# Cholesterol-lowering effects of dietary blue lupin (*Lupinus angustifolius* L.) in intact and ileorectal anastomosed pigs

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**Abstract The present study was undertaken to investigate the effect of cholesterol-enriched casein (CAS) and blue lupin seed (BL) diets on the cholesterol metabolism of intact (INT) and ileorectal anastomosed (IRA) pigs. For 3 weeks, four groups of six pigs were allocated to the treatments (CAS-INT, CAS-IRA, BL-INT, and BL-IRA). Diet-induced hypercholesterolemia was inhibited by the BL through a substantial decrease in plasma LDL-cholesterol. The BL also reduced liver esterified and total cholesterol, increased hepatic LDL receptor synthesis and HMG-CoA reductase activity, and stimulated intestinal bile acid reabsorption. The neutral sterol output was higher in BL- than in CAS-fed pigs. The bile acid output was lower in IRA than in INT pigs. Surgery also prevented steroid microbial transformation, but it did not influence plasma cholesterol levels. These results suggest that the hypocholesterolemic effect of the BL, compared with the CAS, is attributable to impaired intestinal cholesterol absorption, probably involving increased bile acid reabsorption and higher contents of dietary phytosterols, both factors that reduce the micellar solubilization of cholesterol. Furthermore, according to our data, the contribution of the large intestine to cholesterol metabolism is very weak.—** Martins, J. M., M. Riottot, M. C. de Abreu, A. M. Viegas-Crespo, M. J. Lança, J. A. Almeida, J. B. Freire, and O. P. Bento. **Cholesterol-lowering effects of dietary blue lupin (*Lupinus angustifolius* L.) in intact and ileorectal anastomosed pigs. *J. Lipid Res.* 2005.** 46: **1539–1547.**

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Hypercholesterolemia and its implications for cardiovascular diseases is a major problem in human health, and much attention has been paid to dietary intervention as a tool for its prevention and treatment (1). Legumes have shown hypocholesterolemic effects in human and animal models (2–4), but these studies have mainly been done with soybean or its components. Therefore, studies involving other legumes, such as lupins, may clarify the mechanism by which plasma cholesterol is reduced and lead to the identification of new functional foods and/or components.

Seeds of several species of lupins have been used as food for >3,000 years in the Mediterranean area (5). These bitter seeds had to be soaked in water before consumption, to remove most of their alkaloid content (6). From the second half of the 20th century onward, low-alkaloid varieties of white lupin (*Lupinus albus*), yellow lupin (*Lupinus luteus*), and blue lupin (*Lupinus angustifolius*) have been domesticated and selected (7). In 2004, sweet varieties of these three species were mainly cultivated in several parts of Australia, Europe, and South America (8) and used for feed and food applications. Blue lupin seeds have higher nonstarch polysaccharide (6) and protein contents than soybean, with a similar amino acid profile (9). Their use in the food industry is being developed, and lupins are beginning to replace soybean in products such as tempe, miso, fermented sauces, and cooked snack foods (6). Lupin-based fiber supplements, cookies, bread, and spaghetti, with a high sensory quality, are also reported (10).

No studies have been undertaken to test the effect of blue lupin seeds on cholesterol metabolism in the pig, an animal model with a plasma lipid profile similar to that of human, which responds markedly to hyperlipidemic diets (11). Moreover, although the role of the small intestine in cholesterol metabolism is well documented (12, 13), the role of the large intestine and its microflora is still unclear.

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Abbreviations: BL, blue lupin seed diet; CAS, casein diet; CYP7A1, cholesterol 7α-hydroxylase; CYP27A1, sterol 27-hydroxylase; GLC, gas-liquid chromatography; INT, intact; IRA, ileorectal anastomosed.

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