

Diet rich in animal foods, alcohol and sugar linked to 'inflammatory' gut microbiome

13 April 2021



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A high dietary intake of animal products, processed foods, alcohol and sugar is linked to a gut microbiome that encourages inflammation, finds research published online in the journal *Gut*.

But a diet rich in plant-based foods is linked to gut microbes that have the opposite effect, the findings show, prompting the researchers to suggest that dietary modifications may help to ease inflammation in the body.

The variety and volume of [bacteria](#) in the gut, known as the microbiome, directly affects the balance of pro- and anti-[inflammatory responses](#) in the gut.

This ecosystem also affects systemic immunity and an imbalance is implicated in a growing number of inflammatory conditions, ranging from diabetes to

arthritis, [heart disease](#) and systemic lupus erythematosus, note the researchers.

But it's still not clear if specific foods and dietary patterns might affect the composition of the [gut microbiome](#) and consequently inflammatory responses in the gut.

To try and find out, the researchers looked at the interplay between usual diet, gut microbes, and intestinal inflammation in 1425 people with either [inflammatory bowel disease](#) (Crohn's disease or ulcerative colitis; 331); irritable bowel syndrome (223); or a normal gut (871).

Each person provided a stool sample for microbial analysis and filled in a Food Frequency Questionnaire (FFQ) to quantify average daily nutrient intake. Specific food items were aggregated into 25 food groups measured in grams per day.

Analysis of the data revealed 38 associations between dietary intake and particular bacterial clusters. What's more, 61 individual foods and nutrients were associated with 61 [species of bacteria](#) and 249 [metabolic processes](#) across all the study participants.

Processed foods and animal-derived foods were consistently associated with a higher relative volume of 'opportunistic' bacterial species, including certain bacteria belonging to Firmicutes and *Ruminococcus* sp, and involved pro-inflammatory activity.

Plant foods and fish, on the other hand, were associated with 'friendly' bacterial species involved in anti-inflammatory activity.

Eating nuts, oily fish, fruit, vegetables and cereals was linked to a higher abundance of bacteria, such as *Faecalibacterium* sp which produce short chain fatty acids: these acids help control inflammation

and protect the integrity of the cells lining the gut.

Red wine was similarly associated with a higher abundance of several bacteria producing short chain fatty acids. But total alcohol intake, spirits, and sugar were associated with friendly microbial species and functions.

Coffee intake was also associated with a higher relative abundance of *Oscillibacter* sp, while fermented dairy products, such as buttermilk and yoghurt were strongly associated with anti-inflammatory bacteria, such as *Bifidobacterium*, *Lactobacillus*, and *Enterococcus* sp.

Food clusters of breads; legumes, such as lentils, peas, and chickpeas; fish; and nuts were consistently associated with a lower relative abundance of 'opportunistic' bacteria and pro-inflammatory activity.

But a fast [food](#) cluster of meats, french fries, mayonnaise and [soft drinks](#) was associated with a cluster of 'unfriendly' *Clostridium bolteae*, *Coprobacillus* and *Lachnospiraceae* bacteria across all study participants.

In the absence of fibre, these bacteria turn to the mucus layer of the gut to feed off, leading to an erosion of the integrity of the gut, note the researchers.

These patterns were observed across all groups of study participants, suggesting overlaps in diet and gut microbiome signalling between healthy people and those with inflammatory bowel disease or irritable bowel syndrome, suggest the researchers.

This is an observational study, and as such, can't establish cause, added to which it's not clear how long it takes for gut bacteria to respond to dietary changes, caution the researchers.

But they write: "Despite these limitations, we were able to derive dietary patterns that consistently correlate with groups of bacteria and functions known to infer mucosal protection and anti-inflammatory effects.

"The findings suggest shared responses of the gut

microbiota to the diet across patients with [Crohn's disease, ulcerative colitis, [irritable bowel syndrome](#)] and the general population that may be relevant to other disease contexts in which inflammation, gut microbial changes, and nutrition are a common thread."

And they conclude: "Long-term diets enriched in legumes, vegetables, fruits and nuts; a higher intake of plant over animal foods with a preference for low-fat fermented dairy and fish; while avoiding strong alcoholic drinks, processed high-fat meat and soft drinks, have a potential to prevent intestinal inflammatory processes via the gut microbiome."

More information: Laura A Bolte et al, Long-term dietary patterns are associated with pro-inflammatory and anti-inflammatory features of the gut microbiome, *Gut* (2021). [DOI: 10.1136/gutjnl-2020-322670](#)

Provided by British Medical Journal

APA citation: Diet rich in animal foods, alcohol and sugar linked to 'inflammatory' gut microbiome (2021, April 13) retrieved 31 May 2021 from <https://medicalxpress.com/news/2021-04-diet-rich-animal-foods-alcohol.html>

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