Lactic Acid-Utilizing Intestinal Bacteria, a Key Component of Colonic Microflora That Explains the Effect of Pro-and Pre-biotics

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Summary
Undigestible oligosaccharide such as fructooligosaccharide (FOS) or sodium gluconate (GNA) has a potential to improve growth performance of pigs via modification of cecal and colonic microflora and their fermentation end-products. The effect of these compounds has been discussed in relation to the increase in lactic acid bacteria (LAB) such as Bifidobacteria and lactobacilli. However, LAB produce lactate that is not used by the host as energy and often causes a non-pathogenic diarrhea when accumulated in the lumen. Lactic acid should be converted into short-chain fatty acid, namely n-butyric acid, because n-butyric acid is preferentially used by the epithelial cells of the large intestine to maintain their physiological function. We have previously demonstrated that n-butyrate is correlated with morphometrical variables of the cecal and the colonic mucosa in piglets that received FOS. We have also demonstrated in the pig cecal fluid that stimulation of LAB by a dose of GNA was accompanied by the stimulation of lactic acid utilizing butyrate producer, _Megasphaera elsdenii_. A dose of _M. elsdenii_ rescued rats from hyper lactate accumulation caused by FOS. We believe that the improvement of growth performance of piglets by undigestible oligosaccharides previously known as bifidogenic can be explained at least in part by the stimulation of n-butyrate production via metabolic cooperation between LAB and lactate utilizing butyrate producers such as _M. elsdenii_.