

The Role of Oats and Oat Products in the UK Diet



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The oat grain is a wholegrain cereal that has been widely consumed in Northern Europe for centuries. Consistently viewed as a healthy choice, oats have been recommended for several therapeutic diets, including heart health, gut health and weight management. In recent years, the evidence underpinning health benefits has developed to the extent that official European health claims were authorised for specific oat-rich products. This article reviews studies on the health impact of oats, explores EU claims, and describes the wide range of food and drink products which are based on oats.

Composition

Once harvested, the oat grain is milled to remove the inedible husk whilst preserving the wholegrain.¹ The milling process varies depending on the intended use of the oat ingredient. For example, pinhead oats used for oatcakes are cut into two or three rough pieces by steel cutters, while rolled oats (both jumbo and standard) are steamed first before being flattened by rollers into flakes.²

This produces oats that are quicker to cook and more suitable for products such as porridge, muesli, granola, flapjacks and cereal bars.

Oats have a distinctive nutritional profile compared with other types of grain, including a rich protein content of higher biological value, a greater proportion of unsaturated fatty acids and a high dietary fibre content; both as soluble and insoluble fibre.³ Indeed, fibre represents six to nine per cent of the oat grain, half of which is the soluble fibre, beta glucans.⁴

A recent review concluded that 3 g/day oat beta glucans reduced total and LDL cholesterol by five to 10 per cent.

Oats also contain a wealth of micronutrients and are a recognised source ($\geq 15\%$ recommended daily allowance; RDA) of iron, potassium, copper and magnesium, as well as a rich source of ($\geq 30\%$ RDA) of thiamine, folate, zinc and phosphorus (see Table One)

Table One: Nutritional Composition of Raw Oats^{5,6}

Nutrient	Per 100 g oats
Energy (kcal)	375
Carbohydrate (g)	66
- Sugars (g)	1.1
Protein (g)	11.2
Fat (g)	9.2
- Saturated (g)	1.6
- MUFA (g)	3.3
- PUFA (g)	3.7
NSP (g)	7.1
- Beta glucans (g)	5
Salt (g)	0.02
Thiamine (mg)	0.9**
Folate (μg)	60**
Iron (mg)	3.8*
Magnesium (mg)	110*
Copper (mg)	0.23*
Zinc (mg)	3.3**
Potassium (mg)	370*
Phosphorus (mg)	380**

* source ($\geq 15\%$ RDA); ** rich source ($\geq 30\%$ RDA); MUFA, monounsaturated fats; PUFA, polyunsaturated fats.

Benefits of oats

Consumption of oats and oat products has been associated with various health benefits, the most researched being cardiovascular (CV) health. It is now well accepted that eating oats regularly significantly lowers both total and low density lipoprotein (LDL) cholesterol in both healthy individuals and those at risk of CV disease.⁷ A systematic review⁵ reported that oat consumption led to an average total cholesterol reduction of 0.13 mmol/L, although participants with the highest baseline levels of total and LDL cholesterol responded best with reductions of around 5.9 mmol/l. A recent review concluded that 3 g/day oat beta glucans reduced total and LDL cholesterol by five to 10 per cent.⁸

The mechanism underpinning the cholesterol-lowering properties of oats relates to the beta glucans content which inhibits the re-absorption of endogenous cholesterol by interfering with bile acid and micelle formation. This causes the liver to utilise stored cholesterol to synthesise bile acids which decreases blood cholesterol levels.⁴ As beta glucans are present in oat ingredients as well as in the wholegrain, reductions in total and LDL cholesterol have been reported in studies using novel oat products, such as oat milk.^{9,10}

Oats are often used in diets which combine ingredients with cholesterol-lowering properties. An example is the 'portfolio diet' which includes 2 g plant stanol esters or sterols, 30 g almonds, 50 g soya protein and 20 g soluble fibre, typically from oats.¹¹ Several randomised control trials,^{12, 13} have investigated the effectiveness of the portfolio diet on participants with hyperlipidaemia with studies finding significant reductions in total and LDL cholesterol compared with a low saturated fat diet. Jenkins *et al.* (2003)¹² also found no significant difference between the portfolio diet and a low saturated fat diet plus lovastatin, indicating that diet therapy could be as effective as traditional advice plus medication. However, to date, NICE guidance on primary and secondary prevention of CV disease has not included the portfolio diet.

