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A Dairy Vector Exclusively Fermented by Dairy Propionibacteria: a New Model to Study Probiotic Potentialities *in vivo*

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Dairy propionibacteria, commonly used as cheese ripening starters, display probiotic potential. This includes modulation of the microbiota and epithelial proliferation/apoptosis equilibrium in the gut. They trigger apoptosis (programmed cell death) of colorectal cancer cells via the production of short chain fatty acids, propionate and acetate. Such effects require high populations of live and metabolically active propionibacteria in the colon. Fermented dairy products protect probiotic bacteria against digestive stresses and are suitable vectors for probiotic bacteria delivery. As cheese and fermented milks with dairy propionibacteria contain other microorganisms, the identification of specific beneficial effects of propionibacteria is limited. We aimed at 1) developing milk exclusively fermented by a dairy propionibacterium; 2) studying propionibacteria survival to digestive stress in this vector and 3) evaluating the pro-apoptotic potential of this fermented milk on HT-29 human colorectal cancer cells. Since dairy propionibacteria do not generally grow in milk, we determined their nutritional requirements with respect to carbon and nitrogen by supplementing milk ultrafiltrate with different concentrations of food grade lactate and casein hydrolysate. Milk supplemented with 50mM lactate and 5g/L casein hydrolysate allowed growth of all dairy propionibacteria studied, reaching populations of at least 1E+9cfu/mL. In this model fermented milk, dairy propionibacteria remained tolerant to digestive stress *in vitro* towards acid and bile salts challenge, and viable, during at least 15 days at 4°C. The most tolerant strain was used in an animal trial, reaching high concentrations in faeces and colon contents. Fermented milk supernatants were shown to induce the typical features of apoptosis of HT-29 cells. This work leads to a new food grade vector containing exclusively dairy propionibacteria, allowing preclinical and clinical trials. Such new fermented milk might be of interest as a functional food to prevent colorectal cancer or to potentialize therapeutic treatments.