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Low Protein/low Methionine/high Carbohydrate Diets Induce Hyperphagia, Increase Energy Expenditure and FGF21, but Modestly Affect Adiposity in Female BalbC Mice (OR09-01-19)

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Objectives: Low-protein diets are reported to induce hyperphagia to fulfil protein needs but at the expense of energy balance with a risk to gain in adiposity. However, different studies did not show body fat gain because an increased energy expenditure partly compensated the increase in energy intake and prevents the gain in adiposity. The present study evaluated in mice the consequence of protein restricted diets combined with protein quality (milk protein versus soy protein with slight methionine deficiency) on energy balance and adiposity and the role of FGF21 in the response to the protein restricted diets.

Methods: The study investigated in female BalbC mice the behavioural, metabolic and phenotypic responses to 8 weeks feeding a very low (3% energy - P3), moderately low (6% - P6) or adequate (20% - P20) dietary protein diet and evaluated if methionine scarcity, using soy protein (S) vs casein (C), affected these responses. Food intake, body weight, adiposity (assessed by DEXA), were measured throughout the study and body composition determined at the end of the study. Plasma,

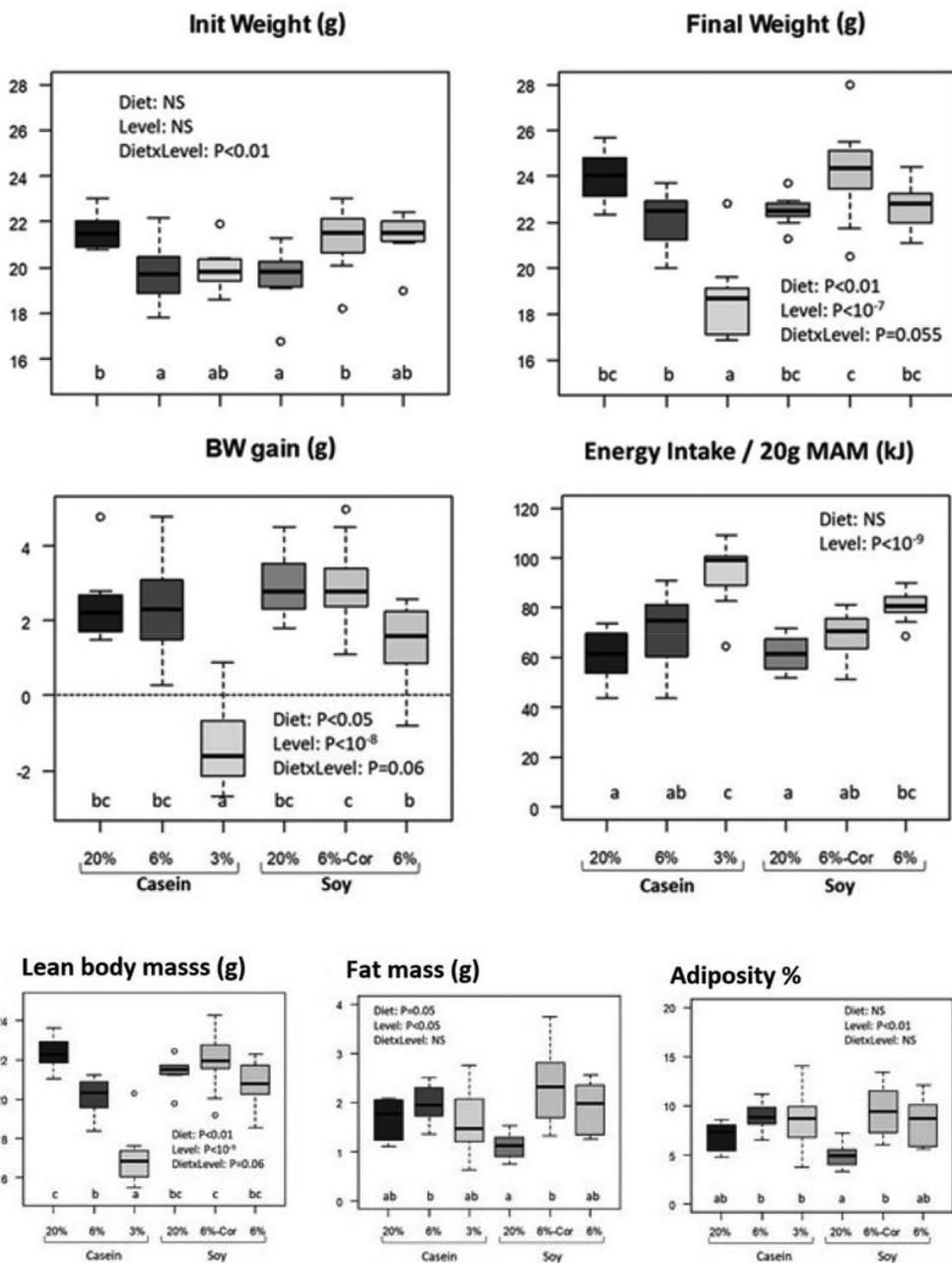
liver, muscle, adipose tissue and hypothalamus samples were collected for nutrient, hormones and gene expression measurements.

