

Efecto de la suplementación con vitaminas y minerales sobre el marcador de estrés oxidativo 3-nitrotirosina en plasma, orina y tejido hepático en vacas lecheras durante el período de transición

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La intensificación de la producción lechera ha generado una gran demanda metabólica en los animales causando un incremento en el estrés oxidativo, particularmente durante el período de transición de vacas lecheras. Por lo tanto, el objetivo fue estudiar la concentración de 3-nitrotirosina (3-NT) en plasma, orina y tejido hepático como marcador de estrés oxidativo, y otros biomarcadores metabólicos en plasma de vacas suplementadas con vitaminas y minerales durante el período de transición. El grupo suplementado (GS; n=11) recibió por vía subcutánea una dosis de 5 mL del suplemento vitamínico ADAPTADOR VIT y 5 mL del suplemento mineral ADAPTADOR MIN a los días -60, -30 y 7, considerando día 0 al parto. El grupo control (GC; n=11) recibió dos inyecciones de 5 mL de solución salina al 0,9%. Se tomaron muestras de sangre, orina y biopsia hepática a los días -21, 7 y 21 para la evaluación de 3-NT. También se evaluó la concentración plasmática de ácidos grasos no esterificados, betahidroxibutirato, glucosa, albúmina, colesterol, bilirrubina, aspartato aminotransferasa, gama-glutamyl transferasa y el contenido hepático de triacilglicerol. Las vacas del GS tuvieron una mayor concentración plasmática de 3-NT ($p<0,05$), pero menor concentración en hígado ($p<0,05$). A su vez, se detectó un menor contenido de triacilglicerol hepático y mayor concentración de glucosa plasmática en vacas del GS ($p<0,05$). Con respecto a la albúmina, la concentración plasmática fue mayor en vacas del GS ($p<0,05$), con un efecto tratamiento x tiempo ($p<0,05$), siendo particularmente mayor al día 21 preparto y al día 4 posparto. No se observaron diferencias significativas en el resto de los parámetros estudiados. Estos resultados sugieren que la suplementación con vitaminas y minerales podría aminorar el estrés oxidativo en el hígado de vacas lecheras en el período de transición.

the control ($p < 0.05$). These results suggest that protein malnutrition during the development predisposes to the occurrence of diabetes and the increment of liver inflammation and oxidative stress markers in their offspring.

337. (314) EFFECT OF DIETARY SUPPLEMENTATION WITH RESVERATROL, ALPHA-TOCOPHEROL AND PIPERINE ON OXIDATIVE STRESS AND INFLAMMATION IN OLDER ADULTS WITH RISK FACTORS FOR METABOLIC SYNDROME

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Oxidative stress, hypertension, blood glucose level and lipid profile are risk factors for metabolic syndrome (MS) and cardiac disease in older adults. The aim of this study is evaluate the protective role of resveratrol supplementation on chronic inflammation and oxidative stress associated to MS. Voluntary patients with a diagnosis of MS ($n=92$) based on the diagnostic criteria of the National Cholesterol Education Program, Adult treatment Panel III, 2002 received a dietary supplement (RTP: 50 mg resveratrol, 25 mg alpha-tocopherol and 5 mg piperine) along with their usual treatment for a period of 3 months. Piperine increases resveratrol and alpha-tocopherol absorption. Control was the patient himself in baseline conditions, avoiding interindividual variables and bioavailability of active principles. Venous blood was collected from 23 patients (68 ± 5 years), and biochemical markers were assessed in plasma: protein oxidation (measured as carbonyl protein, CO), and interleukin 6 (IL-6); and in red blood cells (RBC): catalase activity. Patients were classified into 3 groups according to the amount of risk factors (blood glucose, HDL cholesterol, triglycerides, waist circumference and blood pressure) for MS: 3/5 ($n=7$), 4/5 ($n=5$) and 5/5 ($n=11$) risk factors. Preliminary results showed increase in catalase activity (22-32%, $p < 0.05$) in the 3 groups of patients after RTP treatment, without differences between groups. When blood glucose, HDL-cholesterol and Triglycerides risk factors were evaluated separately, it was observed that they all impact on catalase activity in the same way after RTP treatment. No significant differences were observed in IL-6 and CO after RTP neither among groups. RTP treatment improves the enzymatic antioxidant response by protecting cells from oxidative damage by hydrogen peroxide generated in inflammatory processes, regardless of the risk factors of the MS patient.

