Dietitians of Canada
The Canadian Foundation of Dietetic Research
Letter of Intent

	Principle Investigator	**Co-Investigator**
Name:	Teresa Isaac PDt (DC# 13814)	Chris Arnold PDt (DC# 13709)
	Director of Food & Nutrition Services	Manager,Clinical Nutrition Services
Address:	Parkridge Center	Saskatoon District Health
	Saskatoon District Health	
Telephone:	(306)655-3884	
Facsimile:	(306)655-3801	
E-mail:	isaact@sdh.sk.ca	

	Co-Investigator	**Co-Investigator**
Name:	Wendy J. Dahl MSc PDt (DC#18379)	Susan Whiting, PhD (DC#6037)
	PhD Candidate	Professor
	College of Pharmacy and Nutrition	College of Pharmacy and Nutrition
	University of Saskatchewan	University of Saskatchewan

Title of Project: A comparison of inulin versus modified starch as beverage thickening agents on gastrointestinal function and calcium retention in dysphagic institutionalized young adults.

Introduction

Dysphagia affects a significant proportion of institutionalized adults. Many individuals with dysphagia are unable to handle the fast oral-pharangeal transit of thin liquids and, therefore, require thickened fluids (1). Modified starch is generally used to thicken beverages and although its performance as a thickener is satisfactory, it offers no nutritional or health advantage other than providing carbohydrate-derived calories. That carbohydrate load can be a disadvantage for those individuals with concurrent health conditions, such as diabetes.

There are a number of soluble fibre ingredients that are useful in texture modification, stabilization and water holding capacity; these are the same functions required for the formulation of thickened beverages. The fructan (i.e., fructose polymer) inulin is a dietary fibre that is easily dispersed in water, forms stable gels and imparts a smooth fat-like mouthfeel (2). These qualities make it ideal as a thickening agent**.** Inulin is considered in many countries to be a dietary fibre source, as it demonstrates the physiological effects attributed to dietary fibre such as fecal bulking and cholesterol lowering (3). Fructose oligosaccharide, a product of inulin hydrolysis, has been shown to improve calcium absorption (4), and this benefit may be seen in inulin itself. Inulin also has prebiotic effects (5). All of these other functions of inulin would beneficial to residents of long term care.

For wheel chair-bound patients, gastrointestinal functioning is an important consideration. The use of a thickening agent that also provides dietary fibre may improve bowel frequency that in turn would improve quality of life. Many dysphagic patients are young adults,

having succumbed to head injuries or various neurological pathologies (1). For these young adults in particular, bone loss due to inactivity can lead to further disability through adulthood. Therefore, the effect of inulin on calcium absorption is of particular interest. Calcium retention is critical to wheel chair bound long-term care adults as they lack the stimulus weight bearing exercise on bone and hence are susceptible to bone loss. Improvement in calcium absorption, as has been shown for oligofructose, might be a health benefit of inulin over modified starch.

Hypothesis and Specific Objectives

Our hypothesis is that inulin, used a beverage thickener, will result in an acceptable thickened beverage product that when administered daily will result in improved gastrointestinal functioning (as measured by bowel frequency) and calcium retention (as evidenced by a reduction on bone resorption as measured as a fall in urinary excretion of collagen crosslinks). The objectives of our study are as follows:

1. To develop thickened beverages of acceptable consistency using inulin.
2. To determine if thickened beverages prepared with inulin result in products of acceptable taste and texture.
3. To determine the effect of consuming inulin-containing thickened beverages on bowel frequency and other indicators of GI function
4. To determine the effect of consuming inulin-containing thickened beverages on calcium retention.

Experimental Approach:

Phase 1(Beverage preparation): Standard thickened juice and milk will be developed using inulin and modified starch. Optimum viscosity will be ensured through viscosity testing and consultation with speech-language pathology. Beverage preparation will be initially, piloted by the co-investigators. Once products of acceptable consistency are developed, taste tests be will be carried out by a sample of consenting dysphagic, wheel chair-bound long term care adults at Parkridge Center, Saskatoon District Health, Saskatoon, SK. The preferred products will be used in Phase 2, to test the putative health benefits.

Phase 2 (Health benefits study): A double blind, four week cross-over study will be carried out on the physiological effects and acceptance of 25 g/day inulin- vs. modified starch-based thickened beverages. Ten consenting adult dysphagic subjects, ages 18-40 years, who are wheel chair-bound and living in long term care will be recruited. Subjects will consume each type of thickened beverage for a two-week period in a cross-over fashion, with a one week wash-out in between; the one week wash-out will be modified starch-based beverages. Subjects will complete a questionnaire on long-term acceptability of the product, and a questionnaire on bowel frequency. Volunteers will be enlisted to assist subjects with questionnaires. Fasting morning urine will be collected from subjects by means of changing catheter bags, so that a first morning sample is obtained. Urine will be analyzed for using the Osteomark NTx urine test which is an assay for cross-linked N-teleopeptides of type I collagen; a rise in these cross-links indicates bone resorption (6). Food and beverage consumption will be monitored by weighing portions before

and after meals, and nutrients of interest (calcium, dietary fibre) will be determined using product and ingredient composition data. Questionnaires will be coded and analyzed.

Timeline

The total time for this project is 12 months: 3 months preparation, 1 month conducting Phase 1, 5 months conducting Phase 2, and 3 months writing up.

Significance of the Proposed Study:

An improvement in the consistency of thickened beverages would increase quality of life of dysphagic, wheel chair bound adults. Furthermore, if measurable health benefits such as improved calcium retention and better bowel function through an increase in soluble dietary fibre intake emerge, this would improve overall quality of life of young dysphagic patients. Results may be applicable to older and younger age groups as well.

Miscellaneous Note of Relevance

Saskatoon District Health will act as the sponsor on behalf of the applicants. Research facilities of the College of Pharmacy and Nutrition will be used for laboratory-based aspects of the study.

Budget:

Technician Salary: $6900.00

- Phase 1: Technician half time 1 month @ $1500/m plus benefits = 1725
- Phase 2: Technician 3 months half time @ $1500/m plus benefits = 5175

Subject Honorarium: $1250.00

- Phase 1: 25 tasters @ $10 = 250
- Phase 2: 10 subjects @ $100 = 1000

Food and Supplies: $ 5000.00

- Phase 1: food costs $500; inulin $200
- Phase 2: food costs $8/day x 350 days = $2800; inulin $500
  NTx assay kit and supplies $1000

Miscellaneous: $ 200

TOTAL: **$ 13350.00**

References:

1. American Dietetic Association. Manual of Clinical Dietetics “Diet for Dyphagia” pp667-93, 2000

2. Niness KR. Inulin and oligofructose: what are they. J Nutr 129:1402S-6, 1999. **3**. Flamm G et al. Inulin and oligofructose as dietary fiber: a review of the evidence. Crit Rev Food Sci Nutr 41:353-62, 2001. **4**. Ellen GHM et al. Oligofructose stimulates calcium absorption in adolescents. Am J Clin Nutr 69:544-8, 1999. **5**. Gibson G. Dietary mmmodualation of the human

gut microflora using the prebiotics oligofructose and inulin. J Nutr 129:1438S-41, 1999. **6**. Kyd PA. Clinical usefulness of biochemical resorption markers in osteoporosis. Ann Clin Biochem 36:483-91, 1999.