



The nutritional benefits of an alternative first class meat-free protein source, Quorn.

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Executive Summary

A balanced diet rich in fibre, vitamins and minerals whilst being low in saturated fats, salt and sugar is key to human health. Nutritionally valuable protein-rich foods are an important part of that diet. As meat-rich diets have been linked to health issues such as diabetes, obesity and heart disease, finding alternative sources of dietary protein, such as Quorn, has become increasingly important.

Quorn is the brand name for a wide range of food products made with the meat free protein ingredient, Mycoprotein. The nutritional characteristics of Quorn, such as no-cholesterol, low-fat, low-sat fat and high-fibre content, represent an alternative dietary protein source, helping diversify diets and provide all necessary nutrients.

Introduction

The homogenisation of global diets associated with rising incomes and increased food availability around the world, marks a shift from carbohydrate-based diets to those focused on meats, fats and sugar. As intake of these foods increase, coupled with increasingly sedentary lifestyles, health problems such as obesity, heart disease and diabetes are on the rise¹. The cost of lifestyle-related diseases to public health is a major concern for governments around the world. A recent report from McKinsey placed the economic global cost of obesity at over \$2 trillion².

Meat consumption poses a particular challenge lawmakers are focusing on. A recent Carbon Trust³ report highlighted the need for more protein diversity in British diets after finding that the consumption of more diverse sources of protein would result in health benefits. The report made the case for a 'flexitarian' approach to meal choices, encouraging consumers to experiment with recipes that don't use meat as the main protein source. Furthermore, House of Commons International Development Committee's⁴ report on food security reinforced the need for a change in behaviour such that meat is promoted as an occasional

¹Office for International Development (2014) *Future diets: implications for agriculture and food prices*. Available at: <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8776.pdf>

² McKinsey Global Institute (2014) *How the world could better fight obesity*. Available at: <http://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/how-the-world-could-better-fight-obesity>

³Carbon Trust (2014) *Quorn, beef and chicken footprints*. [internal report]

⁴House of Commons International Development Committee (2013) *Global Food Security*. Available at: <https://www.publications.parliament.uk/pa/cm201314/cmselect/cmintdev/176/176.pdf>



treat, rather than everyday staple.

Nutritionally valuable protein-rich foods are an important part of a healthy diet. Finding alternative sources of dietary protein, such as Quorn, has become increasingly important as concerns over effects of diet on health become more apparent.

Quorn products are made with the meat-free protein ingredient, Mycoprotein. The nutritional characteristics of Quorn represent an alternative dietary protein source which can help diversify diets and provide all necessary nutrients. Quorn aims to give consumers more choice by providing a sustainable and healthy alternative source of protein.

Quorn – key nutritional facts

Quorn is a no-cholesterol, low-fat, low-sat fat and high-fibre meat-free protein source that contributes to a balanced diet, as the below table shows.

Quorn has multiple nutritional and health benefits, as outlined in the below paragraphs.

Table⁵. Nutritional value table for Quorn Mince (per 100g)

Product	Cals (kcal/100g)	Fat (g/100g)	of which Sats (g/100g)	Carbs (g/100g)	Sugar (g/100g)	Fibre (g/100g)	Protein (g/100g)	Salt equivalent
Quorn Mince (Mycoprotein™ (92%), Rehydrated Free Range Egg White, Natural Caramelised Sugar, Firming Agents: Calcium Chloride, Calcium Acetate; Gluten Free Roasted Barley Malt Extract)	105	2.0	0.5	4.5	0.6	5.5	14.5	0.3

Mycoprotein – the main ingredient of Quorn

Mycoprotein

Mycoprotein is a type of fungi (*Fusarium venenatum*), discovered more than 40 years ago in Buckinghamshire, UK. The manufacturing process involves a number of steps which in combination help to align and bind the tiny fibres of Mycoprotein together. To develop the characteristic texture of Quorn products a series of steaming, chilling and freezing processes help obtain the meat-like texture of Quorn products.

⁵ Marlow Foods (2017) *Nutritional value table for Quorn Mince*. Internal Resource

The nutritional characteristics of Mycoprotein have been found⁶ to deliver a combination of health benefits, showing that while it is a fungi in origin, Mycoprotein contains all nine essential amino acids, making it a source of first class protein, comparable with protein sources such as meat or fish.

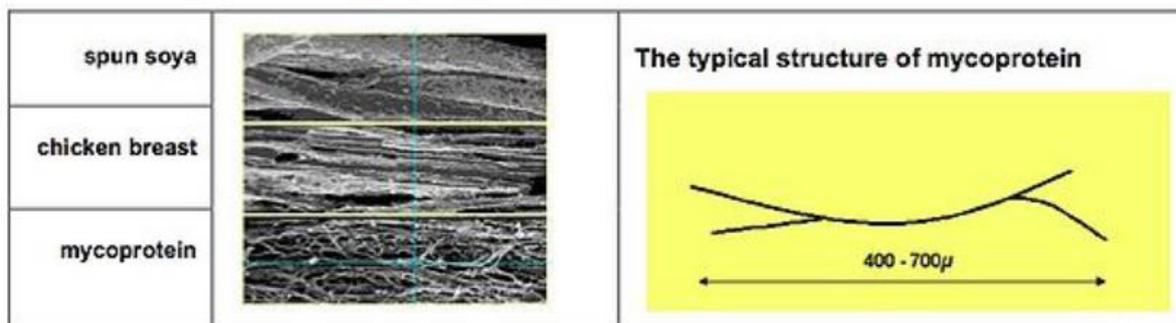
Mycoprotein & Quorn

As the main ingredient of Quorn, Mycoprotein plays an important role in determining the nutritional value of the brand's products.

