AGRI5710 Graduate Module, Dalhousie University, Faculty of Agriculture

Module Topic: Oligosaccharides in Food and Nutrition ***Date:*** *March-April, 2016*

Instructor: *Dr. Beth Mason (Beth_Mason@cbu.ca)* ***Capacity:*** *5 students*

No. of Meetings: 5 (1 in-person and 4 times by Skype). Email the Instructor by Wednesday March 28, 2016 if interested in taking the module.

Module Background: A number of plant based oligosaccharides (inulin, oligofructose) have been investigated for their stimulatory properties on gut microbiota, namely modification of the *Bifidobacterium* ratios in the intestinal tract. These have been shown to be present in greater ratios in populations where the incidence of intestinal inflammatory and cardiovascular diseases are lower than in populations on typical Western diets. Additionally in specific groups of people (isolated Swiss farming communities and some Amish groups), similar gut microbiota profiles have been observed to correlate with lower (or non-existent) incidence of allergies (particularly to food).

Often, food manufacturers refer to the sources of oligosaccharides as insoluble fiber (as opposed to the physical fibers included in total fibre analyses labels, such as bran and psyllium), since these molecules are not digested in the small intestine and become available for fermentative use by microbes in the hind gut. A more commonly used term in the dairy industry is “pre-biotics” as these are synergistic and complementary as nutrient sources to the probiotic species (*Lactobacilli sp. and Bifodobacterium sp.*) generally incorporated into dairy products.

Other carbohydrates, including galactooligosaccharides (GOS), transgalactooligosaccharides (TOS), lactulose, polydextrose, gums, and psyllium, also have prebiotic effects. A number of oligosaccharide products specifically are already approved for inclusion in human food (e.g. Vivinal GOS), and yet there is a range of processing methods that in turn produce a range of oligosaccharides rather than one specific GOS, including di-, tri-, and tetra-oligosaccharides, from the same (lactose) substrate.

It is unclear what the ideal ratio of oligosaccharides in a product is to maximize its “pre-biotic” potential, or how their structures relate to functionality, yet currently the range of products on the market vary in their composition but have the same “health claim”. Part of the problem may be the difficulty in finding analytical methods that do not depend on complete degradation of the oligosaccharides into component sugars for quantification. Additionally, it may be difficult to control reaction kinetics to specifically deliver their desired structural arrangement for the “ideal” prebiotic effect.

Module Description: In comparing the variety of prebiotic oligosaccharides on the market, students will describe their range of structurally active compounds and known “bioactivity”, and describe the methodology one might use to fully evaluate a “new” hypothetical product originating from seaweed (macro algal) oligosaccharides liberated by a simple hydrolysis. Students will also describe whether methods used in analytical characterization may either be incorporated into production process design, or how they may misrepresent the product outcomes of commercially viable processing methods.

Evaluation: Presentation (40%), Final Paper (40%), Participation/Contribution to Discussion (20%)

Materials: Module materials will be derived from peer-reviewed scientific journals.