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Proceeding Paper

How Iron Combined with Prebiotics and Lactoferrin Can Favor a Healthy Gut Microbiota in Infants Living in Rural Africa—An In Vitro Study †

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Iron fortification in infants living in rural areas of Africa has been associated with gut dysbiosis and higher rates of infection which imposes an additional health risk. Ongoing cohort studies assess the protective effect of prebiotics and lactoferrin, which aim to favor a healthy gut microbiota. Relevant ex vivo studies are needed to investigate the mode of action on the gut microbiota directly to further improve nutritional intervention strategies. The aim of this study was to investigate the direct effect of galacto-oligosaccharides and lactoferrin combined with iron on the gut microbiota of infants living in a rural area of Kenya. We used the in vitro continuous fermentation model PolyFermS to cultivate and treat the fecal microbiota of two 6-months-old Kenyan infants in conditions selected to closely mimic their colon and diet (milk and maize porridge). Iron combined with galacto-oligosaccharides induced a strong metabolic and compositional response. In microbiota 1 and 2, acetate increased by 45 mM and 16 mM, respectively, concomitant with an increase in *Bifidobacterium* of 0.6 log and 0.7 log, respectively. In microbiota 1 also propionate increased by 10 mM while in microbiota 2 also butyrate increased by 15 mM. We further observed a decrease in *Clostridium perfringens* in microbiota 1 of 1.3 log and a decrease in *Clostridium difficile* of 0.3 log in microbiota 2. A trend towards a synergistic effect against *Clostridium perfringens* was observed upon combination of iron, galacto-oligosaccharides and lactoferrin. Surprisingly, iron alone at a dose of 5 mg/L did not affect the ex vivo colon microbiotas, which hints for a host-dependent mode of action. In conclusion, galacto-oligosaccharides promote the Kenyan infant's beneficial gut microbes and the production of metabolites thereby preventing outgrowth of enteropathogens. Next, the effect of treatment-modified microbial metabolites on the host-microbe interaction will be assessed using in vitro cell models.

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