Postprandial concentration of satiety-related hormones and metabolites in Beagle dogs after consumption of a high carbohydrate or a high fat diet

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Introduction: Dietary macronutrient influence gastrointestinal satiety-related peptides such as ghrelin, cholecystokinin (CCK), peptide YY (PYY) or insulin. Whereas high protein and high fiber diets are known to trigger satiety, the effect of fat and carbohydrates on appetite regulation remains controversial. It has been reported that high fat diet intake is associated to an impaired energy intake control. The aim of this study was to evaluate the satiety response of a high fat (HF) and a high carbohydrate (HC) diet in dogs fed a restricted level of energy.

Animals, material and methods: Twelve female Beagle dogs (2-7 yrs old, 14.5±1.47 kg BW) received a HF and a HC diet in two periods following a change-over design. Both diets had a high CF content (8.5-9.0% DM) and were iso-proteic in an energetic basis (28% ME), providing about 44% ME either by fat or by carbohydrates. After a 9-d adaptation to the diets and a 5-d *ad libitum* administration, level of intake was restricted to 0.70 MER (150 and 180 g DM/d; HF and HC diet, respectively) for 14 d, during which a "challenge diet" was offered 4 h after the morning meal every two days to evaluate the grade of satiation. On d-29 blood samples were collected before feeding (0 h) and 15′, 60′, 120′, 240′and 360′ after eating (0.70 MER) for PYY, CCK, ghrelin and insulin determination. Glucose and triglycerides (Tg) were measured at 0, 60′ and 240′. Dietary effect was analysed relative to fasting value (baseline subtracted) including time as repeated measure using Proc Glimmix (SAS Inst. Inc., Cary, NC). Results were also expressed as net AUC (n-$AUC_{0\text{-}120}$ and n-$AUC_{120\text{-}360}$).

Results and discussion: Basal PYY, CCK, ghrelin, insulin, glucose and triglycerides concentration was not affected by the dietary treatment ($p>0.10$). PYY significantly increase ($P<0.001$) after meal onset reaching a peak 1 to 2 h after eating. The HC diet induced a higher PYY increase than the HF diet along time (diet*time, $p=0.017$), especially at time points 120′, 240′ and 360′ (n-$AUC_{120\text{-}360}$; $p=0.015$). CCK increased after meal ($p<0.001$) and the response also differed between diets (diet*time, $p=0.034$), being lower and retarded with the HF compared with HC (maximum concentration was reached at 360′ and 120′, respectively, n-$AUC_{120\text{-}360}$, $p<0.05$). Ghrelin basal concentration significantly decreased after eating ($p=0.003$) reaching a nadir at 120′ in both HC and HF. Ghrelin n-$AUC_{0\text{-}120}$ and n-$AUC_{120\text{-}360}$ did not differ between diets ($p>0.10$). Insulin, glucose and Tg postprandial increase was neither significantly affected by the diet ($p>0.10$), although, quantitatively, glucose and insulin was higher with HC whereas for Tg was higher with HF at 60′.

Conclusion: In dogs fed a restricted level of intake, the HC diet induced a greater satiety hormone response than the HF diet, which could be related to the type of metabolites absorbed but also by the differences in meal size. However, this effect was not accompanied by variations in challenge diet intake[1].

References: [1]Schauf S, Pérez-Calvo E, Salas A, Torre C, Castrillo C. Proceedings of the 15th ESVCN Congress; 2011Sep 14-16; Zaragoza, Spain.