



The Lebanese
Association for the
Advancement of
Science (LAAS)



National Council for Scientific Research

22nd International Scientific Conference of LAAS *“The Social Avenues of Research”*

Holy Spirit University of Kaslik (USEK), Kaslik, Lebanon
14 and 15 April, 2016

Introduction

The LAAS's International Scientific Conference is an annual conference that will be held this year at the Holy Spirit University Kaslik in collaboration with the National Council for Scientific Research.

The LAAS's International Scientific Conference is a forum for researchers, allowing them to present and discuss the results of their research in various fields of science and education.

The research axes of the conference are:

- Biological, Medical, Pharmaceutical and Health Sciences.
- Chemistry and Physics, Theoretical and Experimental
- Environment, Food Security and Agriculture
- Mathematics and Computer Science
- Engineering Sciences and Architecture
- Social and Human Sciences
- Economics and Management
- Education Sciences
- Arts and World Vision
- Relations : State, enterprises, universities.

Lebanese and foreign researchers are invited to participate in this meeting by submitting summaries of their research for possible oral presentation or poster or display, in the conference program. In addition to presentations of research in the areas already mentioned, the 22nd International Scientific Conference encourages addressing national and international issues, such as the transfer and assessment of new technologies, inter-university cooperation, university-industry cooperation, science education and innovative technologies.

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acquired during two campaigns in summer of 2011 and in winter of 2012. Salameh et al., (2016) showed an identification of some common sources such as traffic-exhaust, gasoline evaporation and natural gas & distant sources on both sampling sites (Paris and Beirut). In term of contributions to total measured VOC's, traffic sources (gasoline evaporation related to traffic and traffic exhaust) were the major source contributors in Beirut for both summer and winter, while natural gas & distant sources were dominant in Paris. The difference observed among both cities could be explained by the fact that the vehicle fleet in Beirut runs on its majority on gasoline whereas in Paris diesel vehicles are favored. Moreover, the fuel used for heating and cooking, industrial activities as well as the age of the fleet is also different. Comparison of PMF results to national EMEP emission inventory for France and to the national emission inventory for Lebanon (Waked et al., 2012) showed comparable results for heating activities and an underestimation for traffic emissions by meanly a factor of two. For Lebanon, traffic emissions accounted for 67% of total VOC's in 2010 according to Waked et al., (2012) on an annual basis. The PMF source apportionment for Beirut (Salameh et al., 2016) showed a contribution for traffic sources of 74% in summer and 51% in winter in accordance with the values reported for the emission inventory. However, for other identified sources discrepancies among PMF and emissions were recorded. The results obtained indicate that emissions inventories are related to uncertainties and their evaluations using receptor models such as PMF is in need in order to improve their accuracy and to control and reduce emission sources.

Impact of Damour River on the spatial variation of coastal marine sediment characteristics

