COVER SHEET FOR GRANT PROPOSALS

State Board of Education

SBOE PROPOSAL NUMBER: (to be assigned by SBOE)	AMOUNT REQUESTED: $50,000

TITLE OF PROPOSED PROJECT: Generation of Potato-Based Resistant Starch (RS) Ingredients for Testing within Commercial Product Prototypes by an Industrial Partner

SPECIFIC PROJECT FOCUS: "Gap" funds are requested to generate sufficient quantities of novel potato resistant starch (RS) ingredients (University of Idaho role) for an industrial partner (J.R. Simplot Co.) to test within their commercial product lines to validate processability and product quality. Incorporation of such ingredients is anticipated to allow potato products to gain entry into "low glycemic" food markets, which are currently inaccessible for potato products.

PROJECT START DATE: 3/1/2011	PROJECT END DATE: 2/28/2012

NAME OF INSTITUTION: University of Idaho	DEPARTMENT: School of Food Science

ADDRESS: 606 Rayburn Street, 118 Agricultural Science Building, University of Idaho, Moscow, ID 83844-2312

	E-MAIL ADDRESS:	PI PHONE NUMBER:
	huberk@uidaho.edu	(208) 885-4661

	NAME:	TITLE:	SIGNATURE:
PROJECT DIRECTOR	Kerry C. Huber	Associate Professor	Kerry C. Huber
CO-PRINCIPAL INVESTIGATOR			
CO-PRINCIPAL INVESTIGATOR			
CO-PRINCIPAL INVESTIGATOR			

	NAME:	SIGNATURE:
Authorized Organizational Representative	**Polly J Knutson, Director Office of Sponsored Programs University of Idaho**	Polly Knutson CK 12/1/10

Name of Institution: University of Idaho
Name of Project Director: Kerry C. Huber

A. FACULTY AND STAFF

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
% OF TOTAL BUDGET:				SUBTOTAL:	

B. VISITING PROFESSORS

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
% OF TOTAL BUDGET:				SUBTOTAL:	

C. POST DOCTORAL ASSOCIATES / OTHER PROFESSIONALS

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
Jong-Yea Kim (Visiting Research Scientist, 30% Effort)	$32,178	3.6			$9,700
Kathy Hendrix (Scientific Aide Senior, 50% Effort)	$37,003	6.0			$18,500
% OF TOTAL BUDGET: 56.4				SUBTOTAL:	$28,200

D. GRADUATE / UNDERGRADUATE STUDENTS

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
% OF TOTAL BUDGET:				SUBTOTAL:	

E. FRINGE BENEFITS

Rate of Pay (%)	Salary Base	Dollar Amount Requested
Jong-Yea Kim (30% fringe rate)	$9,700	$2,900
Kathy Hendrix (41% fringe rate)	$18,500	$7,600
	SUBTOTAL:	$10,500

F. EQUIPMENT: (List each item with a cost in excess of $1000.00.)

Item/Description	Dollar Amount Requested
SUBTOTAL:	

G. TRAVEL:

Dates of Travel (from/to)	No. of Persons	Total Days	Transportation	Lodging	Per Diem	Dollar Amount Requested
6/1/2011 – 6/2/2011	2	2	$680	$250	$120	$1,050
11/1/2011 – 11/2/2011	2	2	$680	$250	$120	$1,050
					SUBTOTAL:	$2,100

H. Participant Support Costs:

	Dollar Amount Requested
1. Stipends	
2. Travel (other than listed in section G)	
3. Subsistence	
4. Other	
SUBTOTAL:	

I. Other Direct Costs:	Dollar Amount Requested
1. Materials and Supplies	$9,200
2. Publication Costs/Page Charges	
3. Consultant Services (Include Travel Expenses)	
4. Computer Services	
5. Subcontracts	
6. Other (specify nature & breakdown if over $1000)	
SUBTOTAL:	$9,200
J. Total Costs: (Add subtotals, sections A through I) **TOTAL:**	$50,000
K. Amount Requested: **TOTAL:**	$50,000
Project Director's Signature: Kenny C. Ho	Date: 12/1/10

INSTITUTIONAL AND OTHER SECTOR SUPPORT
(add additional pages as necessary)

A. INSTITUTIONAL / OTHER SECTOR DOLLARS Source / Description	Amount
Waiver of F&A Costs (calculated as 43.4% of the total direct costs)	$21,700

B. FACULTY / STAFF POSITIONS Description
Faculty Time (Huber Salary + Fringe, 5% effort): $5,700

C. CAPITAL EQUIPMENT Description

D. FACILITIES & INSTRUMENTATION Description

Executive Summary: A possible link between *high glycemic response (i.e., elevated blood sugar levels following consumption of food) and risk for obesity and chronic human disease* (e.g., type II diabetes, heart disease, etc.) has made concern over blood sugar management a mainstream issue. Processed/cooked potato products are generally classified as 'high glycemic', and are frequently noted as foods to avoid. With annual sales of approximately $3.4 billion, Idaho potato processors are positioned outside the realm of 'low glycemic' market trends and stand to suffer market declines. Based on the concept of resistant starch (RS), *technology has been developed whereby potato granules (i.e., an existing commercial potato product) may be chemically modified to yield novel, whole-tissue, potato-based food ingredients with moderated glycemic response*. These novel potato RS ingredients may be substituted in food applications (i.e., instant mashed potatoes, extruded French fries, snack foods, etc.) for traditional commercial dehydrated potato ingredients, with the added benefits of enhanced RS content and/or moderated glycemic response. They may also be suitable for formulation of specialty food products intended for diabetics or formulated for enhancement of digestive health. Potato RS ingredients differ from most existing commercial RS products (corn-based, purified starch only), in that they are *comprised of the entire tissue of the potato (not simply isolated starch), providing a functional advantage for use in potato-based foods*. A collaborative project between a University of Idaho (UI) research team and an Idaho Potato Processor (J.R. Simplot Co.) will evaluate the commercial potential of these novel RS ingredients.

"Gap" Project Objective: "Gap" funds are requested to *generate sufficient quantities of novel potato resistant starch (RS) ingredients (UI role) for an industrial partner (J.R. Simplot Co.) to test within their existing commercial potato product lines* (i.e., mashed potatoes, potato croquettes, extruded potato products, etc.) to validate processability and product quality.

Total Amount Requested: $50,000

Idaho Public Institution: University of Idaho (UI)

Faculty Member/Project Director: Kerry C. Huber

Alignment with Priorities of the Home Institution: The University of Idaho is the land-grant institution within the state of Idaho, and is charged with delivery of unique, state-wide academic, research, and extension/outreach programs focused on the agricultural sciences (e.g., food science).

Potential Impact to Idaho Economy: Idaho is the largest potato producer, fresh packer, and processor in the U.S.[1], which business sectors together comprise the potato industry within the state. Potatoes provide the largest source of crop revenue within the state, with a base crop value of $796 million reported for 2009[2]. Direct sales from Idaho potatoes and processed potato products totaled $3.4 billion in 2002, with the majority of this total ($2.3 billion) generated by the frozen/dehydrated potato processing industries[1]. In 2002, the total impact of the Idaho potato industry, including both direct and indirect (i.e., supporting) business activities, accounted for more than 5% of Idaho's gross state product, as well as 39,500 jobs, $6.7 billion in sales, and $1.3 billion of income within the state[1]. *Addition of value to potatoes through novel processing technologies solidifies and enhances the competitiveness of the Idaho potato processing industry in global markets, directly strengthening the economy of the state.*

Establishment of Partnerships with Public/Private Sector: A *partnership with the J.R. Simplot Co.*, an Idaho processor of both dehydrated and frozen potato products, has been established based on their expressed interest in the further development of this technology for direct application within their products (letter of support is provided in Appendix 1).

Market Opportunity: There is increasing scientific evidence for a potential *link between the postprandial glycemic response of foods and risk for obesity and chronic human disease* (e.g., type II diabetes, heart disease, etc.)[3]. With more than one million new cases of type II diabetes each year in the U.S., concern over management of blood sugar and glycemic response has grown, with 63% of U.S. consumers expressing an interest in controlling blood sugar via dietary means[4]. The market for low-glycemic food products is projected to reach $1.8 billion in 2011[5], with 53% of consumers desiring more products targeting this market sector[6]. Processed/cooked potato products (based on digestion of their considerable starch content) generally exhibit a relatively high glycemic response, similar to that of refined sugar, placing *potato products in a high glycemic category* as a food to avoid for those with need or desire to control blood sugar. Not only are potato products currently positioned outside the realm of low glycemic market trends, they also may stand to suffer potential market declines in light of these emerging trends.

A technological approach for addressing the glycemic limitations of potatoes utilizes the rationale used to create resistant starch (RS), which contributes not only a moderated glycemic response to food products, but also other physiological functions related to digestive or "gut" health[3,7]. *Resistant starch* is starch material that passes through the small intestine into the large intestine undigested[8], where it is fermented by bacterial microflora within the colon into short-chain fatty acids such as butyrate, a biomarker for colonic health[3,9-12]. Thus, RS is considered a prebiotic or preferred growth substrate for beneficial bacteria within the colon for production of butyrate, as well as a source of dietary fiber and a tool for moderating glycemic response. A summary of known physiological functions of RS is listed in Table I. Another useful category of starch material, termed *slowly-digestible starch* (SDS), comprises starch material that is generally fully degraded to glucose and absorbed during passage through the human small intestine, but at a moderated or reduced rate (i.e., reduced glycemic response)[8]. Both RS and SDS can be generated using similar methods, and together represent a combined approach for moderating the glycemic response of processed foods. To date, there are *no known potato-based ingredients capable of simultaneously delivering a moderated glycemic response, digestive health benefits of RS/SDS, and essential potato sensory attributes (appearance, texture, flavor, etc.) to potato products.*

To fill this void, our laboratory has developed technology for generating dehydrated, whole-tissue potato ingredients, which parallel existing commercially-viable potato ingredients/products (i.e., granules, flakes, flours, etc.). A dehydrated potato vehicle not only has the advantage of an existing market share (Idaho dehydrated potato products currently generate nearly $1 billion in annual sales)[1], but possesses the further