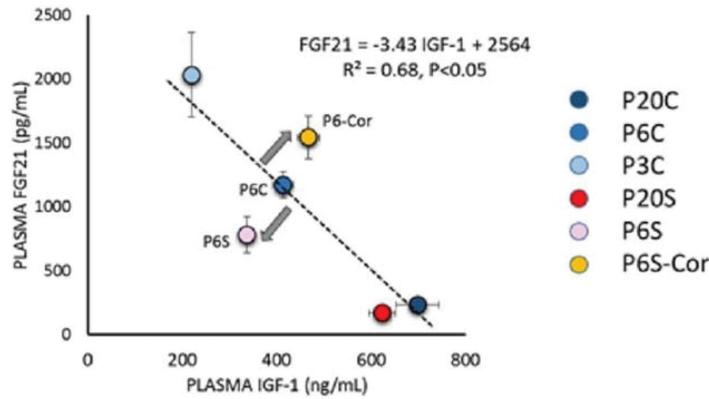
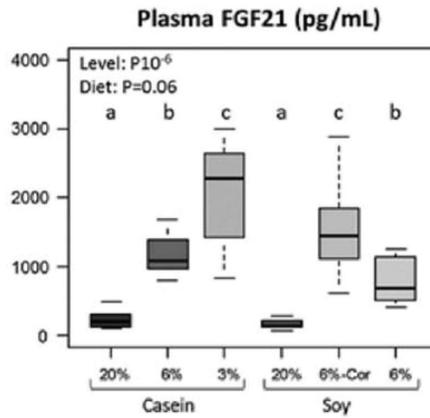
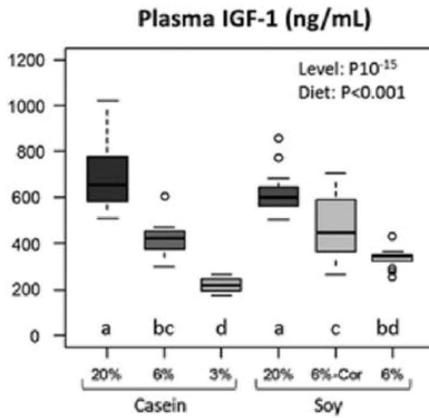
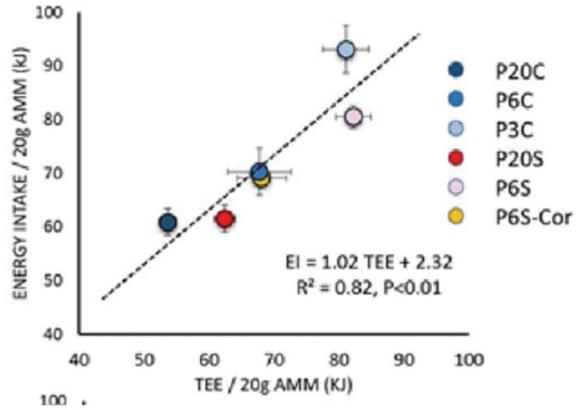
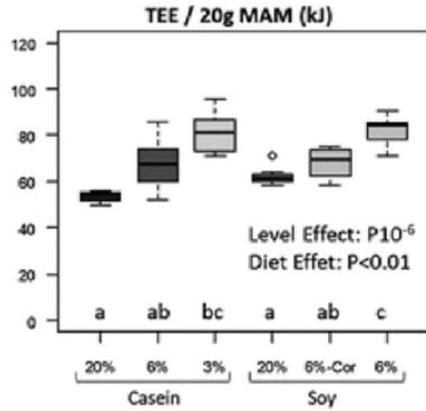
Results: Decreasing dietary casein from 20% to 3% increased energy intake, slightly increased adiposity, and this was exacerbated with methionine-deficient soy protein (figure 1). Lean body mass was reduced in 3% casein fed mice but preserved in all 6% fed mice. The effect on fat mass was limited because energy expenditure was also increased (figure 2). In plasma, low protein diets decreased IGF-1 and increased FGF21 that was related to protein level, protein to carbohydrate ratio and methionine content in the diet (figure 3). Insulin response to an oral glucose test was reduced in soy and low-protein fed mice. Low-protein diets did not affect Ucp1 but increased Fgf21 in brown adipose tissue and Fgf21, Fas, and Cd36 in the liver. In the hypothalamus, Npy was increased and Pomc was decreased only in 3% casein fed mice.