Milad Fakhri (National Center for Marine Sciences-CNRSL, Lebanon); Myriam Ghsoub (Universite de Perpignan Via Domitia & CNRS-L, Lebanon) The Damour River is a perennial river with 40 Km length, 304 Km² catchment area, and 307 Mm³ average annual flow originating from 1948 m altitude and fed by Safa and Barouk springs and several other small springs. Its warm and alkaline water making it the warmest and most alkaline of Lebanon's perennial rivers characterizes it. Nowadays, the water of Damour River is subjected to overexploitation by upstream and in the aquifers in order to satisfy residential needs and agricultural irrigation. Two dams were built on the river for irrigation. Those activities are leading to a decrease in the water discharge downstream, altering water quality. In addition to wastes and wastewater from restaurants, farms, and industrial activities such as olive oil, the water of this river is threatened by oil waste from gas stations, pesticides, fertilizer and sewage discharges. In the aim to evaluate the impact of Damour River on the environmental status of its coastal marine zone, geochemical (grain size composition), chemical (total organic matter, calcium carbonate, organic and inorganic phosphate) and biochemical (chlorophyll-a, pheopigments, carbohydrates, proteins and lipids) parameters of the sediment have been analyzed and interpreted since the sediment is considered as the ultimate reservoir of natural and anthropogenic matters and its analysis is more reliable in contamination studies than water analysis. The sampling campaign was executed on 10 March 2015 using "CANAL-CNRS" the Lebanese scientific vessel as a platform. Samples of sediment were collected from Damour River coastal marine area at nine sampling points in duplicates in accordance with three horizontal transects; (a southern transect mentioned as SDam, a middle transect MDam, and a northern transect NDam), at three different depth (15, 30, 60 m) using a stainless steel Van Veen Grab. The collected sediments were placed in glass containers and kept frozen until further analysis at the laboratory. Concerning the grain size composition the sediment seems to be mainly composed of the two fractions: fine sand: 250 < % < 63 µm, and fine fraction (silt & clay): % < 63 µm. Through the 3 transects their distribution was almost the same where the percentage of fine sand decreased with depth and vice versa for the percentage of fine fraction. The obtained values of organic matter from the analysis of Damour River's sediment ranged between 2 and 25 mg/g similar to those measured in other oligotrophic sites, and showed an increase with depth. The percentage of calcium carbonate fluctuated between 10 and 55%, and showed a rapid increase with depth, which coincided with the evolution of organic matter concentrations. This situation may be attributed to the decomposition and the sinking of the shells and some aquatic organism such as Coccolithophores, foraminifers, gastropods and bivalves. Calcium carbonate may also have terrestrial origin related to the adjacent land and may be exported to the coastal area with the river inputs. The sediment of the studied area was richer in pheopigments (0.87 - 17.74 µg/g) than in chlorophyll-a (1.60 - 6.14 µg/g). The chlorophyll-a concentrations showed a decrease with depth, far from the photic zone where photosynthesis is absent. Therefore, the highest values were recorded in the shallower points. While in opposite to the chlorophyll-a, the pheopigments, seem to increase with depth with calmer conditions and finer sediments. The ratio chlorophyll-a: pheopigments which may indicate the state of degradation of the organic matter and with consequences that of phytoplankton cells in the studied sediment showed a steady decrease with depth from 15 to 60 m through the 3 transects. It fluctuated between 0.18 and 7.08. The concentrations of total phosphate ranged between 70 and 263 µg/g and showed a steady increase with depth through the 3 transects which coincided with the distribution of organic matter. This situation may be attributed to the increase of the fine fraction concentrations with depth, since the concentrations of total phosphate is related to the surface of adsorption of the sediment particles and with calmer conditions governing the deepest points. The dominance of the inorganic phosphate at all sampling points (66 - 86%) indicates that phosphorus is available for the producers, and that the studied area is less contaminated with anthropogenic discharges. On the other hand, the organic matter was mainly constituted of refractory material since the low percentage of labile fraction (between 2 and 14% of the total organic matter) witnessing also the low levels of food available for consumers. This labile fraction is dominated by lipids (0.08 - 0.45 mg/g) due to the anthropogenic inputs into the river resulting on high LPD: CHO ratios occurring at most of the stations. Then, lower concentrations of carbohydrates (0.066 - 0.081 mg/g) followed by proteins (0.007 - 0.061 mg/g) were recorded. The PRT:CHO ratio is found to be lower than 1 through the three transects. This situation indicates the dominance of degraded material, and a terrestrial origin witnessed by the increase of the ratio with depth through the middle and southern transects. The ratios found in the sediment of Damour River's coastal area are similar to those found in the Ligurian Sea (0.14) considered as an oligotrophic site. The obtained results highlight the influence of the Damour River flow on its coastal marine area, in fact the geomorphology and the hydrodynamics governing this marine zone influence the deepest stations (60 m) that acted as accumulation points presenting the highest values for most of the studied parameters such as organic matter, total, inorganic, and organic phosphate as well as pheopigments adsorbed to the fine fraction in calmer conditions. According to this research work, Damour marine area was found to be less subjected to sources of contamination when comparing its sediment's chemical and biochemical contents to those from other coastal marine regions, and its benthic trophic classification may be considered as meso-oligotrophic to oligotrophic according to the PRT:CHO ratio.

BIO4_Biologique: Biological, Medical, Pharmaceutical, Health Sciences IV

Room HS315, Building H

Chairs: Fouad Dabboussi (Lebanese University, Lebanon), Laure Chamy (Université Saint Joseph, Lebanon), Mahmoud Halablab (RHU, Lebanon)

Modulation of Mucin 2 and Mucin 3 in Colitis Induced by Iodoacetamide and Enteropathogenic Bacteria in Rats

Abdo Jurjus (American University Of Beirut, Lebanon); Alice Geagea and Sahar Al Kattar (American University of Beirut, Lebanon); Giovanni Tomasello, Angelo Leone and Francesco Cappello (University of Palermo, Italy)