The main additional ingredient in Quorn is egg white (used as a binding agent) and in the case of breaded products and ready meals these will contain other ingredients that contribute to the nutritional value of the product.

The structure of Mycoprotein, as seen under a microscope, is very similar to chicken breast. Mycoprotein is made up of made up of tiny, fine fibres called hyphae. Products made with Mycoprotein have a meat-like texture because the harvested strands (hyphae) have a similar structure to animal muscle cells (i.e. they are filamentous with a high length/diameter ratio), as show in Figure 1.

Figure 5. Soya/chicken/Mycoprotein structure comparison



Cholesterol & lowering cholesterol

As a fungi-derived product, Quorn contains no cholesterol. Additionally, studies suggest⁷ that Mycoprotein helps maintain normal blood cholesterol levels and can possibly even lower LDL cholesterol levels⁸ [LDL cholesterol can build up on the walls of arteries and increase chances of getting heart disease. HDL cholesterol protects against heart disease by keeping LDL cholesterol from building up in arteries].

In one of the studies conducted⁸, a group of adults ate all meals under supervision, with people in the intervention group consuming 191g Mycoprotein at lunch and dinner, in place of meat, for three weeks. Mycoprotein was consumed as commercially available products such as pies, breadcrumb coated pieces, or dishes containing Mycoprotein chunks, and people in the control group consumed quantities of meat and meat products of an equivalent calorific value. The authors of the study reported a 13% reduction in plasma cholesterol in the intervention group, a 9% reduction in LDL cholesterol and a 12% increase in HDL

⁶Marlow Foods Ltd. (2018) *What is Mycoprotein*. Available at: http://www.mycoprotein.org/assets/alft_v2_2.pdf

⁷Turnbull WH, Leeds AR, Edwards GD. (1990) *Effect of Mycoprotein on blood lipids*. Am J Clin Nutr; 52:646-50

⁸Turnbull WH, Leeds AR, Edwards DG. (1992) *Mycoprotein reduces blood lipids in free-living subjects*. Am J Clin Nutr 1992; 55:415-9



cholesterol, compared with a 12% increase in LDL cholesterol in the control group and an 11% decrease in HDL cholesterol.

Further research is required before any claim could be made for the cholesterol lowering properties of Mycoprotein but the results of those studies which have been conducted are promising.

Fibre content & glycaemic response

Quorn is a good source of dietary fibre due to the material (chitin) that makes up the cell walls of the hyphae, or "hair-like" threads of Mycoprotein. The table below enables us to compare the fibre content of a range of foods. Fibre comprises about 25 per cent of Quorn's dry weight.

Table⁹. Fibre content of Quorn

Food	Approx. fibre per 100g
Mycoprotein	6.0g
Baked beans in tomato sauce	3.7g
Boiled potatoes	1.2g
Brown bread	3.6g

There is evidence to suggest that Mycoprotein may be useful in the management of obesity and type 2 diabetes as it appears to show beneficial effects on glycaemia (glucose in the blood) and insulinaemia (insulin in the blood)¹⁰¹¹¹².

The mechanisms by which Mycoprotein reduces the rise in blood glucose are thought to be associated with its high fibre content. Fibre delays the passage of food into the small intestine. As a result, the glucose is absorbed more slowly. Additionally, the presence of soluble, viscous fibre slows the diffusion of glucose across the small intestinal wall bringing about an improved glycaemic response. Periodic high peaks of insulin secretion are thought to contribute to the development of type 2 diabetes and heart disease, so a reduced glycaemic response is desirable.

Saturated fats

As Quorn's main ingredient, Mycoprotein, is derived from fungi, the product contains very low levels of saturated fats, usually found in animal products. Eating a diet that is low in saturated fat can help lower the levels of cholesterol in the blood, helping with maintaining a healthy heart¹³.

Conclusion

Quorn's ambition is to provide a source of protein that is healthy and nutritious. As presented above, Quorn is a first-class protein source with many dietary benefits, such as no cholesterol, low-sat fat content and high fibre percentage.

⁹Marlow Foods (2004) *What is Mycoprotein?* Available at: http://www.mycoprotein.org/assets/alft_v2_2.pdf

¹⁰Turnbull, WH. & Ward, A. (1995) *Mycoprotein reduces glycemia and insulinemia when taken with an oral glucose-tolerance test*. Am J Clin Nutr, January 1995 Volume 1 Number 1

¹¹Turnbull, WH. (1998) *Mycoprotein as a Functional Foods; Effects on Lipemia, Glycemia and Appetite Variables*. 16th International Congress of Nutrition

¹²Williamson et al. (2006) *Effects of consuming mycoprotein, tofu or chicken upon subsequent eating behaviour, hunger and safety*. Appetite 46 (2006) 41-48

¹³NHS (2017) *Lowering cholesterol levels*. Available at: <http://www.nhs.uk/livewell/healthyhearts/pages/cholesterol.aspx>



Moreover, studies suggest that Quorn might have cholesterol-lowering properties as well as a beneficial effect on glucose and insulin levels in the blood. With obesity, heart disease and diabetes as some of the most pressing concerns for public health, Quorn presents a viable dietary addition for those who want to live a healthier lifestyle.