Table I. Physiological Effects of Resistant Starch (RS)[12]

Potential physiological effects	**Conditions where there may be a protective effect**
Improved glycemic and insulinaemic responses	Diabetes, impaired glucose and insulin responses
Improved blood lipid profile	Cardiovascular disease, lipid metabolism, metabolic syndrome
Improved bowel health	Colorectal cancer, ulcerative colitis, inflammatory bowel disease, diverticulitis, constipation
Prebiotic and culture protagonists	Colonic health
Increased satiety and reduced energy intake	Obesity
Increased micronutrient absorption	Enhanced mineral absorption, osteoporosis
Adjunct to oral rehydration therapies	Treatment of cholera, chronic diarrhea
Synergistic interaction with other dietary components, e.g., dietary fibers, proteins, lipids	Improved metabolic control and enhanced bowel health
Thermogenesis	Obesity, diabetes

inherent benefits of excellent storability, low-cost transport, consumer convenience, and versatility as a food ingredient. Food uses and applications for our novel potato ingredients would be similar, but not limited to, existing applications of potato granules, flakes, and flours (e.g., instant mashed potatoes, restructured products [extruded shreds, French fries, etc.], and snack foods [crackers, chips, etc.]), with the added benefit of contributing an enhanced RS/SDS content and/or a moderated glycemic response to such products. The novel physiological attributes (i.e., moderation of glycemic response, increased RS/SDS contents) of these potato ingredients also make them suitable for formulation of specialty food products, including those intended for diabetics or formulated to enhance digestive/gut health. As our novel potato RS products have greatest potential to be utilized as food ingredients, the direct market audience is anticipated to primarily consist of food companies (including potato processors), which formulate potato-based products for retail, as well as large-scale institutional (i.e., fast food, restaurant) markets. However, in the case of instant mashed potato products, there is likely potential for potato processors to cater directly to the retail market. In short, development of potato-based ingredients with enhanced RS/SDS contents and moderated glycemic response attributes *expands traditional uses of dehydrated potato products, allowing their entry into market areas that are at present inaccessible*.

U.S. Market competitors for RS/SDS and low glycemic ingredients largely consist of food starch manufacturers, of which Carghill, Inc., National Starch and Chemical Co. (recently purchased by Corn Products International), and Tate & Lyle are the top tier starch producers (collectively control 75% of the market shares)[13]. Examples of second tier starch producers include Grain Processing Corporation, Ciranda, and Penford Food Ingredients (niche potato starch focus)[13]. As reported by Frost and Sullivan[13] more than 90% of isolated starch produced in the U.S. market is extracted from corn, while native (43.2%) and modified (chemically enhanced, 46.8%) represent the two major market segments. Current total U.S. starch market value is estimated at $1.63 billion, with growth to $2.58 billion projected by 2014[13]. Market drivers supporting this projected growth are: 1) greater consumer demand for convenience foods, 2) growing trends for increased health and wellness, and 3) need for more functional starch products[13]. Based on the noted consumer trend related to increased health and wellness (trend 2 above), Frost and Sullivan[13] specifically *identified RS as a high*

impact market driver of starch demand through the remainder of the forecast period (2014). To date, virtually all commercial RS products on the market consist of extracted starch in purified form (i.e., starch isolated/separated from other components of a grain, such as corn). In contrast, the novel potato-based RS products developed in our laboratory are derived from *whole-tissue potato material (containing also protein, lipid, fiber, and ash components* from the original potato tissue), rather than just the isolated starch. Thus, this *whole-tissue RS approach is novel, retaining the native characteristics and properties of potatoes to enhance functional performance in potato-specific end-product applications (i.e., mashed potatoes, restructured potato shreds, potato snacks, etc.).*

Description of the Technology: Though potato starch in its native granular form within raw (i.e., uncooked) potatoes is extremely resistant to human digestion, potatoes are rarely consumed without first being subjected to heating or cooking. Upon cooking, starch granules within potato tissue cells undergo swelling and gelatinization (loss of native order), rendering starch readily digestible. This physical change in starch structure is responsible for the noted 'high glycemic' characteristics of cooked/processed potato products. Strategies for reducing the glycemic response of cooked potato products can involve stabilization of the starch native physical state (prior to cooking) to better withstand heat processing, or alteration of starch structure after heating/cooking to reduce digestibility of starch by enzymes. *The overarching emphasis of our technology development efforts is to develop dehydrated, multifunctional, whole-tissue potato ingredients with enhanced RS/SDS contents and moderated rates of starch digestibility (i.e., reduced glycemic response).* Resistant starch is classified into four primary types (RS_1-RS_4), based on its respective mode of resistance to digestion by human enzymes (Table II), with each RS type possessing specific functional advantages that make it particularly suitable for a specific food application. Our ultimate goal is to *generate a full repertoire of potato-based RS ingredients, representing all established types of RS, to match the comprehensive functional requirements of diverse potato end-use applications* (snack foods, extruded/restructured French fries, mashed potatoes, bread products, etc.). Since 2004, technologies surrounding multiple potato RS concepts, representing all four RS types, have been developed into laboratory-scale prototypes by our research group through the efforts of multiple undergraduate/graduate students and visiting research scientists, with further development efforts ongoing for

Table II. Primary Types and Characteristics of Resistant Starch (RS)

Resistant Starch (RS) Type	Nature of Resistance	Food Examples	Attributes/Limitations
RS_1	Starch physically shielded or protected from enzymes by a physical barrier (e.g., intact cell wall)	Whole kernel grains, vegetable tissue	Resistance may diminish with heating due to loss of integrity by the physical barrier (e.g., cooked potatoes)
RS_2	Starch granules in the native semi-crystalline (non-heated) state	Raw vegetables (e.g. carrots), uncooked starch granules	Generally loses resistance to digestion with heating
RS_3	Starch molecules retrograde or re-crystallize after cooking to resist digestion by enzymes	Resistant starch ingredients, breads and a wide range of foods (low levels only)	Stable to high temperatures (120-170°C), but may not always contribute a significant physical function (at high levels of addition)
RS_4	Bulky chemical groups incorporated onto starch chains physically block digestion by enzymes (e.g. steric hindrance)	Chemically modified food starches	Resistance stable against heating; treatment may enhance starch physical function in food

all RS types. Efforts to date have generated two M.S. theses, two provisional patents, and one filed patent (U.S. Utility and PTC).

For the purposes on this proposal, discussion will be focused on a single developed potato RS technology, which describes a method by which starch within potato tissue may be made resistant to human digestion by chemical modification (i.e., RS_4, Table II). This technology was developed in collaboration with a former M.S. graduate student (Wei Chen Yu) using both general departmental (Dept. of Food Science and Toxicology, UI) and federal (USDA) funds. The work generated one M.S. thesis[14], as well as the filing of U.S. Utility and PTC patent applications (*Potato Products with Enhanced Resistant Starch Content and Moderated Glycemic Response and Methods Thereof*) in October, 2010. Potato granules, an existing, commercially-available, dehydrated, instant mashed potato product, are the preferred reaction substrate, though either potato flakes or flour may be utilized in similar fashion. Thus, the generated *RS ingredient is a chemically modified potato granule ingredient, which may be substituted for its traditional (i.e., non-chemically modified) counterpart in typical commercial potato applications to enhance the RS and glycemic response attributes of a final potato product (e.g., mashed potatoes).*

For generation of the modified ingredient, commercial potato granules are reacted as a partially-hydrated slurry with reagents approved for modification of food starch (e.g., propylene oxide, sodium trimetaphophate,

phosphorus oxychloride, etc.). Reaction conditions (slurry composition, reaction temperature, reagent addition levels) have been optimized to yield varied degrees of substitution and levels of RS. Established *in vitro* enzyme assays (used to simulate *in vivo* starch digestion) document a positive correlation ($r = 0.93$) between starch modification and RS levels, allowing RS levels as high as 50% to be achieved within modified granules. The estimated glycemic index (measure of glycemic response) for modified potato granules in established *in vitro* tests is significantly decreased by derivatization (from 116.4 to 59.7), even after simulated cooking. Thus, the RS content within the modified potato granules not only decreases both the rate and extent of starch digestion by enzymes, it is also capable of withstanding the rigors of cooking (i.e., indicative of its ability to withstand industrial processing conditions). Further, starch within chemically modified potato granules exhibits properties very similar to those observed in industrial chemically modified food starches (i.e., enhanced stability in frozen food systems), greatly expanding their functionality for use in potato product applications. Modified potato granules also retain microstructural features (i.e., intact cell wall structures; retention of starch within potato tissue cells) characteristic of commercial (i.e., unmodified) potato granules. In summary, our developed *modified potato granule ingredient possesses a documented RS content and ability to lower glycemic response*, as well as multiple favorable physical characteristics (i.e., demonstrated heat stability of RS attributes, modified starch behavior, favorable microstructure). Based on laboratory work conducted to date (equivalent to Department of Defense [DoD] Technology Readiness Levels [TRLs] 1-4), this technology now requires integration and validation within industrially-relevant potato product systems. *These next steps are to be accomplished using "gap" funds requested within this proposal, with the goal of conducting bench-top and pilot-scale integration (DoD TRLs 5 and 6) of potato RS ingredients into select commercial potato product applications in collaboration with an industrial partner.*

10. Commercialization Partners: *J.R. Simplot Co., an Idaho potato processor, has agreed to partner with our laboratory* since becoming aware of our potato RS research efforts in September, 2010. Simplot represents an ideal partner, since they manufacture a wide array of both dehydrated and frozen potato ingredients/products with broad commercial distribution. Within this partnership, our laboratory will generate needed quantities of various chemically modified potato RS ingredients, while at the same time documenting the RS contents and

physical properties of these ingredients. The role of Simplot will be to integrate RS ingredients at both bench-top (DoD TRL 5) and pilot-scale (DoD TRL 6) levels into select potato products (i.e., mashed potatoes, potato croquettes, extruded potato products, etc.), and evaluate RS ingredient functionality and feasibility within product prototypes. Our UI laboratory will confirm the RS contents (carry-through of RS attributes following processing) in final product prototypes prepared by Simplot. Quarterly face to face meetings (two at Moscow/University of Idaho; two at Caldwell/Simplot) will be held to discuss project progress and challenges, with more frequent discussions conducted by telephone as needed. Upon successful completion of this project, the existing partnership is expected to continue to move RS products toward commercialization (DoD TRLs 7-9), as well as expanding utilization of RS ingredients to other relevant end-products. Discussion of future research pursuits beyond the scope of this proposed collaboration are already in process.

