

What is Mycoprotein

It's important for good health that we encourage everyone to try to follow a balanced diet – one that is varied and provides all the nutrients our bodies need.

Protein rich foods from animal and vegetable sources are an important part of this along with other foods that are good sources of fibre, vitamins and minerals whilst being low in saturated fats, salt and sugar.

Mycoprotein can contribute to this.

Mycoprotein nutrition.

Mycoprotein is a healthy, meat-free form of high quality protein. Mycoprotein is a type of fungi (*Fusarium venenatum*), discovered more than 40 years ago.

The nutritional characteristics of mycoprotein have been found to deliver a unique combination of health benefits, showing that while 'vegetable' in origin, mycoprotein contains all nine essential amino acids and so falls into the category of being a source of first class protein, comparable with other protein sources such as meat and fish. However, unlike meat proteins, mycoprotein is free from cholesterol, is low in fat and saturated fat and contains no trans fats. It also possesses a unique fibre, comprising about 25% of its dry weight, composed mainly of polymeric n-acetyl glucosamine (chitin) and beta 1-3 and 1-6 glucans. Studies suggest that mycoprotein helps maintain normal blood cholesterol levels and can possibly even lower LDL cholesterol levels.

Quorn products are made using mycoprotein as an ingredient and have a similar nutritional profile. The main difference is that Quorn products contain egg white (used as a binding agent) and many contain other ingredients that contribute to the taste of the product.

Through the following information we can compare the nutritional value of mycoprotein products with other foods.

Comparative Nutrient Content of Quorn products vs Meat Equivalents.

Food	Cals/100g	Total Fat (g/100g)	Sat Fat (g/100g)	% Energy from Total Fat	Cholesterol (mg/100g)
Quorn Mince (frozen)**	94	2	0.5	19	0
Beef Mince (Raw)*	225	16.2	6.9	65	60
Quorn Burger (frozen)**	146	4.8	0.5	30	0
Beefburger (raw)*	291	24.7	10.7	76	76
Quorn Chicken Style Nuggets**	207	11	1.3	48	0.005
Breaded Nuggets *	265	13	3.3	44	54

*SOURCE: MCCANCE AND WIDDOWSON 'THE COMPOSITION OF FOODS' SIXTH EDITION.

** SOURCE: MARLOW FOODS

The table below compares essential amino acid (EEA) content for mycoprotein against other vegetable and animal protein sources.

Essential Amino Acid content of mycoprotein and other protein foods (g amino acids per 100 g)

Essential Amino Acids	Mycoprotein	Cows Milk (i)	Egg (ii)	Beef (iii)	Soy isolate*	Soy concentrate* (acid wash)	Peanuts (v)	Wheat (vi)
Histidine	0.39	0.09	0.30	0.66	0.6	0.4	0.65	0.32
Isoleucine	0.57	0.20	0.68	0.87	1.1	0.8	0.91	0.53
Leucine	0.95	0.32	1.10	1.53	1.8	1.3	1.67	0.93
Lysine	0.91	0.26	0.90	1.60	1.4	1	0.92	0.30
Methionine	0.23	0.08	0.39	0.50	0.3	0.2	0.32	0.22
Phenylalanine	0.54	0.16	0.66	0.76	1.1	0.9	1.30	0.68
Tryptophan	0.18	0.05	0.16	0.22	0.3	0.2	0.25	0.18
Threonine	0.61	0.15	0.60	0.84	0.8	0.7	0.88	0.37
Valine	0.60	0.22	0.76	0.94	1.1	0.8	1.08	0.59

* SOY ISOLATE AND CONCENTRATE DATA ARE ADJUSTED TO SAME WATER CONTENT AS MYCOPROTEIN @ 75%

(i) WHOLE FLUID MILK [3.3% FAT] (ii) RAW FRESH EGG (iii) GROUND BEEF (REGULAR, BAKED-MEDIUM)

(iv) (A + B) SOYA DERIVATIVES USED IN THE PRODUCTION OF TEXTURED SOY PRODUCTS

(v) RAW PEANUTS [ALL TYPES] (vi) DURUM WHEAT



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The Protein Digestibility-Corrected Amino Acid Scoring (PDCAAS) method for assessing protein nutritional quality takes into account the essential amino acid profile of foods, its digestibility, and its ability to supply essential amino acids in amounts required by humans.

