

No link between probiotics and obesity? Author reply

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I am surprised that my Editorial (Probiotics and obesity: a link? *Nature Rev. Microbiol.* **7**, 616 (2009))¹, in which I proposed a possible link between probiotics and obesity, would generate such animated correspondence from such well-known scientists as Ehrlich (Probiotics — little evidence for a link to obesity. *Nature Rev. Microbiol.* **7**, 16 November 2009 (doi:10.1038/nrmicro-209-c1))² and Delzenne and Reid (No causal link between obesity and probiotics. *Nature Rev. Microbiol.* **7**, 16 November 2009 (doi:10.1038/nrmicro2209-c2))³. Surprisingly, Ehrlich confirms that a valid hypothesis exists simply by stating that he will investigate this query in the future.

These comments on my Editorial provide a good opportunity to update my position on this question. Indeed, it is difficult to ignore previous work showing how transplantation of gut microbiota from obese mice to bacteria-free mice can cause obesity in the recipients⁴.

For many years, the manipulation of gut microbiota by growth promoters, including probiotics, prebiotics and antibiotics, has had a huge impact on the livestock and poultry industries, ever since they were first prescribed to prevent diarrhoea in animals and later found to be useful for weight gain⁵. One needs only to perform a quick search on the internet using the key words 'growth promoters' and 'probiotics' to see the enormity of this market. My interest in a possible link between *Lactobacillus* spp. and obesity evolved from some paradoxical results that

we identified in birds following their intra-gastric inoculation with lactobacilli⁶, and I remain convinced that this link requires further investigation⁷. Since the publication of my Editorial¹, our group has published a report showing that the prevalence of *Lactobacillus* spp. in the intestinal tracts of obese persons is notably greater than the prevalence observed in lean individuals⁸.

Certainly, more work is needed to evaluate the full effects of probiotics on humans; however, preliminary data suggest that children gain weight when given probiotics. In some of these initial studies, the small number of children enrolled precluded a statistically significant assessment. However, in one long term study, the weight gain in infants receiving probiotics was 4% compared with controls, for three different products administered to male or female infants⁹. This increase is similar to the weight gain that was observed in piglets receiving probiotics¹⁰. All six studies with probiotics show a weight gain of $\geq 3\%$ compared with controls (Fisher exact test $p=0.04$)⁹. Furthermore, one of the references mentioned by Ehrlich that supposedly opposes the notion that probiotics promote weight gain is not related to the subject¹¹.

In conclusion, there is enough evidence from the use of probiotics as growth promoters in animals and from preliminary studies in humans to consider a link between probiotics and obesity. I am happy to see that this hypothesis will be tested by the European Commission project on Metagenomics of

the Human Intestinal Tract (MetaHIT), as stated by Ehrlich²; I am also pursuing this type of evaluation. A final determination will undoubtedly require more work. Nonetheless, the idea that probiotics may cause effects in humans that are similar to those observed in many other species of animals cannot be that surprising. We must keep an open mind when dealing with the many causes of obesity in the twenty-first century.

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