338. (326) EFFECTS OF FLAXSEED OIL RICH IN LIGNANS ON LIPID ALTERATIONS INDUCED BY CAFETERIA DIET IN RATS

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Cafeteria (CAF) diet, composed by palatable foods high in saturated fat and refined carbohydrates, leads to a deregulation of lipid metabolism with hepatic triacylglycerol (TAG) accumulation which can progress to non-alcoholic fatty liver disease (NAFLD). Flaxseed oil (FO) can be used as a functional food ingredient due to its potential health benefits and excellent nutrient profile. The principal component of virgin FO is α -linolenic acid, which can be enriched with lignans (LGN). This preliminary study aimed to investigate the effects of virgin FO rich in LGN on the alterations induced by the cafeteria diet. Wistar rats (310g) were fed during 60 days with the diets: control (SO): soybean oil 4%, CAF (C): lipids 30% and CAF+FO (CF): lipids 26%+4% FO rich in LGN. Food intake, body weight gain, relative epididymal (EAT) and retroperitoneal (RPAT) adipose tissues and liver weights; and serum TAG, cholesterol (CHO) and glucose (GLU) levels, were measured. Liver fatty acids profile was determinate by

gas chromatography. Data were analyzed by One-Way ANOVA followed by Tukey's test ($p < 0.05$). The results were: food intake: SO($108,2 \pm 6,5$), C($140,1 \pm 6,5$) and CF($125,9 \pm 2,6$), body weight gain: SO($115 \pm 3,6$), C($170,6 \pm 4,1$), CF($155,8 \pm 7,7$); relative tissues weights: EAT: SO($2,44 \pm 0,12$), C($3,09 \pm 0,07$) and CF($2,53 \pm 0,11$); RPAT: SO($3,95 \pm 0,14$), C($4,60 \pm 0,11$) and CF($3,81 \pm 0,24$) and liver: SO($2,24 \pm 0,04$), C($2,52 \pm 0,07$) and CF($2,52 \pm 0,03$); serum TAG: SO($2,31 \pm 0,14$), C($3,10 \pm 0,12$) and CF($2,33 \pm 0,26$), CHO: SO($0,98 \pm 0,02$), C($0,80 \pm 0,04$) and CF($0,81 \pm 0,04$) and GLU: SO($1,53 \pm 0,07$), C($2,17 \pm 0,20$), CF($1,56 \pm 0,05$). In liver $n-3$ polyunsaturated fatty acids (PUFA) were increased (200%) and $n-6/n-3$ ratio was diminished (70%) by CF vs C. In conclusion, these preliminary results showed that virgin FO rich in LGN attenuates some negative effects on lipid alterations induced by cafeteria diet, diminishing adipose tissues weights and serum TAG levels, as well as, improving liver fatty acids profile.

339. (341) EFFECTS OF MINERAL AND VITAMIN SUPPLEMENTATION IN THE OXIDATIVE STRESS BIOMARKER 3-NITROTYROSINE IN PLASMA, URINE AND LIVER TISSUE OF DAIRY CATTLE DURING THE TRANSITION PERIOD

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The intensification of milk production has generated a great metabolic demand in the animals causing an increase in the oxidative stress, particularly during the transition period of dairy cattle. Therefore, we aimed to study the concentration of free 3-nitrotyrosine (3-NT) in plasma, urine and liver tissue, as a marker of the oxidative stress, and other metabolic biomarkers in plasma of cows supplemented with vitamins and minerals during the transition period. The supplemented group (SG; $n = 11$) received subcutaneously a dose of 5 ml of the vitamin supplement ADAPTADOR® Vit and 5 ml of the mineral supplement ADAPTADOR® Min (Biogenesis Bagó, Bs. As.; vitamin A palmitate 3.5% and vitamin E acetate 5%, copper edetate 1%, zinc edetate 4%, manganese edetate 1% and sodium selenite 0.5%) on -60, -30 and 7 days relative to calving. The control group (CG; $n = 11$) received two injections of 5 ml of 0.9 % sodium chloride. Blood, urine and liver biopsies were sampled at -21, 7 and 21 days relative to calving and to evaluate 3-NT. Also, plasma concentrations of non-esterified fatty acids, beta-hydroxybutyrate, glucose, albumin, cholesterol, bilirubin, aspartate aminotransferase, gamma-glutamyl transferase and liver triacylglycerol content were spectrophotometrically measured. In cows of the SG, 3-NT concentration was greater in plasma ($p < 0.05$) and lesser in the liver tissue ($p < 0.05$). In addition, a lesser liver triacylglycerol content and greater glucose concentration was detected in cows of the SG ($p < 0.05$). Regarding albumin, plasma concentration was greater in cows of the SG ($p < 0.05$), with a supplementation \times time effect ($p < 0.05$), being particularly greater on day 21 pre-calving and day 4 post-calving. No statistical differences were evidenced in the other studied parameters. These results suggest that mineral and vitamin supplementation could ameliorate the oxidative stress in the liver and the transition of dairy cows.

340. (399) COMPARISON OF INTESTINAL AND HEPATIC MTTp IN THE STATE OF DYSDIOSIS ASSOCIATED WITH INSULIN RESISTANCE

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