

Impact of the Gut Microbiome on Health Impacts of Haskap Berries

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Study Protocol:

Polyphenol-rich Haskap berries (Haskap) have untapped therapeutic potential to improve human health, and agricultural producers in northern U.S. states are poised to increase production if consumer demand increases. This is important because inflammation and abnormal metabolism play a major role in the development and progression of many diseases including type 2 diabetes, cardiovascular disease and cancer. Therefore, identifying foods with bioactive components that decrease inflammation and improve metabolism is an important strategy for reducing disease burden. Berries high in polyphenols promote human health through a variety of mechanisms, including inflammation lowering, that may be dependent on interactions with the gut microbiota. We identified gut microbiota dependent anti-inflammatory polyphenol breakdown products from polyphenol rich berry juice in the blood of germ-free mice humanized with fecal microbial transplants from humans. Some of these bioactive polyphenol molecules were measured in mice with a gut microbiota from a human donor with low but not high inflammation levels, suggesting that the microbial digestion of polyphenols may contribute, at least in part, to the difference in inflammation between the human donors. Haskap (*Lonicera caerulea* L.) are rich in anthocyanins and other polyphenolic compounds. The long-term goal of this project is to form a partnership linking the health impacts of Haskap with varieties and management practices to maximize health-promoting compounds to benefit both consumers and producers. A critical knowledge gap is that little is known about the interactions between gut microbes and Haskap polyphenols to produce bioactive metabolites linked to downstream health impacts. Additionally, we need to know which Haskap varieties and harvest timing will yield the greatest bioactive potential.

Aim 1: Determine the impact of Haskap on the gut microbiome and metabolome in a cohort of adults with both low and high risk of metabolic syndrome.

Aim 2: Determine how gut microbiome composition and production of bioactive metabolites from Haskap impacts serum metabolite, health, and inflammation biomarkers in a cohort of adults with both low and high risk of metabolic syndrome. This analysis will identify the impact of individual differences in gut microbiome composition on the response to Haskap consumption.

Aim 3: Identify Haskap varieties and growing practices that increase production of health-promoting compounds. Previous research has demonstrated the concentration of general and specific polyphenols and in vivo anti-inflammatory and anti-diabetic activity in Haskap differ widely among varieties and harvest timing (fruit maturity). MSU-Western Ag Research Center will determine the effects of harvest timing on concentration and yield of health-promoting compounds in over twenty varieties of Haskap.