses. Therefore, it is crucial that the plant control cellular ROS levels. A major mechanism is through the ascorbate/glutathione cycle which acts as a cellular redox buffer. When a caterpillar feeds, it secretes saliva on the leaf material. These secretions contain numerous enzymes that potentially can affect H_2O_2 levels, such as ascorbate peroxidase (APXs) and glucose oxidase (GOX). Therefore, the objective of this study was to determine the role of caterpillar labial saliva in redox-related plant defense responses. To ascertain this, plant responses to caterpillars with salivary secretions and those with impaired salivary secretions were compared.

POSTER 2

SEDIMENT CONTROL USING ECOLOGICAL ENGINEERING IN THE LAKE DELIGNY WATERSHED

Armstrong, S., Adamwowski, J., Department of Bioresource Engineering

The purpose of this research was to propose a solution to a sedimentation problem in the Lake Deligny watershed in Mandeville, QC. To reach our objective, several ecological engineering techniques were studied. Indigenous plants will be used to modify the stream's characteristics in order to solve part of the sedimentation issue. A dense band of common cattails (*T. Latifolia*) and wooden fagots made of sweet gale (*Myrica Gale*) will be planted on each side of the stream. These plants will form a "channel" forcing the water and flushing the sediments. To collect the sediments/debris, an eddy current will be created using prevailing winds and a wooden palisade that will gather everything at the exit of the stream. These techniques are easy to apply and would reduce the overall cost of the project. They do not require major modifications to the stream but would greatly reduce the amount of sediments.

POSTER 3

VITAMIN D DEFICIENCY IN MATERNAL DIET MAY BE LINKED TO GESTATIONAL DIABETES MELLITUS

Babar, A., Weiler, H., School of Dietetics and Human Nutrition

In recent years, studies have shown a significant link between vitamin D deficiency and the development of diabetes. The objective of this study was to determine the effect of vitamin D deficiency in maternal diet on occurrence of gestational diabetes mellitus, in a guinea-pig animal model (n=44). The sows were assigned to 5 diets with differing levels of vitamin D: 0 IU/g, 0.25 IU/g, 0.5 IU/g, 1 IU/g and 2 IU/g. An OGTT was performed to determine the prevalence of gestational diabetes in the different diet groups. The results of a chi-squared test ($p=19$) performed on the occurrence of GDM illustrates that there is no significant difference between diet groups. These results do not account for many factors that affect the likelihood of developing GDM such as fetal burden, body fat changes and serum 25-hydroxyvitamin D. Future analyses that incorporate these factors will clarify if vitamin D deficiency is linked to the development of GDM.

POSTER 4

TAXONOMIC REVISION OF THE GENUS *DICRAEUS* (DIPTERA: CHLOROPIDAE)

Barrie, C., Wheeler, T., Department of Natural Resource Sciences

The purpose of my research project was to complete a revision of the grassfly genus *Dicraeus* in North America. Six species were previously recorded in the Nearctic region, but my studies of museum specimens have found one additional species previously known only from Europe as well as two new species. I will provide descriptions of all Nearctic species as well as a key to distinguish between them. Illustrations of each species will be included to facilitate identification of these flies. These species descriptions are the first step in future work including reconstructing the phylogeny of the Nearctic species and evaluating the utility of the subgeneric divisions within *Dicraeus*.

POSTER 5

AN INVESTIGATION OF HABITAT USE BY THE SHORT-EARED OWL ACROSS SEASONS ON AMHERST AND WOLFE ISLANDS

Cloutier, C., Bird, D., Department of Natural Resource Sciences

The Short-eared Owl (*Asio flammeus*) is a grassland species found throughout the world except in Australia and Antarctica. This bird was once the most abundant owl species in southern Ontario. Unfortunately, according to the Breeding Bird Survey, its numbers have declined by 4.6% annually from 1996 to 2005 across North America, leading to a total loss of 85% of the original population. Since 1994, the Short-eared Owl is considered a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada, although the updated 2008 status report indicated that it nearly meets the criteria for Threatened status. One of the reasons why this owl is not assigned a higher conservation status is because important aspects of its biology are poorly understood. In fact, a better understanding of the habitat use by the Short-eared Owl across seasons as well as improved population estimates are necessary to implement a management plan.

