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Fermented Healthy Beverages



Key external stakeholders:

Food manufacturers, dairy industry, pharmaceutical industry, gastroenterologists, wider research community, policy makers, public health agencies and health professionals.

Practical implications for stakeholders:

The role fermented foods and beverages play in human health has gathered increased attention in recent years. Kefir is a fermented dairy beverage with a long history and wide range of attributed health benefits. By better understanding the microbes present in this fermented beverage, and how these communities contribute to any kefir associated benefits, we can develop new products with an even greater potential to positively impact human health.

Main results:

- Traditional kefir is better able to improve circulating cholesterol profiles and liver triglyceride levels than commercial kefir differ in a mouse model of obesity.
- Microorganisms from traditional kefir can be utilized to produce a kefir product that resembles traditional kefir while maintaining the industrial production levels.
- Lab produced kefir is able to recapitulate the health benefits of traditional kefir in a mouse model of obesity.

Opportunity / Benefit:

As many existing commercial kefir products do not utilize traditional kefir microbes, there is an opportunity to develop a unique fermented dairy product with the capacity to greatly improve human health.

Collaborating Institutions:

University of Alberta

Teagasc project team: Dr. Paul Cotter.

External collaborators: Dr. Ben Willing at the University of Alberta.

1. Project background:

There has been increased public interest in functional foods recently, due to their perceived ability to improve health. Of these products, kefir has garnered particular attention as it has been associated with a multitude of health benefits. While there are a large number of commercial kefir products available, most do not contain the specific microorganisms associated with traditional kefir. The Fermented Healthy Beverages project is focused on determining how traditional kefir microorganisms play a role in the health benefits associated with kefir. Research focuses on comparing traditional and commercial kefir, as well as the development of a commercially viable kefir that is able to maximize these health benefits.

2. Questions addressed by the project:

- Can kefir improve metabolic markers in a model of obesity?
- Do traditional kefir and commercial kefir differ in their impact to host metabolism?
- Can kefir be engineered to provide health benefits based on the inclusion of specific microbes?

3. The experimental studies:

- Testing different kefir examples for their ability to lower plasma and liver lipid profiles in a mouse model of obesity.
- Screening bacterial and yeast isolates from kefir for potential health promoting characteristics and development of a pitched culture kefir.
- Comparing different lab manufactured kefir for their ability to lower plasma and liver lipid profiles in a mouse model of obesity.
- Comparing volatile compound production in different lab manufactured kefir.

4. Main results:

Kefir Mouse Trial #1:

- Traditional kefir varied in its ability to lower cholesterol levels in plasma, improve plasma cholesterol profiles, and lower liver triglyceride levels.
- Traditional kefir was better able to improve plasma and liver lipids than a commercially produced kefir.

Pitched Culture Kefir Development:

- A library of 3000 bacterial and yeast isolates from traditional kefir was generated and screened for pH and bile tolerance, bile salt hydrolase activity, and bacteriocin production.
- From this library, a mixture of 5 bacteria and 4 yeast were identified and a method for the fermentation of a kefir product that resembles traditional examples in pH and microbial density was developed.

Kefir Mouse Trial #2:

- The traditional kefir from mouse trial #1 once again out performed commercial kefir in improving liver and plasma lipid levels.
- Lab generated pitched culture kefir was able to recapitulate the health benefits of traditional kefir and outperform commercial kefir.
- Pitched kefir without *Lactobacillus* sp. or yeast could not recapitulate the health benefits of traditional kefir.

Metabolomics Study:

- Lab generated pitched kefir and traditional kefir were found to differ in their profiles of volatile compounds.

5. Opportunity/Benefit:

Outputs from this research are of significance in both the food and pharmaceutical industries. The development of a novel kefir product which has demonstrated health benefits has potential applications for the improvement of functional foods, as well as human health.

6. Dissemination:

Extensive dissemination of research findings has been undertaken in the form of peer reviewed publications and scientific presentations at conferences.

Main publications:

- Bourrie BCT, Willing BP, Cotter PD. The microbiota and health promoting characteristics of the fermented beverage kefir. *Front Microbiol.* 2016;7:1–17.
- Bourrie BCT, Cotter PD, Willing BP. Traditional kefir reduces weight gain and improves plasma and liver lipid profiles more successfully than a commercial equivalent in a mouse model of obesity. *J Funct Foods.* 2018;46:29–37.

7. Compiled by: Ben Bourrie, Paul Cotter
