Consuming a probiotic once a day could improve cognitive skills

Probiotics, which are friendly and beneficial bacteria to our bodies, could improve cognitive skills, i.e the ability to learn, memorise, process information or react to events, as demonstrated by researchers at the APC Microbiome Institute, University College Cork, Ireland, in a pre-clinical study. The study has been published in April 2015 in the journal Behavioural Brain Research and is the first to show that feeding certain bacteria, of the genera *Bifidobacteria*, once a day, for 3 to 11 weeks, could improve brain functioning especially cognition.

These findings have strong implications for brain health and disease, brain function and many neuropsychiatric disorders, which either present cognitive impairments, or for which it is one of the main features, such as for neurodegenerative disorders like Alzheimer's disease. Indeed, brain disorders still do not have satisfactory pharmacological treatments although they affect a large proportion of the population, with mental illnesses alone affecting up to 25% of the population, and other disorders such as schizophrenia or Alzheimer's disease, affecting each at least 1% of the population. Moreover, most sufferers are either resistant to treatments (up to 40%) or experience severe debilitating side-effects. Therefore, it is of prime interest to investigate and find new potential treatments.

The aim of the study was to assess the potential effects of two *Bifidobacteria* on cognition, using a battery of tests which all target different aspects of brain processes and involve different brain areas. This was in order to get an as large as possible picture of the potential beneficial effects of the two bacteria. The aim of using two *Bifidobacteria* was also to compare their effects, since previous publications showed that the effects of bacteria are highly strain-dependent and could possibly be as complex and intrinsic as conventional pharmaceutical treatments. The interest in using bacteria to improve brain processes comes from an exponentially growing field in neurosciences and a wide range of inter-related disciplines such as neurogastroenterology, immunology or microbiology. This growing area of research aims at investigating the impact on the brain of the gut microbiota, which is the collection of indigenous micro-organisms lying our gut wall and contributing to host health via multiple interactions. Indeed, there is a permanent, bi-directional communication between the gut ad the brain, and numerous studies have now shown that modulating the gut microbiota and notably via feeding specific bacteria, or the so-called probiotics, improve the host health and also certain brain disorders. However, the effects of probiotics on cognition on a healthy brain, ie without prior disease or manipulation, had not been explored.

The study consisted in feeding mice for up to 11 weeks with *Bifidobacterium longum* 1714 or *Bifidobacterium breve* 1205 or a saline-equivalent solution as a control and test them in behavioural tests pre-established to assess key aspects of brain functioning. These mice were chosen as they are naturally anxious, in order to better match natural occurrence of cognitive disorders in humans, since anxiety is associated with cognitive impairments. The aspects of

cognition that were investigated were related to (1) short-term and episodic memory, which corresponds to remembering where our bike or car is parked in the morning only until we need it; (2) spatial learning and memory, which corresponds to learning and memorising a new route to meeting a new friend or to go to a new job and (3) a classic Pavlovian conditioning, which corresponds to associate a stimulus with a response, such as learning that when the traffic light is red, we should not cross the street as cars are coming. Other secondary stress-related parameters, as well as a test of gastro-intestinal pain were assessed. The results showed that the effects were dependent on the bacterial strain and mainly that *B. longum* 1714 improved all the aspects of cognition. These results therefore are very promising and give hope for potential future treatments for stress related disorders and possibly cognitive decline. Further studies are now warranted in order to characterise better the effects of these bacteria and to investigate by which mechanisms they exert their beneficial actions.

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Publication

Bifidobacteria modulate cognitive processes in an anxious mouse strain.
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