Fungal Protein with Fibre

Can Quorn's mycoprotein Contribute to Children's Fibre Intakes?

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In the Western world diets remain devoid of dietary fibre. Unfortunately, this extends to the diets of children. Evidence from the latest UK *National Diet and Nutrition Survey* showed that only 12% of 1.5-to-3-year-olds, 14% of 4-to-10-year-olds and 4% of 11-to-18-year-olds met their daily fibre intake recommendations. This is concerning given that fibre plays an important role in disease prevention, satiety and weight regulation. Fruits, vegetables, wholegrains and pulses are classically known as foods that provide dietary fibre. This present paper shows that Quorn's mycoprotein could also help contribute to fibre intakes and be an additional vehicle for delivering fibre into the diets of children.

Introduction

Whether as an adult or child, fibre intake plays a central role in reducing the risk of non-communicable diseases.[1] The health benefits of dietary fibre intake in children are becoming well-established. A reduced risk of developing diabetes, obesity and constipation has been reported.[2] Higher dietary fibre intakes in prepubertal children have also been linked to better cognitive control.[3] Other research shows that children with higher dietary fibre intakes tend to have better quality diets lower in total, and saturated, fat and higher in micronutrients such as vitamin B6, magnesium, iron and potassium.[4]

Dietary fibre recommendations for children were updated in the United Kingdom (UK) in 2015.[5] Previously, fibre intake recommendations were defined by the Englyst method and reported as non-starch polysaccharides.[5] In 2015 it was agreed that new dietary fibre benchmarks should be derived using the Association of Analytical Chemists (AOAC) methods which includes lignin, resistant starch and non-starch polysaccharides.[5] It was subsequently advised that the average population intake of dietary fibre for children aged 2-to-5 years should approximate 15 g/day.[5] For children aged 5-to-11 years it should be around 20 g/day, for children aged 11-to-16 years 25 g/day and for adolescents aged 16-to-18 years approximately 30 g/day.[5] It was further recommended that fibre intakes should be achieved by eating a variety of food sources.[5]

The latest data shows that many children are falling short of these recommended guidelines. Data from the recent UK *National Diet and Nutrition Survey* rolling programme (UK NDNS RP)[6] (years 9-11; 2016/17-2018/19) also reports daily fibre intakes using AOAC methods. For children aged 1.5-to-3 years arithmetic mean intakes was 10.4 g/day, for children aged 4-to-10 years these was 14.3 g/day and for children aged 11-to-18 years mean daily fibre intakes was 16 g/day. **Table 1** summarises the present childhood 'fibre gap' between habitual fibre intakes and Scientific Advisory Committee on Nutrition (SACN) recommendations.

Table 1: UK children's daily fibre intakes *vs.* recommendations

Ages	NDNS Years 9-11 Mean fibre Intake (g/day) derived using AOAC methods	SACN fibre recommendation (g/day) based on AOAC methods	Fibre gap (g/day) (approximation)
1.5-to-3 years	10.4	15 (2-to-5 years)	4.6
4-to-10 years	14.3	20 (5-to-11 years)	5.7
11-to-18 years	16	25 (11-to-16 years) 30 (16-to-18 years)*	11.5

*Average taken as 27.5 g/day.

The UK NDNS RP[6] also reports the percentage of children meeting SACN's fibre recommendations. As shown in **Figure 1**, only 12% of young children aged 1.5-to-3 years met fibre recommendations. For those aged 4-to-10 years just 14% met daily fibre intakes recommendations and a smaller percentage of older children – 4% of those aged 11-to-18 years met daily fibre benchmarks.

Quorn's mycoprotein as a rich source of fibre

Quorn's mycoprotein is a fungal protein present in all Quorn products. Quorn's mycoprotein qualifies being a rich source of dietary fibre as it provides at least 6 g of fibre per 100 g (6% fibre by wet weight).[7] The dietary fibre present in Quorn's mycoprotein is approximately two-thirds β-glucan and one-third chitin.[8] Typically, a 75 g serving of Quorn's mycoprotein typically provides around 4 g of β-glucan and 1.5 g of chitin.[9] There is a growing evidence that β-glucan polysaccharides have immunomodulatory properties.[10] Chitin also demonstrates antibacterial and immune modulatory properties.[11] Certain health effects i.e. favourable modulation of blood lipids has also been attributed to the amount and type of fibre present in Quorn's mycoprotein.[8] Ongoing research using mycoprotein fibre and fermentation models has been taking place to help decipher mechanisms.[12]

