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Physicochemical properties of oat beta-glucan influence its LDL cholesterol lowering effect in human subjects

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Daily consumption of 3 g oat β -glucan is considered sufficient to lower serum LDL cholesterol (LDL-C), but not all studies show an effect. The ability of oat β -glucan to reduce LDL-C is thought to depend on viscosity which is controlled by the molecular weight (MW) and the amount of oat β -glucan solubilized in the intestinal lumen (C), but this has not been demonstrated in human subjects.

Therefore, our two primary objectives were to determine if consuming 3 g high-MW oat- β -glucan daily reduced LDL-C, and if LDL-C-lowering was related to $\log(\text{MW} \times \text{C})$ of oat- β -glucan. To address these objectives, we conducted a randomized, controlled, double-blind parallel design clinical trial in two contract-research-organisations and three university nutrition research centres in Canada, Australia and UK. A volunteer sample of healthy subjects with LDL-C ≥ 3.0 and ≤ 5.0 mmol/l (n 786 screened, n 400 ineligible, n 19 refused, n 367 randomized, n 345 completed) were randomly assigned by the computer to receive one of five treatments. Subjects consumed cereal containing wheat fibre (n 87) or a total of 3 g high-MW (n 86), 4 g medium-MW (n 67), 3 g medium-MW (n 64) or 4 g low-MW (n 63) oat β -glucan daily (OatWell[®], divided doses, twice-daily) for 4 weeks. Using an intent-to-treat analysis, serum-LDL-C concentration after 4 weeks was compared between treatments after adjusting for baseline LDL-C.

After 4 weeks, LDL-C on 3 g high-MW oat β -glucan cereal was less than on wheat-fibre cereal by 0.21 mmol/l (95% CI; -0.11 , -0.30 , $P = 0.0023$). By analysis of covariance $\log(\text{MW} \times \text{C})$ was a significant determinant of week 4 LDL-C-cholesterol ($P = 0.003$). The treatment effect was not significantly influenced by age, sex, study centre or baseline LDL-C.

It was concluded that consuming only 3 g high-MW oat β -glucan daily in a ready-to-eat cereal reduced LDL-C by 0.2 mmol/l; efficacy was reduced in cereals containing oat β -glucan with low MW. Thus, the physicochemical properties of oat β -glucan should be considered when assessing the cholesterol-lowering ability of oat-containing products.

The trial was registered at www.clinicaltrials.gov NCT00981981.

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