POSTER 6

CHARACTERIZING THE INTRACELLULAR SIGNALING PATHWAY REGULATED BY THE ADIPOSITY HORMONE LEPTIN IN THE MURINE OVARY

Cohen, T., Kalaiselvanraja, A., Duggavathi, R., Department of Animal Science

Leptin is a 16-kDa protein hormone encoded by the *ob* gene and normally produced in the adipose tissue in correlation to fat reserves. It binds to its receptor (Lepr) of which six isoforms exist, all derived by alternative splicing of the mRNA transcript. However, only the long (LeprB) and short (LeprA) isoforms can activate the JAK-STAT and MAP kinase pathways of signal transduction, respectively. The purpose of this project was to determine the mRNA expression pattern of Lepr isoforms in the murine ovary as well as to determine if leptin treatment stimulates known Lepr targets *in vivo*. RT-PCR was used to determine the relative abundance of LeprA and LeprB transcripts, and western blot to analyse the ovaries of PBS and leptin treated mice for activation of leptin signaling. Results show that Lepr is highly expressed around ovulation, especially in the interstitium/theca cells, and that intact leptin signaling is active in the ovary.

This suggests a putative role for leptin in steroidogenesis associated with maturation of the dominant follicle and ovulation.

POSTER 7

THE INFLUENCE OF FOOD ABUNDANCE ON THE BODY MASS OF FEMALE RED SQUIRRELS (*TAMIASCIURUS HUDSONICUS*) IN KLUANE NATIONAL PARK, YUKON

Doucet, C., Fletcher, Q., Humphries, M., Department of Natural Resource Sciences

Many mammals are known to gain weight in resource rich environments, but food hoarders that store energy in food caches instead of as body fat may represent an important exception. Red squirrels (*Tamiasciurus hudsonicus*) in south-western Yukon experience pronounced variation in resource availability related to the masting pattern of cone production by white spruce (*Picea glauca*). Red squirrels have been shown to anticipate the arrival of a masting event by increasing litter size and the number of litters per year. In presence of abundant food, female red squirrels are also known to breed earlier in the season and have faster growing offspring. This parental care is energetically costly and the biological characteristics allowing for such energy allocation remain unknown. This poster will examine the effects of food levels on the mass of lactating female red squirrels using data collected from a wild population of red squirrels near Kluane Lake, Yukon. Using previous year's cone index and the average mass of lactating females, the Preliminary results show that the body mass of lactating females in a given spring varies inversely with cone production during the previous autumn. Thus, following a large seed crop, lactating females are in general lighter than under low food level conditions.

POSTER 8

GREENHOUSE CULTIVATION: REDUCING RESOURCE CONSUMPTION WHILE MAINTAINING OPTIMAL YIELDS

Fulleriger, M., Lefsrud, M., Department of Bioresource Engineering

Hydroponic Systems: Hydroponic cultivation is the process of growing plants without soil. The most common systems are the standing aerated, thin film, drip, ebb and flow, and aeroponic systems. All of these were studied, and two were selected; the standing aerated system and the ebb and flow system. The systems were designed and prototypes

constructed and tested. Carbon Dioxide Enrichment: The benefits of carbon dioxide enrichment are well documented. Enrichment using the waste products of biomass combustion is an attractive alternative to existing techniques. However, the exhaust from the combustion process is laden with toxic compounds. It must therefore be treated prior to introduction into the greenhouse. Membrane separation theory was studied as a method of separating the carbon dioxide from the other compounds produced. A gas exchange chamber was designed and will be constructed to measure the diffusion rate of carbon dioxide using various membranes.

