

## Exercise boosts diversity of gut bacteria

*As do high levels of dietary protein; implications for overall health and wellbeing*

**Research:** [Exercise and associated dietary extremes impact on gut microbial diversity doi 10.1136/gutjnl-2013-306541]  
**Linked editorial:** [The gut microbiota, dietary extremes and exercise doi 10.1136/gutjnl-2014-307305]

Exercise boosts the diversity of the bacteria found in the gut, indicates the first study of its kind published online in the journal *Gut*.

This may have implications for overall long term health, says the author of a linked editorial. Reduced variation in gut microbes (microbiota) has been linked to obesity and other health problems, while increased diversity has been associated with a favourable metabolic profile and immune system response.

The researchers analysed faecal and blood samples from 40 professional rugby players in the midst of a rigorous training programme to assess the range of microbiota they were hosting in their guts.

Elite athletes were chosen for the study on the grounds that extremes of exercise are often associated with extremes of diet.

Their samples were compared with the same samples taken from 46 healthy men who were not professional athletes, but who matched the physical size and age of the rugby players.

Half of the comparison group had a normal body mass index (BMI) of 25 or less; and half had a high BMI of 28 or more.

All study participants completed a food frequency questionnaire, detailing how much and how often they had eaten 187 food items over the preceding four weeks. And all were asked about their normal levels of physical activity.

Despite having significantly higher levels of creatine kinase, or CK for short - an enzyme that indicates muscle/tissue damage - the athletes had lower levels of inflammatory markers than any of the men in the comparison group. They also had a better metabolic profile than the men with a high BMI.

But they had a significantly wider range of gut microbiota than men in the comparison group, particularly those with a high BMI.

And the numbers of several microbial types (taxa) were also higher. For example, they had significantly higher proportions of 48 taxa than the men with high BMI, and of 40 taxa than the men with normal BMI.

In particular, they had much higher proportions of Akkermansiaceae, a species of bacteria that is known to be linked to lower rates of obesity and associated metabolic disorders.

Analysis of the dietary habits of all the study participants showed that the rugby players ate more of all the food groups. And protein accounted for considerably more of their energy intake (22%) than it did in the comparison group (15-16%).

Meat and meat products made up the bulk of this, but the athletes also took a lot of protein supplements, and they ate far more fruit and vegetables, and far fewer snacks than their counterparts.

"Our findings indicate that exercise is another important factor in the relationship between the microbiota, host immunity and host metabolism, with diet playing an important role," conclude the authors.

In a linked editorial, Dr Georgina Hold, of the Institute of Medical Sciences, Aberdeen University, points out that our guts are colonised by trillions of bacteria, the composition of which has been implicated in many conditions and is known to determine how well we harvest the energy from the foods we eat.

"Understanding the complex relationship among what we choose to eat, activity levels and gut microbiota richness is essential," she writes. "As life expectancy continues to increase, it is important that we understand how best to maintain good health. Never has this been more important than in respect of our resident microbiota," she says.