

## Studies on Blackcurrants and Digestive Health

**Title:** In vitro metabolism of anthocyanins by human gut microflora

**Authors:** Anna-Marja Aura, Pilar Martin-Lopez, Karen Anne O'Leary, Gary Williamson, Kirsi-Marja Oksman-Caldentey, Kaisa Poutanen, Celestino Santos-Buelga

**Study:** Aim of the study was to explore if anthocyanin glycosides were deglycosylated, whether the resulting aglycones were degraded further to smaller phenolic compounds by colonic bacteria, and to characterize metabolites.

**Results:** Cyanidin-3-glucoside and cyanidin aglycone could be identified as intermediary metabolites of cyanidin-3-rutinoside. At early time points the formation of protocatechuic acid as a major metabolite for both cyanidin glycosides and detection of lower molecular weight metabolites show that anthocyanins were converted by gut microflora.

**Conclusion:** Bacterial metabolism of anthocyanins involves the cleavage of glycosidic linkages and breakdown of the anthocyanidin heterocycle.

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**Title:** Influence of Elderberry and Blackcurrant Concentrates on the Growth of Microorganisms

**Authors:** Werlein H., Küttemeyer C., Schatton G., Hubbermann E.M., Schwaz K.

**Study:** The purpose was to test the berry concentrates on the growth of microorganisms. The concentrates from elderberry and blackcurrants were purified anthocyanin mixes, which were then tested on the growth of typical Gram-negative bacteria, Gram-positive bacteria and a yeast.

**Results:** Blackcurrant concentrates inhibited the growth of *Staphylococcus aureus* DSM 799 while elderberry concentrates exhibited a slight stimulatory effect. Blackcurrant concentrates inhibited *Enterococcus faecium* DSM 2918, whilst *Saccharomyces cerevisiae* ATCC 9763 was slightly stimulated by the fruit concentrates.

**Conclusion:** Anthocyanins do not significantly effect the growth of microorganisms, and the inhibitory effects witnessed with blackcurrant concentrates may be attributed to other phytochemicals present in the concentrates.

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**Title:** High Molecular Weight Polysaccharides From Blackcurrant Seeds Inhibit Adhesion of *Helicobacter pylori* to Human Gastric Mucosa

**Authors:** Lengsfeld C., Deters A., Faller G., Hansel A.

**Study:** Several crude and purified polysaccharides from blackcurrant seeds (*Ribes nigrum* L.) have been isolated, analyzed and examined on their effects against *Helicobacter pylori* in situ adhesion studies on sections of human gastric mucus.

**Results:** Molecular weight profiling by GPC revealed that the anti-adhesive activity of the buffer eluate correlated with high molecular weight components ranging from about 1000 Da to 340 kDa, whereas the ones of the inactive water eluate had molecular weights of about 100 and 25 kDa, respectively. None of the active fractions revealed inhibitory effects on bacterial growth in vitro.

**Conclusion:** Acidic, high molecular weight galactans are responsible for the anti-adhesive qualities of blackcurrant seed extracts and that these polymers are able to block *Helicobacter* surface receptors, thus inhibiting their interaction with specific binding factors located on human gastric epithelia.

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**Title:** Stability of Anthocyanins from Commercial Blackcurrant Juice Under Simulated Gastrointestinal Digestion

**Authors:** Uzunovic A., Vranic E.

**Study:** to assess the stability of anthocyanins from commercial Blackcurrants (*Ribes nigrum* L.) juice using an in vitro digestion procedure that mimics the physiochemical and biochemical conditions encountered in the gastrointestinal tract. The main objective was to evaluate the stability of anthocyanins during in vitro digestion in gastric and intestinal fluid.

**Results:** Anthocyanins present in commercial blackcurrant juice remain stable during in vitro digestion in gastric fluid regardless whether pepsin was added into the medium or not. Also, they remain stable during in vitro digestion in simulated intestinal fluid without pancreatin.

**Conclusion:** Blackcurrant anthocyanins remain stable through the digestive tract, and may offer other biological activities independent of their antioxidant capabilities that produce additional health benefits in the digestive tract.

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**Title:** Modulation of intestinal micro biota: The ability of AOCE (food product containing antioxidants with during effects) and CAM30 (blackcurrant extract powder) to positively modulate key markers of gastrointestinal function

**Author:** Dr. Abdul L. Molan

**Test:** The objective is to assess the effect of aqueous extracts from CAM30 and AOCE on the population size of bacteria (good and bad) in the ceca of rats orally gavaged with

these extracts, inulin (positive control), or water (negative control) three times weekly for four weeks.

**Results:** Inulin and AOCE showed only bifidogenic capacity. Bifidobacteria was increased higher than inulin in the groups using AOCE and CAM30. CAM30 showed both bifidogenic and lactogenic capabilities. CAM30 showed the greatest lactobacilli improvement all groups, including inulin. Bacteroides were significantly decreased with AOCE and CAM30, with CAM30 showing the most drastic decrease. Closteridia was also decreased with AOCE and CAM30 when compared to the control group. AOCE and CAM30 also inhibited  $\beta$ -glucuronidase.

**Conclusion:** Lowering the activity of  $\beta$ -glucuronidase could be considered beneficial in terms of risk of colon cancer, and the results showed promise for the potential use of CAM30 as a  $\beta$ -glucuronidase inhibitor. This study identified CAM30 and AOCE as good prebiotics that can significantly promote the growth of friendly bacteria and lower the numbers of undesirable bacteria in the cecum of rats.

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**Title:** Study the effect of Cassi Anthomix (blackcurrant extract powder) on the growth of beneficial lactic acid bacteria and on risk markers for colon cancer in rats

**Authors:** Dr. Abdul Molan, Professor Marlena Kruger, and Zhuojian Liu

**Test:** Objectives were to assess the effect of blackcurrant extract powder on the population size of bacteria (good and bad) in the seca of rats orally gavaged with this extract. Also to assess the effects on orally administered extracts on selected metabolic indexes and to assess the affect of orally administered aqueous extract from C-Anthomix on food and water intake and body weight gain in male rats.

**Results:** Gavaging rats with C-Anthomix led to a significant increase in bifidobacteria numbers when compared with the rats gavaged with water. Significant increase in lactobacilli numbers were seen in rats gavaged with C-Anthomix. When compared with control rats gavaged with water, bacteroides numbers decreased to significant levels in rats gavaged with C-Anthomix. There were no significant differences detected in the food and water intakes and body weight of the rats gavaged with C-Anthomix.

**Conclusion:** This study showed that C-Anthomix can decrease the activity of  $\beta$ -glucuronidase and increase the activity of  $\beta$ -glucosidase, which could be perceived as potentially beneficial for the host. The study identified C-Anthomix as a good prebiotic.