Background: The innate and acquired immune systems are both implicated in the etiology of inflammatory bowel disease (IBD) in addition to the genetic predisposition, the environmental factors and the intestinal flora covering the mucosa. A defect in the mucous covering will lead to an invasion of pathogens and stimulation of the immune response with aberrations of mucin 2, the major mucin of the mucous layer. Aim: This study

aims to assess the modulation of colonic MUC2 and MUC3 in a rat model of IBD induced by a combination of iodoacetamide and enteropathogenic *E. coli*. **Methods:** 78 Sprague-Dawley female rats were divided into 4 groups. Each group was subjected, on a weekly basis, to a rectal injection of (1) 1% methylcellulose (MC), the vehicle, or (2) saturated enteropathogenic *E. coli* bacterial suspension (B), or (3) 3% iodoacetamide (IA) in 1% MC, or (4) 3% IA followed by *E. coli* injection 48 hours later (IA+B). Biopsies of the colon were obtained for light microscopy and indirect immunofluorescence using a monoclonal primary antibody against MUC2 and MUC3. Colonic mucosal scrapings were also used for RNA extraction and running for Real-time PCR using MUC2 and MUC3 primers. **Results:** Under light microscopy, the histological sections revealed severe colonic tissue damage in the IA and IA+B groups throughout the experiment. Immunohistochemistry showed a significant decrease in the abundance of MUC2 proteins, starting day 28 of the experiment, together with an increase in their fluorescence intensity in both IA and IA+B groups. In Real-time PCR, MUC2 expression dropped significantly in the iodoacetamide-treated group and in the combined iodoacetamide-*E. coli* group, as compared to the methylcellulose-injected and the bacteria-inoculated groups. MUC3 expression did not undergo significant changes in all the groups, despite a tendency towards a reduced expression at the end of the experiment. **Conclusion:** This induced IBD model succeeded in the arousal and maintenance of IBD for a 2-months period. The inflammation lead to a clear mucosal tissue damage and disruption of the mucosal barrier, together with a decreased expression of MUC2, both on the protein and the RNA levels, whereas MUC3 expression was not significantly altered

Functional Interaction between Apolipoproteins and Complement Regulate the Mosquito Immune Response to Systemic Infections

Mike Osta (American University of Beirut, Lebanon); Layla Kamareddine (AUB, Lebanon); Johnny Nakhleh (American University of Beirut, Lebanon)

The complement-like protein TEPI is the hallmark effector molecule against *Plasmodium* ookinetes in the malaria vector *Anopheles gambiae*. We have previously shown that the knockdown (kd) of the non-catalytic clip domain serine protease CLIPA2 increased TEPI accumulation on ookinete surfaces and rendered mosquitoes more resistant to *Plasmodium*, bacterial and fungal infections. Here, CLIPA2 co-immunoprecipitation from the hemolymph of *Beauveria bassiana* infected mosquitoes followed by mass spectrometry and functional genetic analysis, lead to the identification of Apolipoprotein-II/I gene, encoding the two lipid carrier proteins Apo-I and II, as a novel negative regulator of TEPI-mediated immune response during mosquito systemic infections. Apo-II/I exhibits a similar RNAi phenotype as CLIPA2 in mosquito bioassays characterized by increased resistance to *B. bassiana* and *Escherichia coli* infections. It was previously reported that Apo-II/I kd mosquitoes exhibit increased resistance to *Plasmodium* infections in a manner also dependent on TEPI, suggesting that Apo-I and II play a broad regulatory role in mosquito immunity. Here, we provide evidence that this enhanced resistance to systemic infections is TEPI-dependent. Interestingly, silencing Apo-II/I but not CLIPA2 upregulated the expression of TEPI following systemic infections with *E. coli* and *B. bassiana* in a c-Jun N-terminal kinase (JNK) pathway dependent manner. Our results suggest that mosquito apolipoproteins-II/I play an important immune regulatory role during systemic infections. Identifying the molecular composition of lipoprotein particles from mosquitoes coupled with genome-wide gene expression studies in Apo-II/I kd genotypes challenged with different microbes is expected to reveal novel insight into the mechanisms that link lipid metabolism to immune gene regulation.

