Northumbria University NEWCASTLE

Quorn

FOR GUT-NESS SAKE, SHOULD WE SWAP RED AND PROCESSED MEAT FOR MYCOPROTEIN?

Substituting meat for mycoprotein reduces genotoxicity and increases the abundance of beneficial microbes in the gut

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What is wrong with eating red and processed meat?

Human health:

Population studies show that eating too much red and processed meat **increases the risk of cancer and cardiovascular disease**.

Planetary health:

Greenhouse gas emissions from meat are a **major contributor to the escalating climate crisis**.

Why is it hard for consumers to change?

Meat has an **important role in culinary traditions** (ie, **'meat and two veg'**).

Uncertainty about **how best to replace meat** and concerns **whether alternatives are as nutritious**.

20%
Increased risk of bowel cancer for every 50g of red and processed meat eaten each day[1]

14%
Livestock contribution to global greenhouse gas emissions - comparable to the entire transport sector[2]

66.3%
Of people had no intention of eating less meat in a 2019 study[3]

Mycoprotein as a substitute?

A **nutritionally complete protein** developed by UK scientists in the 1980s and **main constituent of Quorn Foods products**.

High fibre, high protein, low fat protein produced from cultured fungal biomass (*Fusarium Venenatum*).

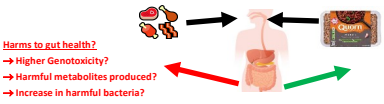
Swapping meat for mycoprotein has been **shown to lower cholesterol**.[4]

But the **effects on gut health are unknown**.

What did we want to find out?

We asked the question: **Does substituting red and processed for mycoprotein benefit gut health?**

We investigated the effects this substitution would have on 1) faecal **genotoxicity** 2) **metabolites** produced during digestion 3) **gut bacteria** enriched.



FYI - Glossary of select terms used

Genotoxicity is the extent to which the balance of chemicals within the gut can damage the DNA of intestinal cells. Lots of DNA damage may increase cancer risk.

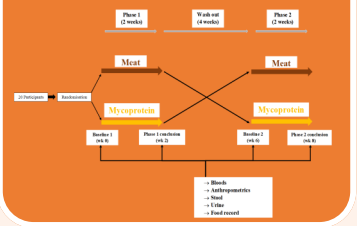
Metabolites are digestion by-products from food in the gut. For example, **short chain fatty acids** are produced by **gut bacteria** and are believed to help maintain a healthy gut, while **nitroso compounds** are formed from the digestion of red and processed meat and are genotoxic.


Butyrate
A short chain fatty acid


Structure of nitroso compound

There are trillions of microorganisms in our gut, collectively known as the **gut microbiota.** Around 90% of these microbes are **bacteria** which break down food, make vitamins and train our immune system among many other functions. Imbalances in **gut bacteria is** linked to many health problems including obesity, mood disorders, inflammatory bowel disease and bowel cancer.

MYCOMEAT



What did we do?

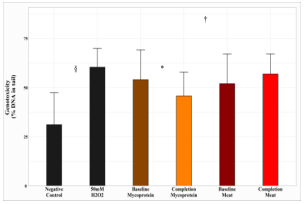
We conducted **Mycomeat**, a randomised crossover control trial.

20 healthy male adults were randomly assigned to consume either **240 g/day of red and processed meat** or **240 g/day mycoprotein (as Quorn products)** for **2 weeks**. They **returned to their usual diet for 4 weeks**, before **crossing over to the opposite diet for 2 weeks**.

At the **beginning and conclusion of each diet**, **physical measurements and biological samples** were taken to investigate the **effects of the different diets**.

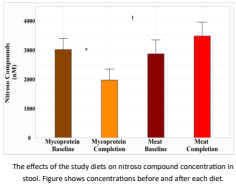
What did we find?

Mycoprotein consumption **significantly reduced faecal genotoxicity** compared to the meat diet.

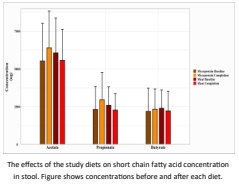


The effects of the study diets on faecal genotoxicity. Figure shows genotoxicity before and after each diet. Black bars show genotoxicity for a positive and negative control.

The genotoxic **nitroso compounds** were **significantly reduced** in stool by **mycoprotein** and **increased** by the **meat** diet. In contrast, **short chain fatty acids** were **increased** in stool by **mycoprotein**.

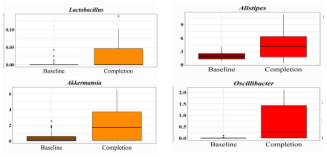


The effects of the study diets on nitroso compound concentration in stool. Figure shows concentrations before and after each diet.



The effects of the study diets on short chain fatty acid concentration in stool. Figure shows concentrations before and after each diet.

Gut bacteria that help to maintain a healthy gut including ***Lactobacillus***, ***Roseburia*** and ***Akkermansia*** were **enriched** by the **mycoprotein** diet, whereas **potentially harmful bacteria** such as ***Oscillibacter*** and ***Alistipes*** were **enriched** by the **meat** diet.



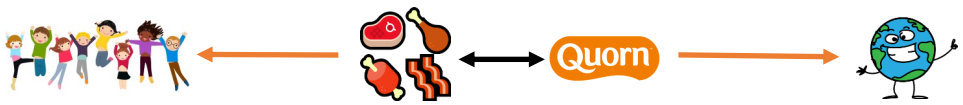
The effects of the mycoprotein diet on the abundance of *Lactobacillus* (top) and *Akkermansia* (bottom). Figures shows abundance before and after diet.

The effects of the meat diet on the abundance of *Alistipes* (top) and *Oscillibacter* (bottom). Figures shows abundance before and after diet.

What are the implications?

We have found that **consuming more Quorn** and **less meat** may be **good** for the **health of your gut**.

With **recommendations to reduce our production and consumption of meat**, the mycoprotein-based Quorn represents a **promising meat alternative to provide benefits to both planetary and human health**.



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