11. Project Plan/Use of Funds: The project plan consists of three primary project phases, with specific tasks outlined for both the UI research team and J.R. Simplot Co. within each project phase (Table III). "Gaps" to be addressed are two-fold: 1) validate the functionality of potato RS ingredients within actual commercial product prototypes (ensure that potato RS ingredients will process and provide product qualities similar to those of traditional ingredients), and 2) demonstrate that the RS attributes of the novel potato ingredients "carry-through" (withstand the rigors of commercial processing) after integration within commercial product prototypes. This proposal initiates a true collaboration between a UI research team (technology developer) and an industrial partner (potential user of the technology) in directly addressing current "gaps", increasing the likelihood for continued joint efforts toward commercialization.

A simplified budget (Table IV) is provided below (see Appendix 2 for detailed budget). The Project Director (PD, Kerry Huber) will utilize a Ph.D. Visiting Research Scientist (hired at 30% effort + fringe benefits) to design experimental protocol and oversee day-to-day production of needed quantities of various potato RS ingredients for use in bench-top and pilot-scale in-product tests to be conducted by J.R. Simplot. Under the direction of the Visiting Research Scientist, a Scientific Aide Senior (hired at 50% effort + fringe benefits) will prepare the mass quantities of the various potato RS ingredients and establish the initial RS/SDS

Table III. Project Plan for Bench-top (TRL 5) and Pilot-scale (TRL 6) Integration of RS Ingredients in Commercial Product Prototypes

Timeline	University of Idaho		J.R. Simplot Co.	
	Tasks to be Completed	Methods/Metrics	Tasks to be Completed	Methods/Metrics
Phase I (Bench-top Level Testing): 3/1/11 to 8/31/11	• Prepare a range of RS ingredients with variable molar substitution levels (0.1-0.2) and/or cross-linking levels (0.01-0.4% phosphorus) for testing in bench-top commercial product trials conducted by Simplot • Verify initial RS/SDS levels within the various modified RS ingredients • Measure pasting properties of the various RS ingredients	Established protocol used for modification of potato granules and measure of RS/SDS contents (Yu, 2010)	• Test RS ingredients in bench-top commercial products (i.e., instant mashed potatoes, potato croquettes, extruded potato products) at various levels of addition (10-50% by weight) • Evaluate processability and quality of commercial products containing varied levels of RS ingredients • Provide feedback to UI research team regarding performance of the various RS ingredients in commercial products	Standard procedures of commercial production Quality control specifications established for products Face to face meetings and/or written/verbal reports
Phase II (Pilot-Level Testing): 9/1/11 to 12/31/11	• Narrow number of RS ingredients to be used in Phase II trials (based on feedback received from Phase I commercial product trials conducted by Simplot) • Prepare greater quantities of select RS ingredients (those identified in the previous bullet above) for use in larger-scale (pilot) commercial product tests conducted by Simplot • Verify initial RS/SDS levels within the various modified RS ingredients • Measure physical properties of the various RS ingredients	Established protocol used for modification of potato granules and measure of RS/SDS contents (Yu, 2010)	• Same as bullets listed for Phase I above, except using the narrowed number of Phase II RS ingredients prepared by the UI research team	Same as those identified in Phase I above
Phase III (Validation of RS/SDS level and estimated glycemic response in commercial products): 1/1/12 to 2/28/12	• Measure RS/SDS levels and estimated glycemic index values for select pilot-scale commercial products (those deemed to have the best commercial potential by Simplot following Phase II tests)	Established protocol for measure of RS/SDS contents (Yu, 2010)	• Based on performance (i.e., glycemic response and functionality), identify potato RS ingredients with the greatest potential for application within the various commercial product applications	Finished product targets include at least a 20% RS content and a 30% reduction in the estimated glycemic index

contents of individual RS ingredient batches. After incorporation of the prepared RS ingredients into commercial product prototypes by Simplot, the Visiting Research Scientist will assess RS/SDS contents and estimated glycemic index values to verify "carry-through" attributes of the RS ingredients within the finished commercial products. The PD will coordinate the overall effort through weekly meetings with UI laboratory personnel (Visiting Research Scientist, Scientific Aide Senior) and regular interface with J.R. Simplot Vice President of R&D (Steve Vernon). Travel funds ($2,100) are requested for two trips to Caldwell, ID (J.R. Simplot R&D facility) by two members of the UI research team (technical support/trouble-shooting role) coinciding with initial bench-top and pilot-scale integration of potato RS ingredients within commercial product prototypes. Facilities and major equipment needed for production/analysis of potato RS ingredients are present on the UI campus within the School of Food Science (see Appendix 3), while requested operating expenses ($9,200) will cover costs associated with preparation of RS potato ingredients and verification of their RS/SDS attributes and physical properties (i.e., food-grade reagents/chemicals, glassware, RS/SDS assay kits, enzymes, thermal analysis pans, rheology test canisters, microscope use, etc.). In short, PD Huber, as well as the Visiting Research Scientist, have *extensive expertise within the starch chemistry field, as well established ongoing relationships with regional potato processors* (see CVs in Appendices 4-6), needed to conduct this project.

Institutional Support: The UI Intellectual Property Office has covered initial costs associated with drafting and filing of U.S. and PTC patents associated with this technology. Further, the UI will provide in-kind support (5% of the PD time, waiver of project F&A costs) to the current project.

Table IV. Simplified Budget Summary

Budget Item	**Dollar Amount**
Personnel Salaries	
Visiting Research Scientist (30% effort)	$9,700
Scientific Aide Senior (50% effort on the project)	$18,500
Personnel Fringe Benefits	
Visiting Research Scientist (30% fringe rate calculated as a percentage of the salary noted above)	$2,900
Scientific Aide Senior (41% fringe rate calculated as a percentage of the salary noted above)	$7,600
Operating Expenses (chemicals, assay kits, expendables, etc.)	$9,200
Travel (Two trips to Caldwell Idaho; $525 per person per trip)	$2,100
TOTAL	**$50,000**

Facilities:

The bi-state School of Food Science, University of Idaho/Washington State University:

The *bi-state School of Food Science* encompasses Food Science faculty at both the University of Idaho (UI) and Washington State University (WSU), and uniquely operates as a single department/school across the two land-grant institutions. These two academic institutions are located only seven miles apart and together offer joint undergraduate and graduate degree programs in Food Science. All research facilities and equipment within the Food Science programs of the two institutions are shared and available for use by researchers within the bi-state School. All facilities required for the project are located within the School of Food Science (University of Idaho, Moscow, ID/Washington State University, Pullman, WA) or allied departments with whom we have collaborative arrangements. These will be used to perform various analyses needed to assess food composition and quality, determine molecular and physical properties, as well as microbiological, sensory, and thermal analyses. The Analytical Science Laboratory at the UI has specialized analytical instruments that will be used to assess vitamins and mineral contents of foods.

Computer Facilities: Both UI and WSU have access to wireless high-speed Internet connections campus-wide. Faculty and lab personnel have personal desktop and laptop computers with printers available for their use.

Office Facilities: The UI/WSU bi-state School of Food Science employs both office support staff and accounting personnel to aid in preparation of grants, budget management and other office needs. The office is equipped with a Ricoh Aficio MP C3500, Super G3 Scanner, Printer, Facsimile, Document Server and copier for use by faculty and staff. These will be crucial for communication with collaborators, both locally and internationally.

Food Sensory Laboratory: The School of Food Science has two well-equipped research kitchens, and Computerized Sensory Testing Facilities are located in both campuses. The kitchens are fully functional with large preparation areas, ovens, stoves, water baths, and refrigerators. The Food Research Center at the Univ. of Idaho is equipped with SIMS 2000 sensory evaluation software (Sensory Computer Systems, Inc.) wirelessly connected to 7 tablet PCs for rapid data collection and analysis. The WSU Sensory Evaluation Facility (located in the Food Science and Human Nutrition Building, Pullman, WA) has a sensory analysis room with 8 pass-through booths, each equipped with a lap top computer (Dell Dimension 2400). Each of the 8 computers is installed with Compusense 5.0 software (Compusense, Inc.) for sensory data collection from panelists and is linked to a mainframe computer for data analysis. The facility also has a sensory training room for training panelists in descriptive analysis or conducting focus groups.

Pilot Plant and Food Tech Center Facilities: This multi-disciplinary project will utilize the expertise and unique complementary research and development facilities in food processing technology at Washington State University and the University of Idaho. The School of Food Science has a 7100 sq. ft. pilot plant facility at Washington State University, equipped with state-of-the-art equipment for physical property determination, size reduction, heat processing, dehydration, high-pressure processing, and food packaging/preservation studies. See website for more information at http://pilotplant.bsyse.wsu.edu. There

is a large process room with quick utility connections for steam, potable water and compressed air. The facility offers rear entry for large equipment access. Adjoining support rooms for storage, food quality measurement, and equipment maintenance/plant administration are present at the facility. The laboratory has an AquaLab Series 3 water activity meter (Decagon Devices, Inc., Pullman, WA, USA) to establish moisture sorption isotherms and facilities for conducting studies involving thermal and moisture abuse conditions that the prototype potato products may be exposed to during storage and distribution.

The Food Technology Center (Caldwell, ID) consists of 6500 sq. ft. of food processing space, which includes a commercial product development and processing kitchen, in addition to a food processing pilot plant. The pilot plant contains scaled equipment used to simulate standard fruit and vegetable processing common to the Northwest region of the U.S., including potatoes. Equipment specific to the processing of potatoes includes a K&K high pressure steam peeler, abrasive peelers and scrubbers, blancher and dip tank, steam cooker, additive blender and dryers (both drum and fluid bed dryers). In addition, the facility contains and has access to dry blending facilities capable of blending granules in batches from 200 to 5000 lbs. The Food Technology Center conducts research in accordance with current Good Laboratory Practices (cGLP) as outlined in the U.S. EPA Federal Insecticide, Fungicide and Rodenticide Act and maintains quality assurance on staff to evaluate and audit in-process and reporting of critical phases for all projects. See website for more information at www.ag.uidaho.edu/ftc.

