

Probiotics – little evidence for a link to obesity

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In a recent Editorial by Raoult (Probiotics and obesity: a link? *Nature Rev. Microbiol.* **7**, 616 (2009)), it was suggested that there is a connection between probiotics and obesity. The following chain of reasoning was put forward to support the suggestion. Firstly, a recent study has indicated that Firmicutes are more numerous in obese individuals than in lean individuals². Secondly, “The probiotics used ... in the farming industry include products containing Firmicutes, in particular *Lactobacillus* spp., *Bifidobacterium* spp. and *Enterococcus* spp.” (REF. 1.) Thirdly, a particular Firmicute species, *Lactobacillus acidophilus*, “is found in functional foods in amounts that are equivalent to those used to cause weight gain in piglets.” (REF. 1.) Fourthly, another *Lactobacillus* species has “been associated with weight gain in children treated for diarrhoea” (REF. 1), and “some studies have demonstrated weight increases in children who received *Lactobacillus rhamnosus* ...” (REF. 1), yet another Firmicute. However, the logic underlying this chain of reasoning does not completely hold, and the reasoning over-interprets published work and omits studies that support different conclusions.

Logic does not hold

The association of Firmicutes with obesity is still somewhat controversial, as a positive association was less obvious in the second study that was cited⁵ than in the first² and was not confirmed in a study carried out by a different laboratory⁶ (incidentally, *Bifidobacterium* spp. belong to the phylum Actinobacteria, not Firmicutes). Nevertheless, assuming that the association is true, Firmicutes are an extraordinarily diverse group of bacteria and include deadly pathogens, such as *Bacillus anthracis*,

common human commensals, such as *Faecalibacterium prausnitzii* (which may well counteract inflammatory bowel diseases⁷), and bacteria used for cheese and yogurt production, such as *Lactobacillus delbrueckii* subsp. *bulgaricus*. To state that a bacterium that happens to be a Firmicute may cause obesity is the logical equivalent of proclaiming that eating cheese exposes one to a risk of anthrax. There is no evidence that the Firmicutes that were possibly associated with obesity in the studies cited^{2,5} include the species, much less the strains, that are used as probiotics. In addition, a recent study comparing anorexic, lean and obese individuals reports that, “Although the average copy number of *Lactobacillus* was higher in the obese group than the other groups, the difference was not significant.” (REF. 8.)

Over-interpretation of published work

The two studies cited in the Editorial actually conclude that there is no significant effect of probiotics on weight gain in children^{3,4}. Furthermore, one study dealing with acute diarrhoea⁴, examines the effect of probiotic treatment after only 24 hours. This time course is too short to allow conclusions to be drawn about an effect on obesity by the Firmicute that was used (*Lactobacillus rhamnosus* GG). In addition, the results were not statistically significant.

Omission of certain studies

The weight gain that is seen in farm animals after administration of probiotics is far from proven, as only 3 out of 22 studies with piglets found a significant effect⁹. Furthermore, there was no report of the increase in the ratio of fat to muscle that would be expected if the probiotics used did cause obesity. These probiotics are generally administered

to piglets for a short period of time during weaning, aiding the adaptation of young animals to a solid food regime. They might counteract diarrhoea or affect the amount of food that is consumed, and therefore lead to faster growth, but they are unlikely to alter the balance of protein and lipid synthesis, which remains remarkably constant in a fast-growing animal that is exposed to considerable dietary variations¹⁰.

In conclusion, the evidence that was given in the Editorial does not support the suggestion that there is a link between probiotics and obesity. In my opinion, such a link probably does not exist. Deep molecular profiling of gut microorganisms in lean and obese individuals, such as that being undertaken by the European Commission project on Metagenomics of the Human Intestinal Tract (MetaHIT), will test this opinion. In the mean time, there is no reason to worry about consuming probiotics.

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