POSTER 9

EFFECTS OF CAPTIVE BREEDING ON SKIN COLOURATION AND PLASMA CAROTENOIDS IN AMERICAN KESTRELS (*FALCO SPARVERIUS*)

Gagnon, M., Bird, D., Department of Natural Resource Sciences

Captive breeding is widely used as a means of research and species conservation. For captive breeding programs to be considered valuable tools, the wild traits of a captive population must be conserved. Carotenoids in birds are important in the expression of sexually selected traits – orange skin pigmentation – and are used as antioxidants and immunostimulants. Consequently, altered carotenoid concentrations may impair a species' sexual selection and physiological functions. In order to assess whether skin colouration and carotenoid concentrations are affected by long-term captive breeding, we analyzed external color scores and plasma carotenoid concentrations in wild and captive groups of American Kestrels (*Falco sparverius*) as well as in first-generation wild birds raised in captivity. Preliminary results suggest that genetically wild males raised in captivity and their mates, regardless of the origin of the female, have higher plasma carotenoid concentrations than their conspecifics. As to carotenoid-dependent sexually selected traits, they seem to be maintained in captivity.

POSTER 10

VITAMIN D, FOLATE, AND B12 STATUS IN PANAMANIAN INDIGENOUS MOTHERS AND CHILDREN

Ham, Y., Koski, K., School of Dietetics and Human Nutrition

The objective is to determine the prevalence of vitamin D, folate and B12 deficiency in Panamanian mothers and their children. We investigated the prevalence of Vitamin D, B12 and folate deficiency and insufficiency in indigenous Panamanian mothers (n=69) and their preschool children (n=89) from the Ngobe Bugle comarca. Vitamin D deficiency and insufficiency respectively occurred in 21% and 52% of mothers while none of the children were deficient and only 14.8% of preschool children were vitamin D insufficient. Interestingly, maternal and child serum vitamin D concentrations were weakly correlated. In contrast, ninety six percent of mothers and 95% of children were folate deficient while 93% of mothers and 81% of children were B12 deficient. Causes of deficiency should be further investigated and addressed.

POSTER 11

DIVERSITY AND CULTIVATION OF A CRYPTOENDOLITHIC COMMUNITY FROM GYPSUM HILL, AXEL HEIBERG ISLAND

Johnson, H., Whyte, L., Department of Natural Resource Sciences

Endoliths are organisms that can inhabit rock environments including the cavities that exist within porous minerals such as gypsum. Samples containing cryptoendoliths (crypto = hidden) were collected from a gypsum diaper outcrop (Gypsum Hill) near the McGill Arctic Research Station on central Axel Heiberg Island in May 2010. The endolithic organisms were contained within a visible green band a few millimetres below the rock surface. Amplifications of total community DNA revealed the presence of bacteria, archaea, and eukarya. Further deep sequencing analyses revealed a diverse bacterial community and two identifiable archaeal species (sequencing of eukarya not yet complete). Cyanobacterial species belonging to *Anabaena* and *Nostoc*, as well as non-autotrophic species such as *Patulibacter minatonensis*, *Pseudonocardia sulfidoxydans*, and *Microvirga subterranea* were members of the recovered bacterial sequences. Archaeal sequences grouped primarily with unclassified members of Thermoprotei and Halobacteriaceae. Further cultivation, isolation, and identification of cryogenic photosynthetic endolithic microorganisms are in progress.