We have the capability to conduct chemical assessments for food quality using flavor volatile analyses, as well as tests for oxidation and instrumental measurement of color. We can determine the microbial load and composition of foods in our well equipped microbiology labs. The School has pathogen microbiology (Biosafety Level 2 (BL2)) laboratories for study of bacterial food borne pathogens. The microbiology laboratories have various sample preparation equipment (stomacher, centrifuge, autoclave), automatic media dispensers, and autoplater (Autoplate 4000), colony counter, and several incubators covering the range of temperatures from 4 to 37°C. In addition, we have the capability to determine the degree of oxidation and change in macronutrient composition using spectral measurements (Fourier-transform near infrared detection).

We have long time collaborators in both the Department of Mathematics and Department of Statistics upon whom we can call for assistance with data analysis when necessary at no cost.

Analytical Sciences Laboratory (ASL) - Laboratory Services and Capabilities: The University of Idaho Analytical Sciences Laboratory (ASL) is a full-service laboratory offering comprehensive testing services in support of (a) food quality assurance support for consumers, producers, governmental agencies, agricultural groups, and processors, (b) agricultural and environmental monitoring, and (c) enhancement of agricultural production and animal health management.

ASL follows a strict Quality System to maintain the precision and accuracy of the laboratory's analytical data and to ensure that all laboratory operations are in compliance with the applicable Federal Good Laboratory Practice (GLP) regulations (40 CFR Part 160). It is ASL policy that GLP regulations are strictly followed for regulated studies and to the fullest applicable and practical extent for other projects. ASL is

accredited by NAPT-PAP for USDA-NRCS Nutrient Management Plans and by AAVLD for veterinary toxicology testing. ASL conducts extensive third-party proficiency testing for all major analytical programs within the laboratory.

ASL maintains a staff of 10-15 highly trained scientists and analysts with many years of experience in all aspects of analytical chemistry and quality assurance. ASL is located in approximately 10,000 square feet of the Holm Research Center on the University of Idaho Moscow campus. ASL is a secure, limited access facility, with external door access controlled by magnetic card readers. There are separate organic and inorganic laboratories, and wet chemistry and glassware preparation operations are conducted in different areas from instrumental analysis. Sample receiving and storage are in designated secure areas.

ASL operates a secure PC-based LAN under Novell Netware 3.11. There are approximately 20 Windows-based workstations connected via the network with various print devices and scanners available. Sample tracking and reporting are handled by the Sample Master Laboratory Information Management System (LIMS), a Windows–based database software. ASL connects to ITS Networks and Systems to access network and server-based services including: email; Internet access; high-speed data network; wireless networks; wide-area network connecting university sites across Idaho; server-based personal and shared file space; print queues; and wiring and fiber optics for data and voice networks.

Laboratory Equipment – bi-state School of Food Science:

- TA.XT2 Texture Analyzer, with multiple geometries/attachments (Texture Technologies, Stable Micro System Co. Ltd, Surrey, UK)
- Colorimeter, Minolta Chroma Meter CR-400 with data processor DP 400 (Minolta Co., Ltd. Osaka, Japan)
- UV-Vis Spectrophotometer, Model UV 160U (Shimadzu Corp., Japan)
- Viscotek 270 Light Scattering/Differential Viscometer Dual Detector (Viscotek Corp. (Houston, TX)
- Laser Particle Size Analyzer, Accusizer Model 780, PSS·NI COMP (Particle Sizing Systems, Santa Barbara, CA)
- Rapid Viscoanalyzer, Model RVA 4, with Thermoline for Windows version 2.1 (Newport Scientific Pty. Ltd., Warriewood NSW 2102, Australia)
- Nikon light Microscope, Eclipse E600, equipped with hot-stage and high resolution IEEE 1394 Firewire digital CCD camera, and 3.3, Q Imaging software
- Panasonic/Lumix DMC-FZ28 digital camera with copy table with incandescent lighting (Panasonic Consumer Electronics Co., Secaucus, NJ)
- Dynamic Mechanical Analyzer, DMA 800 (TA Instruments, Inc., New Castle, DE) for oscillatory testing of material properties under varying temperatures and time.
- Dynamic Rheometer, AR 2000 (TA Instruments, Inc., New Castle, DE) with peltier plate, with various cone and parallel plate geometries, concentric cylinder, and starch pasting cell with attached refrigerator/heat circulator (Julabo model FS 18-HP/SP/TP (Julabo USA, Inc., Allentown, PA) for lower and higher temperature capabilities.

- Modulated DSCs, Models 2920 and Q200 (TA Instruments, Inc., New Castle, DE)
- Thermogravimetric Analyzer, TGA (TA Instruments, Inc., New Castle, DE)
- Karl Fischer Titrator DL38 (Mettler Toledo, Columbus, OH)
- Waters HPLC system, 1525 (binary pumps) equipped with RI/UV-Vis./Fluorescence Detectors (Waters, Milford, MA)
- Photochem Analyzer, (Antioxidative capacity determinations), with PCL soft software (Analytik Jena AG, Woodlands, TX)
- Ultra Fast GC Analyzer, z-Nose, model 4200 (Electronic Sensor Technology, Newbury Park, CA)
- Labconco-Freeze Dry System/Freezone 4.5 (Labconco Corp., Kansas City, MO)
- Microprocessor forced air convection oven, Model Imperial IV, Ultra Clean 100 (Labline Instruments Inc., Melrose Park, IL)
- Drying and vacuum oven (National Appliance Co., Portland, OR)
- Micro-Centrifuge, Model 59A (Fisher Scientific)
- Sorvall Legend Mach 1.6 Bench-top centrifuge (Kendro Laboratory Products, Langenselbold, Germany)
- Environmental Incubator Shaker, Model G24 (New Brunswick Scientific Co. Inc., Edison, NJ)
- Enviro Scan Bio Freezer, ultra cold (-80°C) (Forma Scientific, Marietta, OH)
- Fraction collector, Frac 920 (Amersham Biosciences Inc., Piscataway, NJ)
- High Pressure Homogenizer, Model 110-S (Microfluidics, Newton, MD) with an H10Z (100μm) interaction chamber, 30,000 psi capabilities.

Other Relevant Laboratory Equipment (Univ. of ID campus):

A complete inventory of advanced instrumentation is available at University of Idaho Analytical Services Laboratory (ASL) (http://www.agls.uidaho.edu/asl/index.htm), Center for Electron Microscopy and Microanalysis (http://www.uro.uidaho.edu/default.aspx?pid=31934), and College of Natural Resources. These include:

- Atomic Emission Spectrophotometer (ICP-AES), Model Optima 3200 RL
- ICP-OES and ICP-MS
- HPLC and LC-MS
- GC-ECD, GC-FID, GC-NPD, and GC-MS
- TOC-TN
- CV-AFS
- CNS Analyzer FIA
- Flow Injection Analyzer
- FAA and UV-VIS Spectrophotometers
- Flame Photometer
- Scanning Electron Microscope (SEM), Zeiss SUPRA 35 VP FESEM
- Transmission Electron Microscope (TEM), JEOL 1200EX II
- Confocal Scanning Laser Microscope, Zeiss LSM 510

- X-Ray Diffractometer (XRD), Model Siemens D5000 (Bruker-AXS, Madison, WI)
- Leistritz Twin Screw Extruder, model ZSE18HP, 18mm co rotating twin screw extruder, with large barrel (length/depth ratio of 40:1) and smaller barrel with a ratio of 20:1 (American Leistritz Extruder Corp. Somerville, NJ)

CURRICULUM VITAE AND PUBLICATION LIST

NAME: Kerry C. Huber

Phone: 208-885-4661 Fax: 208-885-2567 email: huberk@uidaho.edu

EDUCATION

Degree Received	Institution	Date
Ph.D. Food Chemistry (Starch Chemistry	Purdue University	1998
M.S. Food Chemistry (Lipid Chemistry)	Brigham Young University	1994
B.S. Food Science	Brigham Young University	1992

PROFESSIONAL EXPERIENCE

Associate Professor, July 2004 - present, *University of Idaho, Moscow, ID*

Assistant Professor, Nov. 1998 – June 2004, *University of Idaho, Moscow, ID*

Research Assistant, 1995-98, *Purdue University, Lafayette, IN*

Teaching Assistant, 1996, *Purdue University, Lafayette, IN*

Research Assistant, 1992-94, *Brigham Young University, Provo, UT*

Laboratory Instructor, 1993, *Brigham Young University, Provo, UT*

Research & Development Technician, 1989-92, *Tropical Sno, Salt Lake City, UT*

Quality Control Technician, 1988-89, *Ezra Taft Benson Institute, Provo, UT*

PUBLICATIONS (5 most relevant)

Huber, K.C., and BeMiller, J.N. 2010. Modified starch: chemistry and properties. In *Starch Characterization, Properties, and Applications*, (ed.) A. Bertolini. Boca Raton: Taylor and Francis Group, LLC.

Kim, H.S., and **Huber, K.C**. 2010. Impact of A/B-type granule ratio on reactivity, swelling, gelatinization, and pasting properties of modified wheat starch. Part I: hydroxypropylation. Carbohydr. Polym. 80:94-104.

Takhar, P.S., Kulkarni, M.V., and **Huber, K.C.** 2006. Dynamic viscoelastic properties of pasta as a function of temperature and water content. J. Texture Studies 37:696-710.

Bertolini, A.C., Souza, E., Nelson, J.E., and **Huber, K.C**. 2003. Composition and reactivity of A- and B-type starch granules of normal, partial waxy, and waxy wheat. Cereal Chem. 80:544-549.

Higley, J.S., and **Huber, K.C.** 2003. The Rapid Visco Analyzer (RVA) as a tool for differentiating potato cultivars on the basis of flour pasting properties. Amer. J. Potato Res. 80:195-206.

PATENTS/INTELLECTUAL PROPERTY

Huber, K.C., and Yu, Wei Chen. 2010. Potato products with enhanced resistant starch content and moderated glycemic response and methods thereof. U.S. utility patent application No. 12896542.

