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Fecal Transplant and Bifidobacterium Treatments Modulate Gut Clostridium

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Abstract

Gastrointestinal dysfunction and gut microbiota dysbiosis, including an overall increase in Clostridium have been reported in cases of Autism. Modulation of the gut microbiota as a promising venue of intervention to ameliorate autistic symptoms. This study explored the use of two different interventions that target the microbiota in a rodent model of autism. It assessed social behavior, the levels of different fecal Clostridium spp., and hippocampal transcript levels as outcomes of these interventions. Young Sprague Dawley male rats were treated with oral gavage of propionic acid (PPA) for three days to induce autism, while controls received saline. Later, PPA-treated animals were subdivided to receive either saline, fecal transplant from healthy donor rats, or Bifidobacterium for 22 days, while controls continued to receive saline. PPA treatment reduced social interactions in animals, while animals with fecal transplant and Bifidobacterium interventions exhibited normal social behavior. Moreover, increased abundance of fecal C. perfringens with a concomitant decrease in Clostridium cluster IV were observed in PPA-treated animals. In the brain, PPA-treated animals exhibited high hippocampal Bdnf expression compared to controls. Both interventions restored the balance of fecal Clostridium spp. and normalized the level of Bdnf expression. This study indicates the association between the gut-brain axis and the etiology of autism and proposes possible venues of interventions in a preclinical model of autism.