Children's usual, principal, sources of dietary fibre include grain products, bread, pasta, breakfast cereals, potatoes, vegetables, legumes and fruit.[13] Quorn's mycoprotein is typically known as a 'food protein' yet is also a valuable provider of fibre. **Table 2** shows the fibre profiles of protein foods typically consumed by children. Some foods such as white and oily fish, roasted red meat or poultry only contain trace amounts of fibre, or no fibre at all. Other protein-based foods such as beans/pulses, Quorn's mycoprotein and vegetarian burgers, provide useful amounts of dietary fibre. Integrating some of these foods into children's daily diets could help to narrow the fibre gap. As shown in **Table 1** the fibre gap between daily fibre intakes and SACN benchmarks was 5.7 g for children aged 4-to-10 years. One portion of Quorn's mycoprotein shapes for this age category would provide 5.0 g. For children aged 11-to-18 years the fibre gap was 11.5 g below recommendations. For this age category a portion of Quorn's mycoprotein shapes with beans would provide 9 g fibre, thus helping to narrow the gap.

Figure 2 illustrates how a daily portion of different protein foods could contribute to SACN fibre recommendations. For children aged 4-to-10 years the SACN benchmark of 20 g daily was used, and an average calculated for 11-to-16 years (25 g daily target) and 16-to-18 years (30 g daily target) yielding 27.5 g daily for children aged 11-to-18 years. These age ranges then aligned with those used for advised food portion sizes. One daily portion of Quorn's mycoprotein shapes for children aged 4-to-10 years and 11-to-18 years would contribute to approximately a quarter of the daily fibre recommendation. Other foods such as vegetarian burgers and Quorn's mycoprotein nuggets provide about 13% of daily recommended fibre intake. Baked beans and traditional beef sausages contribute between about 5 and 7% of the SACN recommendation.

Figure 1: Percentage of children meeting fibre recommendations

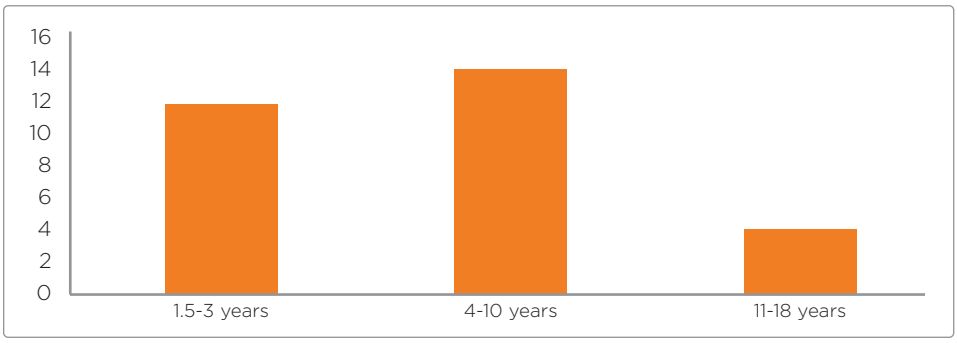


Table 1: UK children's daily fibre intakes *vs.* recommendations

Food source	Fibre content[a] (per 100 g)	Typical portion size (g) 4-to-10 years[b]	Fibre content (per portion)	Typical portion size (g) 11-to-18 years[b]	Fibre content (per portion)
Breaded/battered fish	2.0	55-80	1.4	85-95	1.8
Meat alternatives shapes (Quorn™ mycoprotein derived)	8.4	50-70	5.0	70-100	7.1
Meat alternatives nuggets (Quorn™ mycoprotein derived)	4.5	50-70	2.7	70-100	3.8
Oily fish e.g. salmon in a baked potato, sandwich or salad	Tr	50-70	N/A	70-100	N/A
Pulses (baked beans in tomato sauce)	4.5	20-25	1.0	40-45	1.9
Roast red meat	0.0	50-80	N/A	80-95	N/A
Roast poultry	0.0	60-85	N/A	85-125	N/A
Sausages, beef	1.6	50-70	1.0	70-100	1.4
Vegetarian burger	4.5	50-70	2.7	70-100	3.8
White fish e.g., cod	0.0	60-90	N/A	90-125	N/A

Source: a Values obtained from Manufacturers or McCance and Widdowson's (AOAC fibre). b Portion sizes and Food groups. Fibre content calculated for the mid-point of each range.