Huber, K.C., and Yu, W. 2009. Chemically modified potato products, Provisional Patent.
Huber, K.C., and Anantachote, A. 2008. Separation and solation of intact parenchyma cells from raw (uncooked) potato (*Solanum tuberosum*) tissue, Provisional Patent.

CURRENT GRANTS:

A. McDonald, E. Coats, and K.C. Huber. J.R. Simplot, $150,725. Converting potato peel waste to bioproducts, 10/1/10 – 9/30/12.
K.C. Huber and J.S. Kim. Grain Processing Corporation, $24,999. Preparation of starch particles with enhanced load-carrying capacity using non-traditional processes, 9/1/10 – 3/31/11.
K.C. Huber, J.E. Nelson, and K. Hendrix. Heinz North America, $15,000. Prevention of after-cooking darkening (ACD) in processed potato products: Phase II: Citric acid as an alternative to SAPP, 8/2/10-2/7/11.
K.C. Huber. Basic American Foods, $36,000. Potato Research (unrestricted gift), 7/1/10.
K.C. Huber, and J.N. BeMiller. USDA-NRICGP. $494,472. Bridging the gap between starch granule architecture, molecular structure, and reactivity, 9/1/07-8/31/11.

AWARDS/ACHIEVEMENTS

Potato Processing Faculty Research Fellowship Recipient (Basic American Foods), 2010
Faculty Advisor, 1st Place Student Product Development Team, 2009 Danisco Knowledge Award National Competition.
Faculty Advisor, 2nd Place Student Product Development Team, 2007 Danisco Knowledge Award National Competition.
Alumni Association Award for Faculty Excellence, December, 1999, 2007.
American Association of Cereal Chemists Fellowship, 1996-97, 1997-98
Institute of Food Technologists Fellowship, 1997-98
Induction into Phi Tau Sigma Honor Society, 1995
Induction into Phi Kappa Phi Honor Society, 1992
Member of National Championship IFT College Bowl Team, 1992

PROFESSIONAL ACTIVITIES/RECOGNITION

Faculty Senator, University of Idaho, 2008-present.
Paper Competition Judge, IFT Carbohydrate Division, 2008-2009.
Annual Meeting Review Committee, IFT, 2006-2007.
Chair, AACC International Carbohydrate Division, 2005-2006.
Program Chair, AACC Carbohydrate Division, 2004-2005.
Chair, IFT Carbohydrate Division, 2004-2005.
1st Chair Elect, IFT Carbohydrate Division, 2003-2004.
2nd Chair Elect, IFT Carbohydrate Division, 2002-2003.
Chair, IFT Carbohydrate Division Graduate Paper Competition, 2002-2003.
Starch Technical Session Chair, AACC Annual Meeting, 2001.
Judge, IFT Carbohydrate Division Graduate Paper Competition, 2001.
Starch Technical Session Chair, IFT Annual Meeting, 2000, 2001.
Executive Committee, IFT Carbohydrate Division, 1999-present.
Treasurer, Phi Tau Sigma, Hoosier Chapter, 1996-97.
President, Phi Tau Sigma, Hoosier Chapter, 1997-98.

CURRICULUM VITAE

University of Idaho

NAME: Kerry C. Huber **DATE:** 10/07/10

RANK OR TITLE: Associate Professor

DEPARTMENT: Food Science and Toxicology

OFFICE LOCATION AND CAMPUS ZIP: 118 Ag Sci (Campus Zip – 2312)

OFFICE PHONE: (208) 885-4661
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EMAIL: huberk@uidaho.edu

DATE OF FIRST EMPLOYMENT AT UI: November 1998

DATE OF TENURE: March 2004

DATE OF PRESENT RANK OR TITLE: March 2004

EDUCATION BEYOND HIGH SCHOOL:

Degrees:

Ph.D., Purdue University, West Lafayette, IN, 1998. (Food Chemistry: Carbohydrate/Starch emphasis)
M.S., Brigham Young University, Provo, UT, 1994. (Food Chemistry: Lipid emphasis)
B.S., Brigham Young University, Provo, UT, 1992. (Food Science)

EXPERIENCE:

Teaching, Extension and Research Appointments:

Associate Professor, University of Idaho, Moscow, ID, March 2004-present
Assistant Professor, University of Idaho, Moscow, ID, November 1998-February 2004.
Research Assistant, Purdue University, West Lafayette, IN, 1995-1998.
Teaching Assistant, Purdue University, West Lafayette, IN, 1996.
Research Assistant, Brigham Young University, Provo, UT, 1992-1994.
Laboratory Instructor, Brigham Young University, Provo, UT, 1993.

Consulting:

Basic American Foods (Blackfoot, ID), October 2007-present.
-Seminars on relevant topics (starch chemistry, potato processing, browning reactions)
-Meetings with industrial personnel to troubleshoot processing challenges
-Tours of plant facilities/operations
U.S. Potato Board, scheduled to begin in September/October 2010.
-Assessment of product development plans for inclusion of potatoes in frozen meal products

TEACHING ACCOMPLISHMENTS:

Areas of specialization:

Food Chemistry, Starch/Cereal Chemistry, Starch Structure/Function, Starch Chemical Modification, Resistant Starch, Potato Processing/Quality, Wheat Quality, Product Development

Courses taught:

FST 101, (3 credits) Introduction to Food Science. Spring 1999, Spring 2000, Spring 2001.
FST 404 (3 credits), Principles of Food Science. Spring 1999, Fall 1999, Spring 2000, Spring 2001.
FST 398 (3-4 credits), Internship. Fall 2006, Fall 2007, Spring 2008, Fall 2008, Fall 2009, Fall 2010.
FST 489 (3 credits), Food Product Development. Spring 2003, Spring 2004, Spring 2005, Spring 2006, Spring 2007, Spring 2008, Spring 2009, Spring, 2010.
FST 499 (1-4 credits), Directed Study. Fall, 2001, Spring 2002, Spring 2003, Spring 2004, Fall 2004, Spring 2006, Fall 2006, Spring 2007, Fall 2007, Fall 2008, Spring 2010.
BAE 404/504 (3 credits), Biomass and Biorefinery (co-instructor: ≈10% responsibility). Fall 2006.
FS 504/513 (3 credits), Food Carbohydrates. Spring 2010.
FST 504/518 (1-2 credits), Carbohydrate Chemistry: Starch and Hydrocolloids. Spring 2005, Spring 2008.
FST 512 (3 credits), Food Carbohydrates and Lipids (co-instructor: ≈20% responsibility). Fall 2000, Fall 2002.
FS 504/513 (3 credits), Food Carbohydrates. Spring 2010.

Students advised:

Undergraduate students:

Academic: Spring, 2000 (7 students); Fall, 2000 (8 students); Spring, 2001 (10 students); Fall, 2001 (9 students); Spring 2002 (8 students); Fall 2002 (7 students); Spring 2003 (8 students); Spring 2004 (7 students); Fall 2004 (8 students); Spring 2005 (8 students); Fall 2005 (7 students); Spring 2006 (7 students); Fall 2006 (20 students); Spring 2007 (17 students); Fall 2007 (14 students); Spring 2008 (14 students); Fall 2008 (14 students); Spring 2009 (9 students); Fall 2009 (7 students), Spring 2010 (6 students).

Research: 1999-2000 (Charlene Belles); 2000-2001 (Jeremy Higley); 2001-2002 (Jeremy Higley, Joanie Loertscher, Jaime Yanez Farfan); 2002-2003 (Joanie Marshall, Lanor Bailey, Jaime Yanez Farfan, Kristin Pecka); 2003-2004 (Joanie Marshall, Kristin Pecka, Arkkrapen Anantachote, Cindy Hanson, Charithra Rai, Suneet Randhawa); 2004-2005 (Arkkrapen Anantachote, Charithra Rai, Suneet Randhawa, Cindy Hanson); 2005-2006 (Cindy Hanson, Jonathan Hildenbrand); 2006-2007 (Cindy Hanson, Jennifer Cholewinski); 2007-2008 (Cindy Hanson, Jennifer Cholewinski, Nicholas Sadowski); 2008-2009 (Nicholas Sadowski); 2009-2010 (Nicholas Sadowski, Caroline Campbell, Arkkrapol Anantachote).

Miscellaneous

Faculty Advisor to the Food Science Club, 2000-May 2008.

Graduate students advised:

Melissa Leija, M.S. Food Science, projected August 2012 (Major Advisor)
Chao-Feng Hsieh, Ph.D. Food Science, projected August 2011 (Major Advisor)
Jung Sun Hong, Ph.D. Food Science, projected August 2011 (Major Advisor)
Hyun-Wook Choi, M.S. Food Science (WSU), projected August 2011 (Committee Member)
Dan Ramseyer, M.S. Food Science (WSU), projected May 2011 (Committee Member)
Maria Rosales, Ph.D. Food Science (WSU), projected May 2011 (Committee Member)
Noridah Osman, Ph.D. Forest Products, projected December 2010 (Committee Member)
Ron Johnson. Ph.D. Food Science, projected May 2011 (Major Advisor)
Vinoth Thirugnanasambantham, M.S. Food Science, projected December 2010 (Major Advisor)
Katrina Finley, M.S. Food Science, projected December 2010 (Committee Member)
Jeff (Wei Chen) Yu, M.S. Food Science, August 2010 (Major Advisor)
Matt Agle, M.S. Animal Science, December 2009 (Committee Member)
Hyun-Seok Kim, Ph.D. Food Science, May 2009 (Major Advisor)
Brian Huber, M.S. (non-thesis) Food Science, May 2009 (Major Advisor)
Ark Anantachote, M.S. Food Science, December 2009, (Major Advisor)
Nathan Oberg, Ph.D. Plant Science, did not complete (Committee Member).
Sean Finnie, M.S. Food Science, May 2006 (Major Advisor)
Carl Walker, M.S. Crop Science (WSU), December 2006, (Committee Member)
Jeremy Higley, M.S. Food Science, December 2005 (Major Advisor)
Anand Mangalam, M.S. Forest Products, August 2005 (Committee Member)
Manish Vilas Kulkarni, M.S. Food Science, May 2005 (Committee Member)
Bhimalimgeswarappa Geera, Food Science, December 2004 (Major Advisor)
Chad Larsen, M.S., Food Science (BYU), August 2004 (Co-Advisor)
Scott Frewing, M.S. Food Science, May 2004 (Major Advisor)
Nabil Albaloushi, Ph.D. Agricultural Engineering, December 2003 (Committee Member)
Sanjay Shinde, M.S. Food Science, May 2002 (Major Advisor)
Kevin Wright, M.S., Food Science (BYU), August 2001 (Co-Advisor)
Jennifer Epstein, M.S. Food Science, December 2000 (Major Advisor)
Drew Dalgetty, M.S. Food Science (WSU), May 2002 (Committee Member)
Yiqun Huang, Ph.D. Food Science (WSU), December 2001 (Committee Member)
Eric Cox, M.S. Psychology, August 2000 (Committee Member)

