

WP2: Diets with varying amount and amino acid composition

Background: The branched chain amino acid leucine seems to influence energy balanced related mechanisms both peripherally and in CNS (satiety) [12]. It is abundantly present in dietary proteins from whey. The indication that leucine is inversely associated with the prevalence of obesity might be due to the fact that leucine alters energy partitioning between adipose tissue and skeletal muscle, resulting in reduced net lipid storage in adipose tissue and increased fat oxidation in muscle [13].

The recent (re)discovery of brown adipose tissue (BAT) in adult humans can have implications for the treatment of obesity and metabolic diseases [14]. Compared to white fat, BAT is more metabolically active and burns off energy to heat and it has been suggested that dietary increased brown fat metabolism may induce weight loss – where high leucine may be one dietary factor activating BAT. An association between BAT metabolic rate and ¹³C bicarbonate signal has been demonstrated using DNP [15]. Even though there might be cardiovascular risk of low carbohydrate-high protein diets, [16] less is known about the impact of amino acids in the onset of heart diseases [17] - but recent meta-analysis of high intake of dairy products have found inverse associations with the risk of type 2 diabetes and metabolic syndrome [18].

Objectives: → To acquire metabolic data substantiating the theory that increased relative dietary protein content (especially high leucine–ketogene amino acids) in obese and diabetic patients, can reduce metabolic syndrome diseases; → To investigate the effect of leucine enriched diets on BAT tissue in normal and in obese persons; → To study heart muscle in stroke patients; → To study heart metabolism in pigs undergoing branched-chain amino acids (Leucine, Isoleucine and Valine) feeding programs with or without induced cardiac stroke.

Method: The studies will be based on use DNP ¹³C enriched pyruvate and transaminase bioprobes in humans and on animals. The investigations will be performed with a whey product enhanced with leucine developed in collaboration with Arla. In case of delayed introduction of DNP for human studies the focus will be shifted towards obese rodent models and secondly stroke models in pigs.

Outcome: Possible effect of leucine enriched diets on obesity and diabetes and data on this amino acids role in BAT metabolism; effect of varying branched-chain amino acids content in food on heart metabolism.

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