Discussion

Fibre is an important macronutrient that has not received as much attention as other dietary counterparts. Low fibre intakes have been linked to cardiovascular disease, colonic health, gut motility and altered gut microbiota which impacts on satiety, metabolic and inflammatory pathways.[14] A recent systematic review,[15] specifically focusing on childhood and adolescence, related higher fibre intakes to improvements in body weight, blood lipids and glycaemia, though randomised controlled trials are needed. Quorn's mycoprotein and its purified dietary fibre fraction ferment and yield short chain fatty acids which have been associated with improved metabolic and immune regulation.[12, 16]

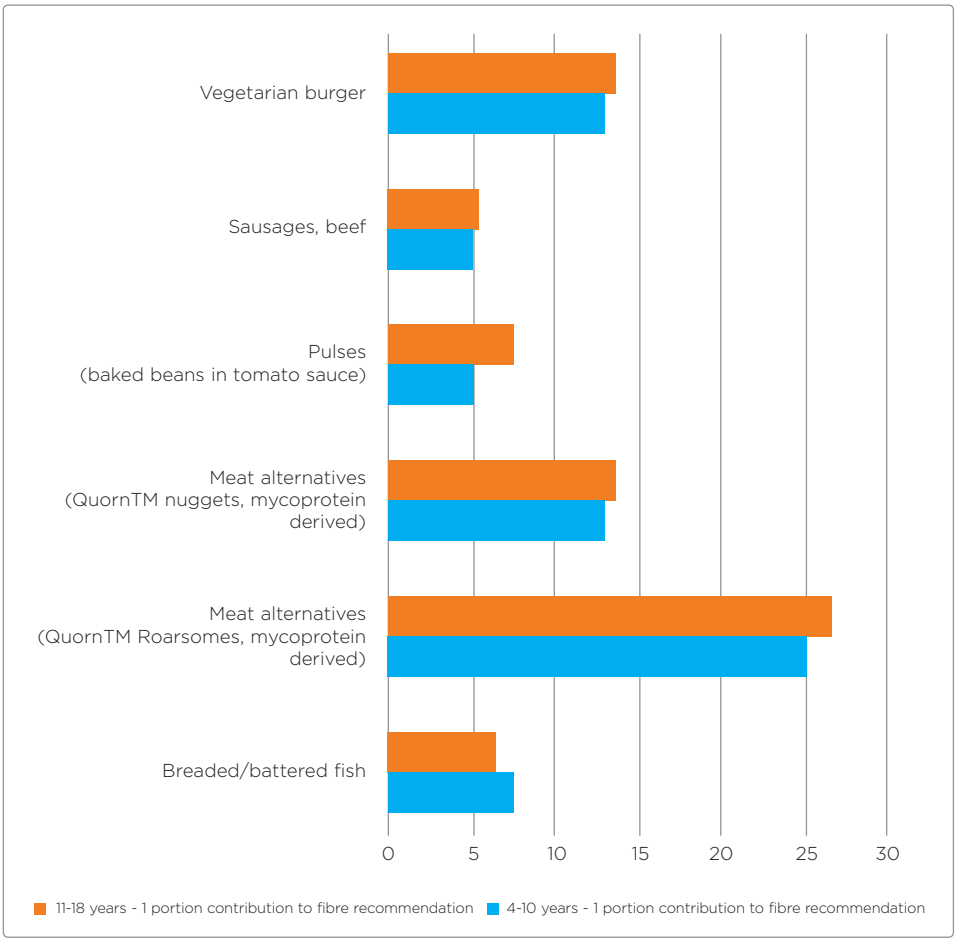
An array of barriers to achieving advised intakes have been purported which include a lack of awareness of the health benefits of fibre, low media interest, perceived high costs of fibre-rich foods and a lack of national awareness campaigns for fibre.[17] A fibre study framework comprised of 6,010 adults from 10 countries showed that global levels of knowledge about dietary fibre was low.[18] Nutrition and health professionals have an important role to play in disseminating dietary advice which also extends to fibre guidance. Parents and educators would also benefit from additional dietary advice that encompasses the benefits of adequate fibre throughout childhood.

We presently associate fruits, vegetables, pulses, and wholegrains being some of the main providers of dietary fibre. Recent NDNS RP data,[6] however, shows that for children aged 4-to-18 years cereals and cereal products provided most - around 43% of daily fibre, followed by vegetables and potatoes 25.5%, vegetables (not raw) including vegetables dishes 13%, meat and meat products 11%, fruits 9% and chips/roast potatoes 7.5%. Unfortunately, at present there is not a 'food group' for meat alternatives i.e., plant- or fungal-protein alternatives within the UK NDNS RP analyses. Subsequently, these foods could be providing fibre into UK diets, including that of children but are currently underrepresented.

Conclusions

Dietary fibre is an important macronutrient for children's health and should not be discounted. The present analysis has modelled how Quorn's mycoprotein could contribute to the fibre profile of children's diets. These provisional findings show that Quorn's mycoprotein could be another vehicle for fibre delivery into children's diets and one that has not been previously considered. The inclusion of such foods could be another means of helping to bridge fibre gaps between intakes and recommendations. There is now scope to discuss whether advice to eat more fibre could be further diversified to include certain fungal proteins.

Figure 2: Percentage contributions to SACN recommendations (per portion, by age)



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