Post-doctoral researchers supervised:

Andrea Bertolini, 2001-2002
Hyun-Seok Kim, 2009
Juan Pablo Hernandez-Uribe, 2009-2010
Jong-Yea Kim, 2010-present

Course Materials developed:

Revised and updated existing lecture materials (Powerpoint slides), added new lectures (FST 101/404).
Revised lecture handouts to facilitate student notetaking/participation (FST 101/404).
Incorporated in-class learning activities and demonstrations that promote self-discovery of course concepts (FST 101/404).
Developed five out-of-class learning activities designed to reinforce course concepts, provide hands-on learning, and provide opportunity for independent thought (FST 101/404).
Designed worksheets to accompany some videos used in the course to help students identify important concepts (FST 101/404).
Developed a series of five flyers to promote the course (FST 101/404).
Developed lecture materials and student handouts (FST 512).
Devised course objectives, philosophy, lectures, course materials, and supporting documents (FST 489).
Established written guidelines for student proposals/reports (FST 489).
Successfully solicited industry-sponsored student projects (FST 489).
Acquired course equipment pertinent to student laboratory (FST 489).
Assembled a small resource library (textbooks, trade journals, computer software, internet resources) (FST 489).
Developed outcome-based course assessments (FST 489).
Initiated a course website (FST 489; http://www.agls.uidaho.edu/fst489/index.htm).
Developed streamlined instructional materials to assist student use of SIMS 2000 software (FST 489).
A computerized (database) library of food ingredients has been established for use by students (FST 489).
Co-developed four 75-minute lecture modules using Powerpoint (BAE 404/504).
Developed a course laboratory session assessing biomass structure, composition, and processing (BAE 404/504).
Developed lecture materials and student lecture handouts (FST 504/513/519).
Developed in-class activity in which students evaluated/debated the appropriateness of hydrocolloid use in actual food products (FS 504/513).

Courses developed:

FST 101/404 - Introduction to Food Science/Principles of Food Science: Revision of lecture materials.
FST 512 - Food Lipids and Carbohydrates (≈20% of semester course): Developed course materials.
FST 489 - Food Product Development: Developed course philosophy and materials.
FST 504/518 - Carbohydrate Chemistry: Starch and Hydrocolloids: Developed lecture and course materials.
BAE 404/504 - Biorefinery and Bioproducts: Co-developed four 75 minute lecture modules and one lab session for this team-taught course.
FS 504/513 - Food Carbohydrates: Developed lecture materials (2/3 adapted from FST 504/518; 1/3 new material).

Non-credit classes, workshops, seminars, invited lectures, etc.

J.E. Nelson, and K.C. Huber 2002. Chromatography of food colorants: a short laboratory exercise for High School chemistry students, Idaho Science Teachers Convention, Haley, ID.
FCS 474, Food Research and Development, Spring 2000. Served as a consultant to student groups as they developed their respective food-related projects. Contributions included review of initial project proposals, assistance and suggestions with research approaches, participation in sensory testing, and, attendance at student final project oral reports.
AVS 101, Animal/Veterinary Orientation, Fall 1999 (guest lecture).
FST 512, Food Lipids and Carbohydrates, Fall 1998 (guest lecture).

Honors and Awards:

1st Place ($10,000), 2009 Danisco Knowledge Award Competition. Served as faculty advisor to the student product development team in a national-level contest.
2nd Place ($5,000), 2007 Danisco Knowledge Award Competition. Served as faculty advisor to the student product development team in a national-level contest.
Alumni Award for Faculty Excellence (recognition for excellence in mentoring/advising/teaching), University of Idaho December, 2007.
Outstanding Division Volunteer Award, Institute of Food Technologists, 2005.
Nominated for Excellence in Advising Award, University of Idaho, 2004.
Nominated for Outstanding Advisor Award, College of Agricultural and Life Sciences, University of Idaho, 2004.
Nominated for Outstanding Advisor Award, College of Agricultural and Life Sciences, University of Idaho, 2003.

Nominated for Excellence in Advising Award, University of Idaho, 2003.
Nominated for Outstanding Advisor Award, College of Agriculture, University of Idaho, 2001.
Alumni Award for Faculty Excellence (recognition for excellence in mentoring/advising/teaching), University of Idaho December, 1999.
American Association of Cereal Chemists Fellowship, 1996-1997, 1997-1998.
Institute of Food Technologists Fellowship, 1997-1998.
Institute of Food Technologists Fellowship Alternate, 1996-1997.
Induction into Phi Tau Sigma Honor Society, 1995.
Induction into Phi Kappa Phi Honor Society, 1992.
Member of National Championship IFT College Bowl Team, 1992.

SCHOLARSHIP ACCOMPLISHMENTS:

Publications, Exhibitions, Performances, Recitals:

Refereed/Adjudicated/Peer-reviewed

Journal Articles:

Kim, H.S., and Huber, K.C. 2010. Physicochemical properties and amylopectin fine structures of A- and B-type granules of waxy and normal wheat starch. J. Cereal Sci. 51:256264.

Kim, H.S., and Huber, K.C. 2010. Impact of A/B-type granule ratio on reactivity, swelling, gelatinization, and pasting properties of modified wheat starch. Part I: Hydroxypropylation. Carbohydrate Polym. 80:94-104.

Kim, H.S., and Huber, K.C. 2008. Channels within soft wheat starch A- and B-type granules. J. Cereal Sci. 48:159-172.

Kim, H.S., and Huber, K.C. 2007. A simple purification (desalting) procedure to facilitate structural analysis of alkali-solubilized/neutralized starch solution by intermediate-pressure size-exclusion chromatography. J. Agric. Food Chem. 55:4944-4948.

Hristov, A.N., Zaman, S., Vanderpol, M., Szasz, P., Huber, K.C., and Greer, D. 2007. Effect of a saponin based surfactant and ageing time on ruminal degradability of flaked corn grain dry matter and starch. J. Animal Sci. 85:1459-1466.

Kim, H.S, Higley, J.S. and Huber, K.C. 2006. Alkaline dissolution of starch facilitated by microwave heating for analysis by size-exclusion chromatography (SEC). J. Agric. Food Chem. 54:9664-9669.

Geera, B.L., Nelson, J.E, Souza, E., and Huber, K.C. 2006. Granule bound starch synthase I (GBBSI) gene effects related to soft wheat flour/starch characteristics and properties. Cereal Chem. 83:544-550.

Geera, B.L., Nelson, J.E, Souza, E., and Huber, K.C. 2006. Composition and properties of A- and B-type starch granules of wild-type, partial waxy, and waxy soft wheat. Cereal Chem. 83:551-557.

Geera, B.L., Nelson, J.E, Souza, E., and Huber, K.C. 2006. Starch factors influencing growing environment-induced fluctuation of flour pasting behavior in wild-type and partial waxy soft wheat. 83:558-564.

Foley, A.E., Hristov A.N., Melgar A., Ropp, J.K., Etter R.P., Zaman S., Hunt, C.W., and Huber, K.C. 2006. Effect of barley and its amylopectin content on ruminal fermentation and nitrogen utilization in lactating dairy cows. J. Dairy. Sci. 89:4321:4335.

Takhar, P.S., Kulkarni, M.V., and Huber, K.C. 2006. Dynamic viscoelastic properties of pasta as a function of temperature and water content. J. Texture Studies 37:696-710.

Fannon, J.E., Gray, J.A., Gunawan, N., Huber, K.C., and BeMiller, J.N. 2004. Heterogeneity of starch granules and the effect of granule channelization on starch modification. Cellulose 11:247-254.

Fannon, J.E., Gray, J.A., Gunawan, N., Huber, K.C., and BeMiller, J.N. 2003. The channels of starch granules. Biotechnology 12 :700-704.

Bertolini, A.C., Souza, E., Nelson, J.E., and Huber, K.C. 2003. Composition and reactivity of A- and B-type starch granules of normal, partial waxy, and waxy wheat. Cereal Chem. 80 :544-549.

Higley, J.S., Nelson, J.E., Love, S, Price, W.R, and Huber, K.C. 2003. The Rapid Viscoanalyzer as a tool for differentiating potato cultivars on the basis of flour pasting properties. J. Amer. Potato Res. 80:195-206.

Shinde, S., Nelson, J.E., and Huber, K.C. 2003. Soft wheat starch pasting behavior in relation to A- and B-type granule content and composition. Cereal Chem. 80:91-98.

Brinkerhof, B.E., Huber, K.C., Huber, C.S., and Pike, O.A. 2002. Effect of antioxidants on cholesterol oxidation in spray-dried egg yolk during extended ambient temperature storage. J. Food Sci. 67:2857-2859.

Wright, K.H., Huber, K.C., Fairbanks, D.J., and Huber, C.S. 2002. Isolation and characterization of *Atriplex hortensis* and sweet *Chenopodium quinoa* starches. Cereal Chem. 79:715-719.

Epstein, J., Morris, C.F., and Huber, K.C. 2002. Instrumental texture of white salted noodles prepared from recombinant inbred lines of wheat differing in the three granule bound starch synthase (*Waxy*) genes. J. Cereal Sci 35:51-63.

Huber, K.C., and BeMiller, J.N. 2001. Location of sites of reaction within starch granules. Cereal Chem. 78:173-180.