For people currently diagnosed with, or at risk of diabetes, oats may offer additional benefits. NICE guidelines^{15, 16, 17} recommend increasing fibre intake to help prevent Type 2 diabetes and to manage both Type 1 and Type 2 diabetes, with an emphasis on including foods with a lower glycaemic index. Evidence suggests that oats lower the postprandial glycaemic response with the mechanism, as for lipid lowering, relating to the soluble fibre content, particularly beta glucans.¹

Wider health benefits for oats have been suggested. A review by Malkki and Virtanen¹⁸ concluded that regular oat consumption delays gastric emptying (thus prolonging satiety), increases stool weight, and may act as a prebiotic by selectively promoting so-called 'good' bacteria in the large bowel. These effects have implications for bowel health, weight management, and immune function.

Table Two: Authorised EU Health Claims for Oats

Nutrient	Claim	Conditions of use
Beta glucans from oats & barley	Consumption of beta glucans from oats or barley contributes to the reduction of the blood glucose rise after a meal.	Products must contain at least 4 g of beta glucans from oats or barley per portion for each 30 g of available carbohydrates. Should be consumed as part of a meal.
Oat grain fibre	Oat grain fibre contributes to an increase in faecal bulk.	Products must contain at least 6 g fibre per 100 g with the majority from oat fibre.
Oat beta glucans	Oat beta glucans has been shown to lower/reduce blood cholesterol. High cholesterol is a risk factor for coronary heart disease.	Products must contain at least 1 g of oat beta glucans per portion. Consumers shall be advised that the beneficial effect is obtained with a daily intake of 3 g of oat beta glucans.

Health claims

The regulatory framework for health claims on food and drink products has been strengthened in recent years and, since 2010, unauthorised claims have not been permitted on food labels, nor on websites, leaflets and adverts aimed at consumers.¹⁹

At present, three authorised health claims for oats have been published which are described in **Table Two**, along with their conditions of use. The most important of these is that products should contain sufficient amounts of oat fibre, or beta glucans, to deliver the benefits claimed. Consumers should also be advised, in labelling or by other means, how much to consume daily.

Oat products

Oats were traditionally eaten as porridge or baked goods to which salt or sugar were added. However, modern product innovation has created an array of oat products to meet the needs of many types of consumers. This has greatly improved the convenience and acceptability of oats and could help widen appeal beyond typical consumers of oats.

New products include instant porridge, that can be microwaved at home, porridge pots for consumption 'on the go', mueslis and granolas, as well as ready to eat breakfast cereals which include oats alongside with other grains. Oat breads are more common, typically made from a combination of wheat flour with added oats, while oat cakes have moved beyond the traditional type to include finely milled, rough, those flavoured with cheese or herbs, gluten-free, and even chocolate chip varieties. Sweet options include an abundance of oat-based cereal bars and flapjacks. Even the dairy sector has seen innovative products using oat milk or cream which can be used as cows' milk replacers. These are typically fortified with calcium, vitamin D, riboflavin and vitamin B12 to enhance the nutrient content. **Table Three** presents the composition of typical oat-based food and drink products.

With the recommendation that 3 g of beta glucans daily for cholesterol reduction, it can be seen that several oat-based products are suitably rich in this special fibre to contribute towards the recommended amount. Simply having porridge or muesli for breakfast and a glass of oat milk later in the day would add up to 3 g beta glucans. The general fibre content of these products is also high which would help to support normal bowel health. Sugar content varies but it is worth noting that sugar is often added to porridge, while preserves and butter/spreads are added to bread.

Commentary

Oats have been a staple part of the UK diet for centuries and offer recognised benefits relating to CV health, diabetes prevention and treatment, as well as to gut health. The high quality research evidence for oats has resulted in European health claims which can be used on the packaging of oat-based product that meet strict conditions of use. Therefore, health claims and related websites/information could be a useful means of raising awareness of the properties of oats amongst health professionals and consumers.

Eating oats as porridge is not to everyone's taste and poor cooking skills or lack of time in the morning are barriers to porridge consumption. Thus, it is good that new oat-based products have become available, particularly ones that fit into a balanced diet, such as bread and dairy alternatives. The nutritional content can vary, such as the salt and sugar content, but the positive contribution of fibre, particularly beta glucans, should be set against this.

In conclusion, it is clear that oats and oat-based products have a useful role to play in the diet and can be particularly useful for therapeutic diets relating to CV health and diabetes prevention or treatment. Those with dairy intolerances would also benefit from increased choice and the chance to consume beta glucans.