Anti-Angiogenesis therapy induce inflammation in MDA-MB-231 breast cancer cell line in vitro and in Vivo

Layal El Hajjar and Mohamed Moustafa (Beirut Arab University, Lebanon); Marwan Sabban (American University of Beirut, Lebanon)

Introduction: VEGF-A stimulates angiogenesis in a variety of diseases, especially in cancer. Bevacizumab (avastin), the recombinant antibody targeting VEGF, improves progression-free but not overall survival in metastatic breast cancer. Recent studies showed that avastin treatment in a diabetic model increased inflammation by pre-activation of RAGE signaling. Moreover, inflammatory factors of the tumor microenvironment induce epithelial-to-mesenchymal transition of non-transformed breast epithelial cells. Therefore it is important to seek further insights in ineffectiveness mechanisms to bevacizumab at the molecular level and investigate whether this is achieved by pre-activation of RAGE signaling pathway in metastatic cancer. On the other hand, both VEGF and direct cancer cell-endothelial cell interaction are crucial in extravasation. In this study, we evaluated the effect of avastin on inflammatory mediators in metastatic breast cancer (MDA-MB-231) cells treated with avastin and evaluated levels of IL-1 β , RAGE, and NF- κ B pathway in a metastatic model of breast cancer in xenograft murine model mice injected with MDA-MB-231 cancer cells treated with avastin and oleamide, a gap junction inhibitor, in secondary site of cancer metastasis (liver and lung tissues). **Methods:** Quantitative PCR and western blot were performed to assess the changes in expression levels of inflammatory mediators and other factors upon treatment with avastin/oleamide. Confocal microscopy was performed to document the expression of Nuclear Factor-kappa B (NF- κ B) phospho-p65 by immunofluorescence microscopy. **Results:** Avastin treatment increases expression of inflammatory mediators including RAGE, IL-1 β and TNF- α and EMT markers (Twist, Snail and N-Cadherin) as well as other metastatic factors including MMP2 and MMP9 at transcriptional and protein levels after treatment in vitro and in vivo. Moreover, inhibition of gap junctions by oleamide in combination with avastin treatment alleviated the effect of avastin on inflammation. **Conclusion:** Ineffectiveness of avastin treatment may be due to avastin-induced inflammatory microenvironment. Gap junction inhibition reverses this effect. Thus, anti-angiogenesis therapy should be coupled with gap junction inhibition to enhance the effect of the treatment.

Effect of Intercellular Communication on Epithelial to Mesenchymal Transition (EMT) in Metastatic Breast Cancer

Nour Ahmad Jalaeddine and Mohamed Moustafa (Beirut Arab University, Lebanon); Marwan Sabban (American University of Beirut, Lebanon)

Pannexins mediate indirect communication between cells their niche, however limited studies implicated them in cancer. We investigated the role and mechanism of action of pannexins on EMT and its association with connexins in metastatic breast cancer. **Introduction:** EMT effectors play critical role in cancer metastasis. Gap junctions contribute to cancer metastasis through cooperating intercellular interaction between subpopulation of cells and their microenvironment via cell-to-cell communication. Pannexins are vertebrate integral membrane proteins that share structural and functional features with connexins. To date, three pannexins have been described in human: PANX1, PANX2 and PANX3. These pore forming hemichannels are involved in major signaling pathways; including intracellular calcium, extracellular ATP release, and ROS production. **Methods:** The transcriptional level of pannexins was assessed in MDA-MB-231, overexpressing Cx43 and in knocked down Cx43 in vitro and in vivo using quantitative- polymerase chain reaction. Live imaging using confocal microscopy was performed to document the activity of pannexin hemichannels. Blocking of pannexin hemichannels was performed by treating the cells with probenecid, a potent pannexin inhibitor. Probenecid effect on viability (%) of MDA-MB-231 cells was assessed by trypan blue exclusion assay. The levels of EMT markers were assessed using quantitative PCR. **Results:** PANX 1 and PANX 2; but not PANX3, are expressed in MDA-MB-231. Pannexin expression is significantly influenced by Cx43 expression in vitro as well as in vivo. We demonstrated that blocking pannexin hemichannel with probenecid, not only affected intercellular communication, but also enhanced the epithelial marker E-cadherin, leading to a change in cellular morphology. Additionally, it decreased N-cadherin expression and hypoxic and angiogenesis markers, suggesting a possible role for pannexins as an anti-angiogenesis marker. **Conclusion:** These findings demonstrate the enhancement of anti-angiogenesis effect and attenuation of the cancer invasive-like phenotype induced by inhibiting pannexin hemichannels, suggesting a therapeutic advantage of combining this treatment with other anti-angiogenic and chemotherapeutic drugs.