Carta G, Giunti E, Scherma M, Abolghasemi A, Murru E, Fadda P, Banni S

Department of Biomedical Science, University of Cagliari, Italy

The survival of any organism requires efficient energy substrate utilization. When energy intake decreases, it takes place an adaptive decrease in energy expenditure and increased motivation to eat to maintain a steady body fat composition. Changes of lipid deposition and distribution among tissues are partially mediated by specific lipid mediators such as N-acylethanolamides (NAEs) and 2-monoacylglycerols (2-MGs), which influence fatty acid oxidation and lipogenesis in peripheral tissues, and food intake and satiety in brain areas. The aim of this study was to evaluate whether in female rats dramatic changes of tissue lipid deposition, as it occurs during calorie restriction, following its replenishment during the recovery phase may influence tissue concentration of NAEs and 2-MGs which may mediate the physiological adaptation of the acute adipose tissue (AT) depletion/replenishment. Our results showed that strong negative energy unbalance resulted in a steep increase of NAEs in the two key tissues for lipid metabolism, liver and AT, that may be due to a relative depletion of fatty acids owed to their β-oxidation and exportation to relevant tissues for energy expenditure such as muscles, and/or an inhibitory effect, possibly mediated by PPAR , of degrading enzymes for NAEs and 2-MGs. Interestingly, the strong increase of some NAEs may further enhance PPAR activity which facilitates the use of fatty acid as a fuel to meet the energy needs during extreme food restriction. Remarkably, in the recovery phase, a prompt rescue of fat deposition is associated to normal levels of the lipid mediators. A nutritional approach targeting NAEs and 2-MGs biosynthesis modulated by dietary fatty acids, may regulate fat deposition and distribution during acute AT depletion/replenishment.

OP.101

Initial Brain Aging and High Fat-High Fructose Diet: Effect on Mitochondrial Bioenergetics, Oxidative Status and Cholesterol Homeostasis in Rat Brain

Crescenzo R[1], Spagnuolo MS[2], Iannotta L[1], Cancelliere R[1], Mazzoli A[1], Gatto C[1], Canè M[1], Nazzaro M[1], Iossa S[1], Cigliano L[1]

[1]Dept of Biology, University of Naples Federico II, Italy; [2]ISPAAM, CNR, Italy

Middle age is an early stage of the aging process, during which the consumption of diets rich in saturated fats and/or simple sugars might influence brain function, but only few data are available on this issue. Our aim was to investigate the impact of a diet rich in saturated fat and fructose (HFF) on mitochondrial physiology and cholesterol homeostasis in brain, where this lipid is involved in the maintenance of several neuronal processes. In particular we focused on critical areas for learning and memory, i.e. hippocampus and frontal cortex of middle-aged rats (11 months old), by including a group of adult rats (90 days) as negative control, lacking the putative effect of aging. Middle-aged rats were fed HFF or control diet for 4 weeks. Mitochondrial function was analyzed by high-resolution respirometry and by assessing respiratory complexes levels. A decrease in the activity of complex I was detected in both brain areas of middle-aged rats. In hippocampus, an age-decrease in mitochondrial respiratory capacity and complex IV content, partly reversed by HFF diet, was evident. Higher oxidative protein damage decreased antioxidant defenses, and increased UCP2 and PGC-1α were found in hippocampus of middle-aged rats. HFF feeding induced a significant reduction in the amount of UCP2, PGC-1α and PPARα, together with higher protein oxidative damage, in both brain areas. Notably HFF feeding also induced the alteration in key proteins of the regulatory network of brain cholesterol levels (LXR-β, HMGR, LDLr, Apolipoprotein E etc) that could predispose to neurodegenerative diseases. Overall, our results point to middle age as a condition of early brain aging for mitochondrial function, with hippocampus being an area more susceptible to metabolic impairment than frontal cortex.

OP.102

Long-term effect of a classical ketogenic diet on glucose metabolism: A 12-months longitudinal study

De Amicis R, Leone A, Foppiani A, Lessa C, Ravella S, Battezzati A, Bertoli S

International Center for the Assessment of Nutritional Status (ICANS), Department of Food Environmental and Nutritional Sciences (DeFENS), University of Milan, Italy

The classical ketogenic diet (cKD) is a normocaloric, high-fat, very low-carbohydrate diet that induces ketosis, mimicking starvation state. The ketone bodies are alternative body fuel and they pass into the brain, replacing glucose as an energy source; for these reasons, it's used as a recognised treatment for drug-resistant epilepsy (DRE), GLUT1 Deficiency Syndrome (GLUT1DS) and PDH deficiency, and it's currently assessed for obesity, metabolic syndrome and type 2 diabetes. Glucose profile on patients treated with a long- term cKD has poorly investigated, so we evaluated the effect of a 12-months cKD on glucose metabolism of 29 children affected by DRE and GLUT1DS (mean age: 8.0 y, range: 0.5- 16.6 y; 17 females; 22 GLUT1DS), to determine fasting HOmeostatic Model Assessment- Insulin Resistance