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References: 1. Butt M, et al. (2008). Oat: Unique among the cereals. *European Journal of Nutrition*; 47: 68-79. 2. Agriculture and Horticulture Development Board (AHDB). All About Oats. Accessed online: <http://allaboutoats.hgca.com/> (Sept 2014). 3. European Commission. The Julius Kühn-Institut (JKI). Federal Research Centre for Cultivated Plants. Avena Genetic Resources for Quality in Human Consumption (AVEQ). Accessed online: www.ec.europa.eu/agriculture/genetic-resources/actions/F-061/final-fact-sheet_en.pdf (Sept 2014). 4. Daou C, Zhang H (2012). Oat Beta-Glucan: Its role in health promotion and prevention of diseases. *Comprehensive Reviews in Food Science & Food Safety*; 11: 355-365. 5. Ruxton C, Derbyshire E (2008). A systematic review of the association between cardiovascular risk factors and regular consumption of oats. *British Food Journal*; 110: 1119-1132. 6. McCance R, Widdowson E (2010). *The Composition of Foods* (6th summary edition ed.) Cambridge: The Royal Society of Chemistry. 7. Kelly S, et al. (2007). Wholegrain cereals for coronary heart disease. *Cochrane Database Syst Rev*; (2): CD005051. 8. Othman RA, et al. (2011). Cholesterol-lowering effects of oat β -glucan. *Nutrition Reviews* 69: 299-309. 9. Onning G, et al. (1998). Effects of consumption of oat milk, soya milk or cows milk on plasma lipids and antioxidative capacity in healthy subjects. *Nutrition & Metabolism*; 42: 211-220. 10. Onning G, et al. (1999). Consumption of oat milk for five weeks lowers serum cholesterol and LDL cholesterol in free living men with milk hypercholesterolemia. *Nutrition & Metabolism*; 43: 301-309. 11. Heart UK (2014). The portfolio diet. D01 Fact Sheet. Accessed online: http://heartuk.org.uk/files/uploads/documents/huk_fs_d01_theportfolio diet.pdf (Sept 2014). 12. Jenkins D, et al. (2003). Effects of a dietary portfolio of cholesterol lowering foods vs lovastatin on serum lipids and C reactive protein. *Journal of the American Medical Association*; 290: 502-510. 13. Jenkins D, et al. (2011). Effect of a dietary portfolio of cholesterol lowering foods given at two levels of intensity of dietary advice on serum lipids in hyperlipidemia. *Journal of the American Medical Association*; 306: 831-839. 14. National Institute for Health & Care Excellence (2014). Lipid modification: cardiovascular risk assessment and the modification of blood lipids for primary and secondary prevention of cardiovascular disease. NICE clinical guideline 181. 15. National Institute for Health & Care Excellence (2004). Type 1 diabetes: Diagnosis and management of type 1 diabetes in children, young people and adults. NICE guidelines [CG15]. 16. National Institute for Health & Care Excellence (2009). Type 2 diabetes: The management of type 2 diabetes. NICE guidelines [CG87]. 17. National Institute for Health & Care Excellence (2012). Preventing type 2 diabetes: risk identification and interventions for individuals at high risk. NICE guidelines [PH38]. 18. Malkki Y, Virtanen E (2001). Gastrointestinal effects of oat bran and oat gum: A review. *LWT - Food Science & Technology*; 34: 337-347. 19. European Union (2007). *Corrigendum to Regulation (EC) No 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods*. Accessed online: <http://www.eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:012:0003:0018:EN:PDF> (Sept 2014). 20. Oatly (2014). Oat Drink Chilled. Accessed online <http://www.oatly.com/products/international/oat-drink> (Sept 2014). 21. Hovis (2014). Hearty Oats. Accessed online: <http://www.hovisbakery.co.uk/our-range/hearty-oats> (Sept 2014).

Table Three: Nutritional Composition of Oat Products^{5, 6, 20, 21}

	Porridge (40 g oats + water)	Oat bread (2 slices)	Oatcakes (x 4)	Oat milk (250 ml)	Flapjack (60 g)
Energy (kcal)	150	218	214	113	296
Carbohydrate (g)	26.4	33	33	16.2	37.4
- sugar (g)	0.4	2.4	1.6	10	20.7
Fat (g)	3.7	3.8	7.8	3.8	16.2
- saturated (g)	0.6	0.8	2.6	0.5	3
- MUFA (g)	1.3	UA	3.3	2.0	4.6
- PUFA (g)	1.5	UA	1.5	1.25	6.2
Protein (g)	4.5	10.8	5.2	2.5	2.8
Fibre (g)	2.8 ^a	5 ^b	4.1	2 ^b	1.6 ^a
- Beta glucans (g)	2	1	0.75	1	UA

a NSP fibre; b AOAC fibre; UA, unavailable.