

EFFECTS OF DIETARY BAKED BEANS, OAT BRAN AND WHEAT BRAN ON PLASMA
LIPIDS AND LARGE BOWEL VOLATILE FATTY ACIDS IN THE PIG

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To reduce the risk of cardiovascular and other diseases, Australians are advised to eat less total and saturated fat and more starches and fibre. Foods (eg oats, legumes) high in water-soluble non-starch polysaccharides (NSP) lower plasma cholesterol but those high in insoluble NSP (eg wheat bran) do not (Schneeman, 1986). In addition, rat studies suggest also that the former yield more volatile fatty acids (VFA) on fermentation by the hind gut microflora. As VFA may mediate some of the physiological effects of fibre, this is an important distinction. As the rat is not the most appropriate model species we have fed pigs a high fat/low NSP diet and also that diet with increased fibre as baked beans, wheat bran or oat bran.

20 male Large White pigs (40 kg of body weight) were fed 4000 kcal/day of a diet formulated from fatty mince, safflower oil, skimmed milk powder (Bonlac Foods), corn starch (Goodman Fielder Wattie) and sucrose. The diet contained (as % of energy): 20% saturated fat, 20% unsaturated fats, 20% starch, 25% sucrose + lactose and 15% protein. There were 4 groups, each of 5 animals. Group C (low fibre control) received the base diet + 10 g of NSP/day as wheat bran (Kellogg's All Bran) and group WB the diet + 40 g of NSP/day as All Bran. The other 2 groups were given the diet + 40 g of NSP/day either as oat bran (George Weston Foods; group OB) or baked beans (H.J.Heinz; group BB). Oat bran and baked beans are high in starch so saturated fat was reduced to 10 % of energy to keep the diets isoenergetic. After 3 weeks the animals were sacrificed for measurement of plasma cholesterol and colonic VFA.

Plasma cholesterol was lowest with OB and highest in Group WB with respective mean values of 1.84 ± 0.06 and 2.56 ± 0.05 $\mu\text{mol/ml}$. Concentrations in Group C were similar to OB, averaging 1.98 ± 0.08 $\mu\text{mol/ml}$. In group BB, mean plasma cholesterol was 2.27 ± 0.13 $\mu\text{mol/ml}$, significantly lower than WB but higher than C. Thus, of the high fibre diets, OB was most effective in lowering plasma cholesterol. Colonic digesta mass was lowest with diet C, averaging 280 ± 29 g and equally greater with OB and WB at 474 ± 58 and 498 ± 36 g, respectively. Total VFA mass in the large bowel of controls was 9.5 ± 1.0 mmol and was raised by similar amounts in the WB and OB groups with respective means of 32.2 ± 2.6 and 34.4 ± 3.9 mmol. Although diets WB, OB and BB were isofibrous, both digesta wet weight (655 ± 59 g) and VFA mass (60.0 ± 2.7 mmol) were significantly higher in group BB.

The data show that in a suitable animal model (the pig) that different fibre-rich foods do not have equivalent effects on plasma cholesterol. In this species (in marked contrast to the rat) both oat and wheat bran seem to be fermented equally well by the colonic microflora. Nevertheless, at the same level of dietary NSP as these brans, baked beans appeared to provide considerably more fermentative substrate. We believe this to be starch which has escaped small intestinal digestion and, if so, such resistant starch effectively raises the fibre content of the beans from 5% to 9-10%.

SCHNEEMAN, B.O. (1986). Food Technol. 40: 104.

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