

**Effects of ileo-rectal anastomosis on cholesterol metabolism in pigs fed either  
casein or extruded soya beans**

**Ofélia P. Bento<sup>2</sup>, José M. Martins, Maria J. Lança, Manuel C. de Abreu, Ana M.  
Crespo<sup>\*</sup>, João P. Bengala-Freire<sup>\*\*</sup> José A. A. Almeida and Michel Riottot<sup>\*\*\*</sup>**

*Departamento de Zootecnia , Universidade de Évora, Apartado 94, 7002-554 Évora,  
Portugal; <sup>\*</sup> Departamento de Zoologia e Antropologia, Faculdade de Ciências de  
Lisboa, Bloco C2, 3º Piso, 1740-016 Lisboa, Portugal; <sup>\*\*</sup> Departamento de Produção  
Agrícola e Animal, Instituto Superior de Agronomia, Tapada da Ajuda, 1349-017  
Lisboa; <sup>\*\*\*</sup> Laboratoire de Physiologie de la Nutrition – INRA, Université Paris Sud ,  
Batiment 447, 91405 Orsay Cedex*

**Running title:** Soybean and cholesterol metabolism in growing pigs

1

---

<sup>1</sup> Supported by PRAXIS XXI research programme of Fundação para a Ciência e Tecnologia, Portugal

<sup>2</sup> To whom correspondence should be addressed. [phone (351 266 760838); fax (351 266 760841)]. E-mail: [ofelia@uevora.pt](mailto:ofelia@uevora.pt)

<sup>3</sup> Abbreviations used: ADF, acid detergent fiber; C, casein; CYP7A, microsomal cholesterol 7 $\alpha$ -hydroxylase; CYP27, mitochondrial sterol 27-hydroxylase; ES, extruded soybean; HDLc, high density lipoprotein-cholesterol; HMG CoA, Microsomal 3-hydroxy-3-methylglutaryl coenzyme A; IRA, ileo-rectal anastomosis; LDLc, low density lipoprotein-cholesterol; NDF, neutral detergent fiber

## ABSTRACT

The importance of legume proteins in the cholesterol metabolism has been recognized in different animals, but the contribution of large intestine to this process is still unclear. The present study was undertaken to compare a casein based diet (C) with a diet, where 60% of the protein supplied by casein was replaced by extruded soybean (ES) on cholesterol metabolism of pigs with (I) and without ileo-rectal anastomosis (IRA). Four groups of six growing pigs (28.0 kg) were assigned to the treatments. All the animals presented a moderate hypercholesterolemia and there were no significant differences, due to the protein source or IRA, in LDL- and HDL- cholesterol plasma concentrations. ES significantly depressed ( $P \leq 0.01$ ) total, free and esters of hepatic cholesterol and increased ( $P \leq 0.01$ ) hepatic total lipids concentration. There were significant ( $P \leq 0.05$ ) interactions between diet and IRA on HMG CoA reductase and cholesterol 7 $\alpha$ -hydroxylase activities, but 27-hydroxylase activity was unaffected. Feeding ES showed a tendency ( $P = 0.056$ ) to decrease the activity of LDL liver receptors, depressed free ( $P \leq 0.05$ ), total cholesterol ( $P \leq 0.01$ ) and total bile acid concentration in bile ( $P \leq 0.001$ ), and increased ( $P \leq 0.05$ ) neutral sterols fecal output. There were interactions effects ( $P \leq 0.05$ ) between diet and IRA in the proportion of microbial sterols, bile acid fecal output and proportion of primary and secondary fecal acids. Nevertheless the effects over hepatic cholesterol and neutral sterol output promoted by ES diets, it wasn't verified any hypocholesterolemic effect, which could be more related with soybean protein structure and LDL receptors modulation.

KEY WORDS: ▪ soybean ▪ cholesterol metabolism ▪ pigs ▪ hepatic synthesis ▪ sterols output