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Potential of pectins to modulate the human gut microbiota evaluated by *in vitro* fermentation: a systematic review

Nélida Pascale[1], Fangjie Gu[1,2], Nadja Larsen[2], Lene Jespersen[2], Frederique Respondek[1]

Affiliations:

1. CP Kelco Inc, Cumberland Center II, 3100 Cumberland boulevard, Suite 600, Atlanta, GA 30339, USA

2. Department of Food Science, University of Copenhagen, Rolighedsvej 26, 1958, Frederiksberg, Denmark.

Speaker: Nélida Pascale

Abstract: Pectins are a group of heteropolysaccharides naturally found in many fruits and vegetables, commonly extracted from citrus, apple, and sugar beet. They are already recognized as beneficial fibres that regulate postprandial blood glucose and cholesterol levels. The aim of this systematic review was to assess the effect of pectic substrates on the human gut microbiota composition and their fermentative activities, and to elucidate their structure-function relationship. As literature available in humans is still scarce, a search for *in vitro* fermentation studies (batch and continuous) performed with human faecal inocula was conducted to study the effects of these substrates on the composition of the gut microbiota using 16S rRNA gene sequencing approaches. The PubMed and Scopus databases were used, and studies published in English after 2010 and until 29th January 2021 (date of the search) were retained. PRISMA framework was used to conduct and report this systematic review. Finally, 42 studies were selected for inclusion. Overall, pectic substrates are more slowly but completely fermented than other fibres. Most substrates were well fermented by the *Ruminococcaceae* family, *Bacteroides* and *Lachnospira* genera, and species such as *Faecalibacterium prausnitzii*, *Roseburia intestinalis*, and *[Eubacterium] eligens*, where the specific stimulation of *[E.] eligens* or *Lachnospira* was quite unique to pectic substrates. Besides these common effects, a strong structure-function relationship is observed, where the degree of methyl esterification and the homogalacturonan (HG, linear backbone) to rhamnogalacturonan (RGI, hairy region) ratio influence which bacteria is preferentially stimulated. Molecular weight also has an influence on bacterial growth, for example *Bifidobacterium* prefers shorter molecules, especially arabinans from RGI side chains. This systematic review indicates that pectic substrates can specifically modulate the human gut microbiota, and they can be considered as potential prebiotic candidates, even if more human clinical studies are needed to confirm the effects and the efficient dose.

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