The PDCAAS for mycoprotein is 0.91, fractionally behind beef at 0.92. You can find more information about this at www.mycoprotein.org.

Mycoprotein is a good source of dietary fibre (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.

Comparison table for dietary fibre.

Food	Approximate fibre per 100g
Mycoprotein	6.0g
Baked beans in tomato sauce	3.7g
Boiled potatoes	1.2g
Brown bread	3.6g
Brown rice	0.8g

DATA SOURCE FOR MYCOPROTEIN, MARLOW FOODS
DATA SOURCE FOR OTHER FOODS; MEREC BULLETIN VOL. 14 No 6, 2004

Mycoprotein Production

Since its introduction to the marketplace in 1985, the popularity of Quorn has grown as trends have moved towards healthier eating with consumers searching for tasty alternatives that provide a healthier eating experience. Mycoprotein is a type of fungus called *Fusarium venenatum* which is grown in fermenters using glucose and minerals for food.

Mycoprotein is made up of made up of tiny, fine fibres called hyphae. If you look at a sample under a microscope, you can see the hyphae which are responsible for giving Quorn products their meat like texture. On reaching the optimum size during fermentation, the hyphae are harvested ready to be used as the main ingredient in Quorn. The images below show how similar mycoprotein is to chicken breast compared to soya when viewed through a microscope. More information is available at www.mycoprotein.org.

Structure comparisons.

spun soya		<p>The typical structure of mycoprotein</p>
chicken breast		
mycoprotein		

To make Quorn products, mycoprotein is mixed with vegetable flavourings and a small amount of egg albumen or potato starch. The presence of egg albumin used in manufacturing, means that Quorn products are suitable for most vegetarians and the vegan range suitable for vegans. Therefore ideal as an alternative protein source providing variety in a balanced diet.

Production of mycoprotein and Quorn products takes place at Marlow Food's plants which are also home to the R&D team who carry out research into mycoprotein, NPD team and Sensory group and Quality Assurance team who are responsible for hazard Analysis and Critical Control Point (HACCP) for the site.

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. During production a series of steaming, chilling and freezing processes help to further develop the meat-like texture of Quorn products.



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The manufacturing route shapes and processes the product employing a range of different manufacturing techniques. The result is a range of ingredients such as mince, pieces, fillets, deli slices and products including burgers and sausages. Ingredients and products are then used as the basis of ready meals and breaded products such as Lasagne, Curry, Nuggets and Goujons.

The Marlow Foods team identify emerging market trends and consumer preferences to guide NPD activities when looking for new products to bring to supermarket shelves. They work closely with the company's in-house Sensory Panel to create products that match consumer preferences.

Marlow Food's fermenters and processing plants have been designed specifically for mycoprotein production and the manufacture of Quorn products, with some pieces of equipment being unique to the manufacturing process and to the company.

Working with Quorn products

Marlow Foods believes that the right foods, consumed as part of healthy lifestyle and carefully managed diet, can provide a major contribution to well being. Marlow Foods seeks to provide an attractive and varied range of Quorn™ foods to the consumer. We know consumers want their food to taste delicious and additionally want it to be good for them. We aim to be the best tasting, healthy meat alternative.

Consumers have found that Quorn products are a good source of protein and offer all the taste and texture found in meat products with an amino acid profile comparable to chicken and better than beef but with less fat, and no cholesterol, providing a good supply of dietary fibre. If you are using Quorn products as part of an investigative study or product development assignment here are some interesting facts that might help you....

- Due to the manufacturing processes used, Quorn products can be shaped to match manufacturers' product requirements such as fillets, mince, sausages, deli slices and pieces etc..
- Quorn mince and pieces are suitable for use as an ingredient for ready meals, but remember, because Quorn products are 'cooked' during the manufacturing process, they require minimum cooking time.
- Quorn products are particularly good for marinating as flavours are absorbed more readily than by other protein foods.
- Quorn ingredients are meat free sources of protein, and are low in fat and a good source of dietary fibre (see the Student notes sheet on nutritional composition).
- Quorn products are suitable for vegetarians as they contain a small amount of egg white, and the vegan Quorn products are suitable for vegans as they contain potato starch.
- Quorn ingredients are low in fat, meaning that apart from being a more healthy protein source, there is virtually no shrinkage during cooking (unlike other protein foods).