

## Research Article

**Betaine supplementation affects the cholesterol but not the lipid profile of pigs**José M. Martins<sup>1</sup>, José A. Neves<sup>2</sup>, Amadeu Freitas<sup>2</sup> and José L. Tirapicos<sup>3</sup><sup>1</sup> Laboratório de Metabolismo Animal, ICAM/Universidade de Évora, 7002-554 Évora, Portugal<sup>2</sup> Departamento de Zootecnia, Universidade de Évora, 7002-554 Évora, Portugal<sup>3</sup> Departamento de Medicina Veterinária, Universidade de Évora, 7002-554 Évora, Portugal

This study was undertaken to investigate the effects of long term betaine intake on the cholesterol and lipid profile of Alentejano (AL) pigs. At ~36 kg body weight (BW), castrated male and female pigs fed a commercial (C) diet, were divided into two groups: i) Group C, consuming the C diet; and ii) Group CB, consuming the C diet supplemented with 1 g/kg betaine. Pigs were slaughtered at ~100 kg BW. Fasting plasma concentrations of protein, urea, glucose, TAG, phospholipids, homocysteine, total and LDL- and HDL-cholesterol were determined. Liver TAG, phospholipids, and total and free cholesterol were analyzed, as well as total lipids, cholesterol contents, and fatty acid (FA) composition of *M. semimembranosus* and dorsal subcutaneous fat. Betaine supplemented pigs presented significantly higher plasma concentrations of TAG, phospholipids, cholesterol, and lipoprotein cholesterol. The dorsal subcutaneous fat cholesterol concentration was also significantly higher in CB than in C pigs. No differences were detected in the most abundant FA profile (including the unsaturated to saturated FA ratio) of muscle and subcutaneous fat tissues among treatments. These data suggest that betaine induces dyslipidemia, and increases cholesterol concentration in dorsal subcutaneous fat, without affecting the FA profile of *M. semimembranosus* and dorsal subcutaneous fat.

**Keywords:** betaine / homocysteinemia / cholesterolemia / tissue fatty acids / Alentejano pig

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**Practical applications**

Betaine has been used as a carcass modifier on pigs and also as a homocysteine-lowering agent, the high plasma concentrations of which are considered a risk factor for pathologies such as coronary heart disease (CHD) and atherosclerosis. This work showed no effect of long term betaine consumption (2 g/d) on body fat deposition and total lipids and FA profile of *M. semimembranosus* and dorsal subcutaneous fat of pigs. It also

showed that betaine consumption induces dyslipidemia, namely by increasing cholesterolemia and the dorsal subcutaneous fat cholesterol concentration, without affecting the FA profile of muscle and fat tissues. These observations indicate that the use of betaine: i) did not alter muscle total lipids and FA profile of the tissues analysed, which would be of concern to consumers' health and to pig producers using betaine as a carcass modifier; but ii) must be further studied since it induces hypercholesterolemia, a CHD risk factor.

**Correspondence:** Jose M. Martins, Departamento de Zootecnia, Universidade de Evora, 7002-554 Evora, Portugal.**E-mail:** jmartins@uevora.pt**Fax:** +351 266760841**Abbreviations:** AL, Alentejano; BHMT, betaine homocysteine methyltransferase; BW, body weight; C, commercial; CB, C diet supplemented with betaine; Hcy, homocysteine; SFA, saturated fatty acids; UFA, unsaturated fatty acids**1 Introduction**

An unfavorable lipid profile (e.g., high total cholesterol, high LDL- and low HDL-cholesterol, and high TAG levels), hypertension, inactivity and smoking are associated with the majority of cases of coronary heart disease (CHD). However, not all CHD cases can be explained by these established risk factors and the search for novel risk factors remains [1,2].