POSTER 12

PROTEIN MALNUTRITION DECREASES VISCERAL PROTEIN SYNTHESIS IN A PIGLET MODEL OF COLITIS

Jones, J., Wykes, L., School of Dietetics and Human Nutrition

Introduction: Malnutrition is an important aspect of inflammatory bowel disease in children. Objectives: To determine effects of moderate and severe protein deficiency on protein synthesis and growth in our piglet model of colitis. Methods: Piglets (n=8 per group) received a liquid diet by gastrostomy, delivering either 100%, 50%, or 15% of protein requirements, for 10 days while receiving dextran sulfate to induce colitis. Protein synthesis was measured with a 6-hour stable isotope tracer infusion of L-[ring-²H₅]phenylalanine. Results and Conclusion: Well nourished piglets with colitis doubled their body weight in 12 days, while severely protein deficient pigs did not gain weight. Fractional protein synthesis in the jejunum, ileum, spiral colon, and liver was decreased by moderate protein deficiency and further decreased by severe protein deficiency. However, protein synthesis in the distal colon did not follow this trend, no further decreases were observed past moderate deficiency suggesting increased burden of inflammatory stress.

POSTER 13

THE GENE FOR FATTY ACID BINDING PROTEIN 6 IS EXPRESSED IN MURINE OVARIES

Ménard, I., Duggavathi, R, Agellon, L.B., Department of Animal Science and School of Dietetics and Human Nutrition

Fatty acid binding protein 6 (Fabp6) is a 14kDa protein known to be expressed in the ileum. This protein preferentially binds bile acids and it is generally accepted that it is involved in the intracellular transport of bile acids. Recently, sequences corresponding to the Fabp6 has been detected in ovarian RNA samples by reverse transcription-polymerase chain reaction (RT-PCR). Therefore, the experimental objective of the present project was to validate the expression of the *Fabp6* gene in murine ovaries. The presence of the Fabp6 mRNA open reading frame in ovarian RNA of C57BL/6J mice was confirmed by RT-PCR. A protein of the same size as ileal Fabp6 was detected in ovarian extracts by immunoblotting, and was localized to the corpus luteum and granulosa cells of the ovaries by immunofluorescence microscopy. These results indicate that the murine *Fabp6* gene is also expressed in ovaries. In

order to assess the role of the Fabbp6 in female gonads, recombinant Fabbp6 protein is being purified for further studies.

POSTER 14

MODULATION OF NUCLEAR HISTONE DEACETYLASE ACTIVITY BY PCB CONGENERS AS A POSSIBLE MECHANISM OF PCB-MEDIATED NEUROTOXICITY AND THE POSSIBLE NEUROPROTECTIVE EFFECTS OF PHYTOCHEMICALS.

Munoz-Nieva, S., Kubow, S., School of Dietetics and Human Nutrition

Polychlorinated biphenyls (PCBs) are among those environmental contaminants which have been implicated in the development of several chronic illnesses, including neurodegenerative diseases. One of the postulated causes includes PCB-induced oxidative stress which may result in imbalanced activity of histone acetyltransferases (HATs) and histone deacetylases (HDACs). Epigenetic changes induced by these enzymes may result in altered gene expression and chromatin structure that could ultimately lead to disease development. Several phytochemicals found naturally in foods have been indicated to modulate the activity of HDACs but this protective effect has yet to be determined. The aim of this research project was to determine the impact of selected PCB congeners on HDAC activity in human nuclear extracts and the possible neuro- and cyto- protective effect of phytochemicals. The study could provide new mechanistic information regarding the neurotoxic and cytotoxic effects of PCBs as well as new avenues of research regarding the possible protective role of phytonutrients.

POSTER 15

CHARACTERIZATION OF C-REPEAT BINDING FACTOR GENES IN *BRACHYPODIUM DISTACHYON*

Nicole, T., Charron, J.-B., Department of Plant Science

In temperate climates, cold and freezing cause severe damage to cereal crops during winter and spring. Understanding the mechanisms responsible for cold acclimation and freezing tolerance is thus crucial to develop more efficient cereal crops. In temperate cereals, C-repeat binding factor genes (*CBF* genes) play a central role in plants' response to low temperatures. In fact, some *CBFs* activate transcription for numerous Cold-regulated genes (*COR* genes), which influence directly or indirectly the cold acclimation response. However, very little is known

about the *CBF* genes and their transcription products in the cereal crop model *Brachypodium distachyon*. The current study aims at identifying the different *CBF* genes and their functions in cold acclimation processes in *Brachypodium distachyon*. With data mining in the model's recently sequenced genome, we discovered 14 potential *CBF* genes and established phylogenetic relationship with other cereals' *CBF* genes. Further work with a RT-PCR approach is still on progress to clone the *CBF* genes and determine their patterns of expression in response to cold stress.