Huber, K.C., and BeMiller, J.N. 2000. Channels of maize and sorghum starch granules. Carbohydr. Polymers 41:269-276.

Huber, K.C., and BeMiller, J.N. 1997. Visualization of channels and cavities of corn and sorghum starch granules. Cereal Chem. 74:537-541.

Huber, K.C., Pike O.A., and Huber C.S. 1995. Antioxidant inhibition of cholesterol oxidation in a spray-dried food system during accelerated storage. J. Food Sci. 60:909-912, 916.

Books/Book Chapters:

BeMiller, J.N., and Huber, K.C. 2010. BeMiller, J.N., and Huber, K.C. 2010. Starch, In *Ulmann's Encyclopedia of Industrial Chemistry*, B. Elvers (ed.), Wiley-VCH, Weinheim **(submitted)**.

Huber, K.C., and BeMiller, J.N. 2010. Modified starch. In *Starch Characterization, Properties, and Applications*, (ed.) A. Bertolini. Boca Raton: Taylor and Francis Group, LLC.

Embuscado, M., and Huber, K.C. (Ed.) 2009. *Edible Films and Coatings for Food Applications*, Springer Science, New York.

BeMiller, J.N., and Huber, K.C. 2007. Carbohydrates. In *Fennema's Food Chemistry*, (ed.) S. Damodaran, K.L. Parkin, O.R. Fennema, 83-154. Boca Raton: Taylor and Francis Group, LLC.

Huber, K.C., and McDonald, A, and BeMiller, J.N. 2006. Carbohydrate Chemistry, In *Handbook of Food Science, Technology, and Engineering*, Y. Hui, (Ed.), CRC Press, New York.

Han, J.H, Gray, J.A., Huber, K.C., and BeMiller, J.N. 2006. Derivatization of starch granules as influenced by the presence of channels and reaction conditions, In Advances in Bioploymers: Molecules, Clusters, Networks, and Interactions, M. Fishman (Ed.), ACS Symposium Series (935), Oxford University Press, Washington D.C.

Published Meeting Abstracts:

Hong, J., and Huber, K.C. 2010 (Abstract). Reaction kinetics of amylose and amylopectin branch chains in a model derivatization system (Abstract). Cereal Foods World Supplement 55(4):A8.

Kim, H.S., and Huber, K.C. 2010 Abstract). Influence of A/B-type granule ratio on cross-linked wheat starch properties. Cereal Foods World Supplement 55(4):A54.

Kim, H.S., and Huber, K.C. 2009 (Abstract). Impact of A- and B-type granule ratio on swelling, gelatinization, and pasting properties of hydroxypropylated wheat starch. Cereal Foods World Supplement 54(4):A50.

Anantachote, A., Kim, H.S., and Huber K.C. 2009 (Abstract). Separation and isolation of intact parenchyma cells from raw (uncooked) potato (*Solanum tubersosum*) tissue. Cereal Foods World Supplement 54(4):A33.

Thirugnanasambantham, V., Kim, H.S., and Huber K.C. 2009 (Abstract). Relating wheat starch A- and B-type granule reactivity to molecular reaction patterns on derivatized starch chains. Cereal Foods World Supplement 54(4):A69.

Kim, H.S., and Huber, K.C. 2008 (Abstract). Granular reaction patterns within chemically modified wheat starch A-type granules (Meeting Abstract). Cereal Foods World Supplement 53(4):A65.

Huber, K.C., and Higley, J.S. 2008. Molecular reaction patterns on intact amylopectin branch chains Abstracts of Papers of the American Chemical Society, 236:213AGFD.

BeMiller, J.N., Fannon, J.E., Huber, K.C., Gunawan, N., and Gray, J.A. 2003. Channels of starch granules (Meeting Abstract). Abstracts of Papers of the American Chemical Society 236:U268.

Publications, Exhibitions, Performances, Recitals (currently scheduled or in preparation):
Refereed/Adjudicated/Peer-reviewed:

Hong, J.S., and Huber, K.C. 2010. Reaction kinetics of amylose and amylopectin branch chains in a model derivatization system. Carbohydr. Polym. (in preparation).

Kim, H.S., and Huber, K.C. 2010. Granular reaction patterns of wheat starch A- and B-type granules in substitution and cross-linking reactions. Macromolecules (in preparation).

Kim, H.S., and Huber, K.C. 2010. Cross-linking of A- and B-type granules of waxy and normal soft wheat starch: reactivity, swelling, gelatinization, and pasting properties. Carbohydr. Polym. (in prepraration).

Huber, K.C., and Anantachote, A. 2011. Separation and Isolation of Intact Parenchyma Cells from Raw (uncooked) Potato (*Solanum tuberosum*). J. Food Sci. (in preparation).

Yu, W.C., and Huber, K.C. 2011. A multifunctional potato ingredient with enhanced resistant starch content and a moderated glycemic response. Food Chem. (in preparation).

Hernandez-Uribe, J.P., and Huber, K.C. 2011. Enhancement of resistant and slowly digestible starch contents within potato tissue via physical modificiation. J. Agric. Food Chem. (in preparation).

Nelson, J.E., and Huber, K.C. 2011. Influence of refrigerated storage on tissue characteristics of a mashed potato product. Amer. J. Potato Res. (in preparation).

Nelson, J.E., Frewing, S.F., Higley, J.S., Kim, H.S., Hildenbrand, J., and Huber, K.C. 2011. Characteristics and properties of tef starch. J. Agric. Food Chem. (in preparation).

Huber, K.C., and BeMiller, J.N. 2011. Advances in knowledge of starch granule architecture as related to reactivity and digestibility. Annual Review of Food Science and Technology (in preparation).

Presented Papers:
Peer-reviewed/Evaluated

Thirugnanasambantham, V., Kim, H.S., and Huber K.C. 2009. Relating wheat starch A- and B-type granule reactivity to molecular reaction patterns on derivatized starch chains, presented at the AACC International annual meeting, Baltimore, MD.

Kim, H.S., and Huber, K.C. 2009. Impact of A- and B-type granule ratio on swelling, gelatinization, and pasting properties of hydroxypropylated wheat starch, presented at the AACC International annual meeting, Baltimore, MD.

Anantachote, A., Kim, H.S., and Huber K.C. 2009. Separation and isolation of intact parenchyma cells from raw (uncooked) potato (*Solanum tubersosum*) tissue, presented at the AACC International annual meeting, Baltimore, MD.

Kim, H.S., and Huber, K.C. 2008. Granular reaction patterns within chemically modified wheat starch A-type granules, presented at the AACC International annual meeting, Honolulu, HI.

He, B.B., Huber, K.C., Ünlu, G., McDonald, A., Chen, S., Van Wie, B., and Worden, R.M. 2008. Offering a biomass & biorefinery curriculum to undergraduate seniors and graduate students, presented at the NACTA/SERD Conference, Logan, UT.

Kim, H.S., and Huber, K.C. 2007. Reactivity of wheat starch A- and B-type granules, presented at the AACC International annual meeting, San Antonio, TX.

Kim, H.S., and Huber, K.C. 2007. Nature of channels within wheat starch A- and B-type granules, presented at the AACC International annual meeting , San Antonio, TX.

Kim, H.S., Higley, J.S., and Huber, K.C. 2006. Alkaline dissolution of starch facilitated by microwave heating for analysis by size-exclusion chromatography (SEC), presented at the AACC International annual meeting , San Francisco, CA.

Higley, J.S., Kim, H.S., and Huber, K.C. 2006. Elucidation of starch granule surface composition and structure using site-directed derivation coupled with gel permeation chromatography, presented at the AACC International annual meeting , San Francisco, CA.

Kim, H.S., Higley, J.S., and Huber, K.C. 2005. Cavities and channels within normal and waxy soft wheat starch granules, presented at the AACC International annual meeting , Orlando, FL.

Geera, B.L., Souza, E., and Huber, K.C. 2004. Composition and properties of A- and B-type starch granules of normal, partial waxy, and waxy wheat, presented at the American Association of Cereal Chemists annual meeting, San Diego, CA.

Higley, J.S., Love, S.L., Price, W.J., Nelson, J.E., Stimpson, J., Spencer, M., Dye, L.D., and Huber, K.C. 2004. Relationships among flour RVA pasting attributes and baked and fried potato texture, presented at the 2004 Institute of Food Technologists annual meeting, Las Vegas, NV.

Brown, B., Gibson, and Huber, K.C. 2004. Irrigated winter and spring wheat response to P, presented at the ASA-CSSA-SSSA annual meeting, Seattle, WA.

Brown, B., Gibson, and Huber, K.C. 2004. Irrigated winter and spring wheat response to P in calcareous high lime soil (pp. 25-29), presented at the 2nd Biannual Idaho Nutrient Management Conference held at Twin Falls, ID.

Brown, B., Gibson, R., and Huber, K.C. 2004. Irrigated winter and spring wheat response to P in calcareous high lime soil. Proceedings, American Association for the Advancement of Science-Pacific Division, presented at the annual meeting, Logan, UT.

Geera, B.L., Souza, E., and Huber, K.C. 2003. Influence of cultivar and environment on wheat flour pasting properties, presented at the American Association of Cereal Chemists annual meeting, Portland, OR.

Frewing, S.F., Morris, C.F., and Huber, K.C. 2003.Variation of wheat flour A-and B-type starch granule content across crop Year and growing location, presented at the American Association of Cereal Chemists annual meeting, Portland, OR.

Larsen, C.L., Huber, K.C., and Pike, O.A. 2003. Phosphorus content determination of Chenopodium quinoa (sweet variety) and Atrpilex hortensis starch using P-31 nuclear magnetic resonance spectroscopy, presented at the American Association of Cereal Chemists annual meeting, Portland, OR.

Higley, J.S., Love, S.L., Price, W.J., Nelson, J.E., and Huber, K.C. 2003. The Rapid Visco Analyzer (RVA) as a Tool for Differentiating Potato Cultivars on the Basis of Flour Pasting Profiles II, presented at the Potato Association of America Annual Meeting, Spokane, WA.

Nelson, J.E, and Huber, K.C. 2003. Influence of variable processing parameters on the freeze-thaw stability of a mashed potato product, presented at the Potato Association of America annual meeting, Spokane, WA.

