Abstract

Due to the large variation in physical and chemical characteristics of fiber sources, predicting physiological responses of microbiota in gut has been a difficult task. Viscosity is a physicochemical property associated with dietary fibers, which may affect utilization by the gut bacteria and affect community dynamics. The objective of this study was to determine changes in gastrointestinal bacterial behavior in medium- and high- viscosity systems. Our group’s research results on the glucose have shown that the growth rate of Bacteroides ovatus was decreased as the viscosity increased. There was also a significant change in lag time affected by the viscosity. To this end, a logistic model was used for analyzing growth curves. In the following part of this research, similar to the glucose model that we have used, we are now being done to compare utilization of polysaccharides with different chain lengths on bacterial growth in different viscosity media. Then we will explore the mechanism of viscous environment to inhibit the bacterial growth. A longer range goal is to better understand how dietary fibers can be used to obtain predicted changes on microbiota composition for improved health.

Introduction

Viscosity and fermentability have been recognized as the main properties of fibers. Viscous dietary fibers thicken when mixed with fluids and include many soluble polysaccharides such as gums, pectins, and β-glucans. The degree of thickening when exposed to fluids is dependent on the chemical composition and concentration of the polysaccharide [1]. Although the viscous fibers is likely to alter the blood glucose and cholesterol concentrations, prolonged gastric emptying, and slower transit time in small intestine, it is not yet established whether there is a simple relationship between bulk viscosity and the utilization of fibers for the microbiota in gut. Based on earlier insights by Mara Lucia Stecchini [1], growth of Listeria monocytogenes was influenced by viscosity and water activity. In high-viscosity systems containing polyvinylpyrrolidone, growth rate was reduced, whereas lag time showed no discernible modification. It is considered to be the result of the effect on the diffusion of nutrition for microbiota.

Bacteroides ovatus ATCC 8483 was grown in sealed, anaerobic tubes, under a CO₂ atmosphere, and strict anaerobic procedures were used. Cell densities were measured using a Spectronic 70 spectrophotometer (Bausch and Lomb, Rochester, NY), as optical density (OD) at 660 nm, 16 mm path length. Measurements were taken until the cultures reached a stable OD. All cultures were incubated in triplicate at 37 °C.

Measurements in triplicate of apparent viscosities at shear rate 100 s⁻¹ were done at 30 °C by using AR G2 rheometer (TA instrument Inc., USA).

RESULTS

The effect of viscosity on B. ovatus growth when dietary fibers with variable chain length are substrates.

Expected result

The decrease of bacterial growth affected by viscosity in fructooligosaccharides is higher than that in inulin media.

REFERENCES