POSTER 16

COMPARING METHANE EMISSIONS AND PHOTOSYNTHESIS LEVELS IN TWO BOREAL PEATLANDS

Stewart, H., Strachan, I., Department of Natural Resource Sciences

Photosynthetic activity and methane fluxes were measured at two peatland sites in Quebec's Cote Nord, one near Havre-St-Pierre that exhibited frozen soil into late May and more Southern site at Baie Comeau, where the soil was melted by the summer. Collars were dug into the three dominant vegetation types at each site. Photosynthesis was measured using a closed plastic chamber attached to an EGM-4, and the change in CO₂ over time as a response to varying light levels was recorded. Another sealed chamber was used for air samples which were analyzed using gas chromatography for methane concentration to determine net methane fluxes. Methane concentrations in two pools at each site were also measured. Sampling was done over the course of three field campaigns stretching from late May to early August. A photosynthetic light response curve and methane fluxes were determined for each site.

POSTER 17

GLP-2 INFUSION IN A PIGLET MODEL OF COLITIS TO PROMOTE INTESTINAL HEALTH

Viola, M., Wykes, L., School of Dietetics and Human Nutrition

Introduction: Children with inflammatory bowel disease have increased nutritional needs due to inflammation. Glucagon-like peptide-2, a GI trophic hormone, may act to decrease disease symptoms by stimulating

intestinal growth, reducing inflammation and apoptosis and increasing cell survival and proliferation. Hypothesis: The trophic actions of GLP-2 infusion in piglets with colitis will decrease disease severity, inflammatory stress, acute phase response, and ultimately improve growth. Methods: 20 female piglets were randomized to receive hGLP-2(1-33) or vehicle. Both groups received dextran sulphate to induce colitis and a 50% macronutrient restricted diet. After 10 days, a stable isotope tracer infusion was conducted to determine protein synthesis. Results: GLP-2 infusion did not improve piglet growth and had no effect on protein synthesis in the colon, liver and in total plasma protein levels. Further Research for Conclusions: Additional results will be collected as the study progresses.

POSTER 18

EVALUATION OF A SCHOOL-BASED PROGRAM TO IMPROVE PHYSICAL ACTIVITY, DIETARY HABITS, AND PSYCHOSOCIAL WELL-BEING IN CHILDREN/ADOLESCENTS

Wang Y.L., Gougeon L., Gray-Donald K., School of Dietetics and Human Nutrition

This study was a community partnership with Big Brothers Big Sisters of Greater Montreal, who would like to participate in an evaluation of a 10 week program, which focused on education in physical activity, dietary habits, and psychosocial well-being in children/adolescents enrolled in two schools. Participants involved were from 9 to 11 years (N=21) with a mean (SD) of 12.19 (1.60) years. In one school, the program was incorporated into the regular Physical Education class (90 min), for the other, participants attended 45 min after-school groups. A pre-test and a post-test of 5 questionnaires were collected to analyze the change of results. SAS 9.2 was used for statistical analysis. Overall, there was no change in sedentary behaviour and little change in eating pattern. The measure of social acceptance was the only domain to improve of well being. The primary mode of transportation to school was by bus and car with the former increasing over time. PA during morning break, and lunch time also consistently increased. For after schools activities, there was a significant increase in going to clubs and playing outside. However, lacking of a control group has made it difficult to attribute all changes to the program and not changes in season, particularly for physical activity. This short program may not be sufficiently intensive or of sufficient length to make important lifestyle changes.

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