Conclusions: Reducing dietary protein and protein quality increases both energy intake and energy expenditure resulting only in slight increase in adiposity. In this process FGF21 is probably a signal that responds to a combination of protein restriction and carbohydrate content of the diet.

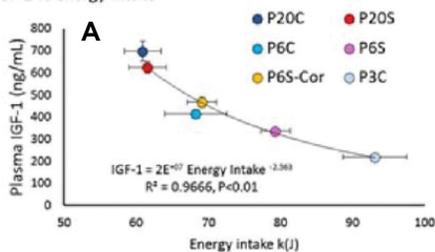
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Supporting Tables, Images and/or Graphs:

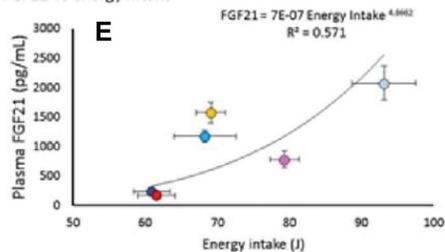




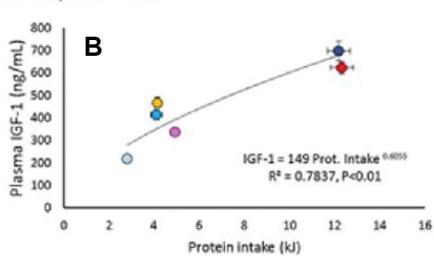
IGF-1 vs energy intake



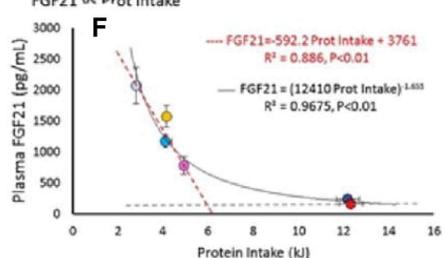
FGF21 vs energy intake



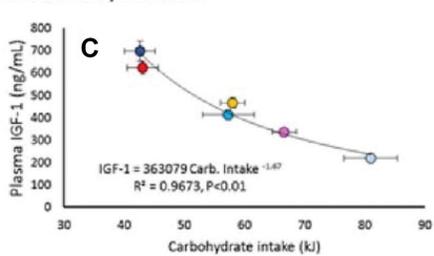
IGF-1 vs protein intake



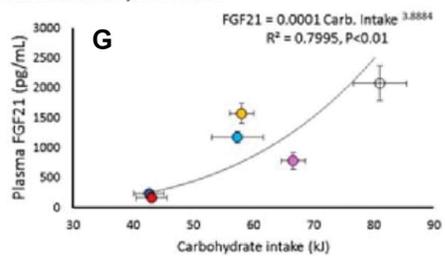
FGF21 vs Prot Intake



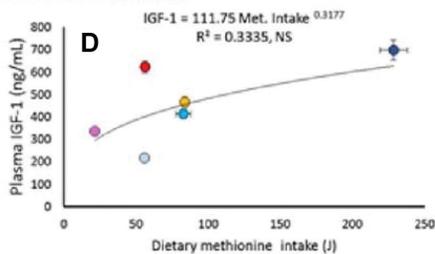
IGF-1 vs carbohydrate intake



FGF21 vs carbohydrate intake



IGF-1 vs methionine intake



FGF21 vs methionine intake