(HOMA-IR) and Quantitative Insulin Sensitivity Index (QUICKI). BMI- zscore (-0.22±1.87 vs -0.38±1.39, P=0.453) and percentage of body fat (22.7±7.8 vs 22.2±1.3, P=0.488) didn't change during the treatment. Children showed a not significant reduction in fasting blood glucose (84.9±1.6 mg/dl vs 80.8±1.6 mg/dl; P=0.085). However, fasting insulin significantly decreased (9.2±1.0 μU/mL vs 5.5±1.0 μU/mL; P=0.013), and both HOMA-IR and QUICKI indexes were significantly changed (2.0±0.2 vs 1.2±0.2; P=0.018; 0.51±0.00 vs 0.52±0.00; P=0.041, respectively). After 12 months of cKD, fasting blood glucose doesn't change, but a significant improvement is observed in HOMA-IR and QUICKI indexes, corroborating our previously published data of short-term effect of cKD on glucose metabolism. These results suggest potential interesting implications of the KD in insulin metabolism alterations; however, long-term studies on adult patients are needed to confirm these adaptive metabolic changes during cKD.

OP.103

Fumonisins induced toxic mechanisms on intestinal epithelial models

Garbetta A[1], Martino NA[2], Debellis L[3]

[1]Institute of Sciences of Food Production (ISPA), CNR, Italy; [2]Dept. of Veterinary Science, University of Turin, Italy; [3]Dept. of Bioscience, Biotechnologies and Biopharmaceutics, University of Bari, Italy

Fumonisins (FBs) are Fusarium mycotoxins, common contaminants in corn products, with toxic effects on animal and human health linked mainly to inhibition of ceramide synthase. The study aimed to assess, on *ex-vivo* human and rat intestine, the effects induced by FBs exposure on: a) epithelial transport index (short circuit current); b) lipid peroxidation (malondialdehyde levels, MDA). Moreover, in order to understand FBs toxicity mechanisms, several functional parameters, such as cell proliferation, oxidative status, immunomodulatory effect and changes in membrane microviscosity, assessed by fluorescence anisotropy, were tested on human intestinal cell line HT-29. Exposure to contaminated (FBs 0.7 to 90 μg/ml) corn chyme samples affected significantly (up to 30%) the electrogenic transports in both intestinal epithelia models, inducing also a significant FBs concentration-related lipid peroxidation (up to 200% MDA increase), probably due to interactions between mycotoxins and intestinal membranes. The experiments carried out on HT-29 line showed an early intracytoplasmatic FB1-FITC localization, confirmed the lipid peroxidation, followed by a significant decrease in IL-8 inflammatory response (up to 24%) and a significant reduction in membrane microviscosity. The lipid peroxidation, concomitant with modification in membrane fluidity, could explain the alterations in the physiological process of cell-mediated transport found in *ex vivo* intestinal tracts.

OP.104

A nutritional intervention based on egg white for phosphorus control in hemodialyis patients.

Di Maro M, Di Lauro T, Trio R, Salomone E, Di Martino R, Di Lauro M, Sacco E, Colantuoni A, Guida B

Department of Clinical Medicine and Surgery, Physiology Nutrition Unit, Federico II University of Naples, Italy

The aim of the present study was to evaluate a dietary intervention for hyperphosphatemia in dialysis patients based on the partial replacement of meat and fish with egg white, a virtually phosphorous-free protein source. 23 hyperphosphatemic patients on chronic standard 4 h, three times weekly, bicarbonate hemodialysis were enrolled in this open-label, randomized controlled trial. Patients in the intervention group were instructed to replace fish or meat with egg white in three meals a week for three months whereas diet was unchanged in the control group. At the end of the study, serum phosphate concentrations were significantly lower in the intervention group than in controls (4.9 ± 1.0 vs 6.6 ± 0.8; $p < 0.001$). Phosphate concentrations decreased more from baseline in the intervention than in the control group both after one (-1.2 ± 1.1 vs 05 ± 1.1; $p = 0.004$) and after three (-1.7 ± 1,1 vs -0.6 ± 1,1; $p < 0.001$) months of follow-up. No change either in body weight or in body composition assessed with bioelectrical impedance analysis or in serum albumin concentration was observed in either group. The partial replacement of meat and fish with egg white induces a significant decrease in serum phosphate without causing protein malnutrition and could represent a useful instrument to control serum phosphate levels in hemodialysis patients.

OP.105

Dietary supply of the antioxidant and prebiotic mix promotes muscle growth and improves disease resistance in cultivated fish

Lysenko L, Kantserova N, Parshukov A, Sukhovskaya I

Institute of Biology KarRC RAS, Petrozavodsk, Russia

In order to maintain welfare of reared fish and to improve performance natural antioxidants and