Bertolini, A.C., Souza, E., and Huber, K.C. 2002. Composition and reactivity of wheat A- and B-type starch granules, presented at the American Association of Cereal Chemists annual meeting, Montreal, CA.

Kreutzer, H., Nelson, J.E., and Huber, K.C. 2001. Determination of free soluble starch as a means for assessing potato quality, presented at the American Association of Cereal Chemists Annual Meeting, Charlotte, N.C.

Higley, J.S., Nelson, J.E., and Huber, K.C. 2001. The Rapid Viscoanalyzer as a tool for differentiating potato genotypes on the basis of starch pasting properties, presented at the American Association of Cereal Chemists Annual Meeting, Charlotte, N.C.

Shinde, S., Nelson, J.E., and Huber, K.C. 2001. Starch factors governing the quality of soft wheat flour, presented at the American Association of Cereal Chemists Annual Meeting, Charlotte, N.C.

Huber, K.C., and BeMiller, J.N. 2001. Location of sites of reaction within starch granules, presented at the American Association of Cereal Chemists Annual Meeting, Charlotte, N.C.

Wright, K.H., Huber, K.C. Fairbanks, D.J., and Huber, C.S. 2001. Isolation and characterization of *Atriplex hortensis* starch, presented at the American Association of Cereal Chemists Annual Meeting, Charlotte, N.C.

Wright, K.H., Pike, O.A., Huber, K.C., Fairbanks, D.J., and Huber, C.S. 2001. Chemical composition of saponin-free quinoa and atriplex, presented at the Institute of Food Technologists Annual Meeting, New Orleans, LA.

Epstein, J., Huber, K.C., and Morris, C.F. 2000. Relationship of GBSS loci, flour swelling volume, and noodle texture, presented at the American Association of Cereal Chemists Annual Meeting, Kansas City, MO.

Brinkerhoff, B.E., Huber, K.C., Huber, C.S., and Pike, O.A. 1999. Antioxidant inhibition of cholesterol oxidation in spray-dried egg yolk after extended ambient temperature storage, presented at the Institute of Food Technologists Annual Meeting, Chicago, IL.

Huber, K.C., and BeMiller, J.N. 1998. Potential roles of granule channels and cavities in starch chemical modification, presented at the American Association of Cereal Chemists Annual Meeting, Minneapolis, MN.

Huber, K.C., and BeMiller, J.N. 1997. Channels and cavities of corn and sorghum starch granules, presented at the American Association of Cereal Chemists Annual Meeting, San Diego, CA.

Huber, K.C., Pike, O.A., and Huber, C.S. 1995. Antioxidant inhibition of cholesterol oxidation in a spray-dried food system during accelerated storage, presented at the Institute of Food Technologists Annual Meeting, Anaheim, CA.

Invited Presentations/Volunteered* Seminars:

Huber, K.C. and Kim, H.S. 2010. Probing wheat starch granule microstructure and reactivity, presented at the SPIE (Scanning Microscopy) conference in Monterrey, CA.

Huber, K.C. 2010. Mechanisms of browning in food systems, presented at Basic American Foods, Blackfoot, ID.

*Huber, K.C., and Hong, J.S. 2009. Reaction kinetics of amylose and amylopectin branch chains using a model derivatization system, presented at the Starch Round Table international conference, Baltimore, MD.

Huber, K.C., and Kim, H.S. 2009. Potatoes with a side of starch, presented at ConAgra Foods, Inc., Richland, WA.

Huber, K.C., and Higley, J.S. 2008. Molecular reaction patterns on intact starch polymers and amylopectin branch chains, presented at the American Chemical Society (ACS) annual meeting in Philadelphia, PA.

*Huber, K.C. 2007. Model system for direct determination of the relative substitution of amylopectin branch chains by modifying agents, presented at the Starch Round Table international gathering in San Antonio, TX.

Huber, K.C. 2007. Starch chemistry 101 – with a side of potatoes, presented at Basic American Foods, Blackfoot, ID.

Huber, K.C. 2006. Probing starch granule structure via directed derivatization, presented at the Whistler Center for Carbohydrate Research Technical Conference, Purdue University, West Lafayette, IN.

Ross, A.S., Saint-Pierre, C., Huber, K.C., Baik, B.K., and Morris, C.F. 2006. Tri-state wheat research update, Portland, OR.

*Huber, K.C. 2005. Starch granule surface composition and reactivity aided by directed derivatization, presented at the Starch Round Table international gathering in Orlando, FL.

Huber, K.C. 2004. Wheat starch A- and B-type granule composition, pasting, and reactivity, presented as part of the AACC annual meeting symposium (Starch: Size Does Matter), San Diego, CA.

Huber, K.C., and Culbertson, J. 2003. Acrylamide in food: an update, Food Safety Farm to Table Conference, Moscow, ID.

Huber, K.C. 2002. Capabilities and Pursuits in Starch Research at the University of Idaho, presented at the annual meeting of the Institute of Food Technologists Intermountain Section, Sun Valley, ID.

Huber, K.C. 2002. Aspects of Starch Granule Size related to Wheat Quality, presented at the annual meeting of the American Association of Cereal Chemists Pacific Northwest Section, Carson City, NV.

BeMiller, J.N., Fannon, J.E., Huber, K.C., Gunawan, N., and Gray, J.A. 2002. Channels in starch granules, Department of Food and Nutrition, Providence University, Taichung, Taiwan.

BeMiller, J.N., Fannon, J.E., Huber, K.C., Gunawan, N., and Gray, J.A. 2002. The channels of starch granules, Korean Society of Food Science and Technology Annual Meeting, Mooju, Korea.

Huber, K.C. 1999. Glass transition and a_w as indicators of stability in starch systems, presented at Decagon Devices, Inc., Pullman, WA).

Patents/Invention Disclosures:

Huber, K.C., and Yu, Wei Chen. 2010. Potato products with enhanced resistant starch content and moderated glycemic response and methods thereof. U.S. utility patent application No. 12896542.

Huber, K.C., and Yu, W.C. 2009. Chemically modified potato products. University of Idaho Provisional Patent.

Huber, K.C., and Anantachote, 2008. Separation and Isolation of Intact Parenchyma Cells from Raw (uncooked) Potato (*Solanum tuberosum*). University of Idaho Provisional Patent.

Grants and Contracts awarded:

A. McDonald, E. Coats, and K.C. Huber. J.R. Simplot, $150,725. Converting potato peel waste to bioproducts, 10/1/10-9/30/12.

K.C. Huber and J.S. Kim. Grain Processing Corporation, $24,999. Preparation of starch particles with enhanced load-carrying capacity using non-traditional processes, 9/1/10-3/31/11.

K.C. Huber, J.E. Nelson, and K. Hendrix. Heinz North America, $15,000. Prevention of after-cooking darkening (ACD) in processed potato products: Phase II: Citric acid as an alternative to SAPP, 8/2/10-2/7/11.

K.C. Huber. Basic American Foods, $36,000. Potato Research (unrestricted gift), 7/1/10.

K.C. Huber. ConAgra Foods, Inc., $40,321. Analysis of potato tissue and starch characteristics, 2/1/09-12/30/09.

K.C. Huber, J.E. Nelson, and K. Hendrix. Heinz North America, $15,000. Prevention of after-cooking darkening (ACD) in processed potato products, 7/1/09-12/12/09.

K.C. Huber. Potandon Produce. $25,000. Potato Research (unrestricted gift), 1/1/08.

Nindo, C., Huber, K.C., and Min, S.C. SBOE (Idaho Technology Incentive Grant). $23,200. Innovative approaches to teaching physicochemical properties of foods, 7/1/08-6/30/09.

K.C. Huber, and J.N. BeMiller. USDA-NRICGP. $494,472. Bridging the gap between starch granule architecture, molecular structure, and reactivity, 9/1/07-8/31/11.

C. Nindo, K.C. Huber, and S.C. Min. SBOE (Idaho Technology Incentive Grant). $71,000. Innovative approaches to teaching physicochemical properties of foods, 7/1/07-6/30/08.

A.N. Hristov, and K.C. Huber. UI Seed Grant. $8,474. Understanding the mechanisms controlling starch digestion in the rumen, 7/1/07-6/30/08.

B. Brown, R. Gibson, K.C. Huber. USDA-ARS. $16,700. Barley value-added property response to nitrogen management, 10/1/07-9/30/08.

B. Brown, R. Gibson, K.C. Huber. USDA-ARS. $16,700. Barley value-added property response to nitrogen management, 10/1/06-9/30/07.

A. McDonald, K.C. Huber, P. Singh, B. Swanson, E. Aston, S. Froes, B. He. M.J. Murdock Charitable Trust, $235,000. Extrusion capabilities for materials and food research in the inland Northwest, 3/1/05-2/28/06.

K.C. Huber and J.S. Higley. USDA-NRICGP, $24,896. Starch granule structure and reactivity characterization aided using high performance size exclusion chromatography with fluorescence detection, 9/15/05-9/14/06.

P. Singh and K.C. Huber, Michael Foods $5,146. Preliminary investigation of starch retrogradation, cuttability, and moisture distribution in industrial potato samples, 8/1/05-10/30/05.

B.B. He, C.L. Peterson, K.C. Huber, G.U. Yuksel, S. Chen, B.J. Van Wie, R.M. Worden, USDA-NRICGP, $284,009. Curriculum Development: Biorefinery Process Analysis and Design, 12/15/04-12/14/07.

K.C. Huber, J.E. Nelson, and S. Love, Idaho Potato Commission, $10,000. Objective discrimination of potato quality and processability, 7/1/04-6/30/05

K. Kidwell and K.C. Huber, IMPACT (WSU), $29,831. Identifying ideal combinations of physicochemical traits for dual-purpose hard white wheat, 7/1/05-6/30/06.

K.C. Huber and P. Singh, USDA-NRICGP, $12,950, Enhanced rheological characterization of starch-based materials using the starch pasting cell, 1/1/05-12/31/05.

K.C. Huber, and J.E. Nelson, The Teff Company. $1000. Characteristics and Properties of Tef Starch (unrestricted gift), 7/1/04.

K.C. Huber, USDA-NRICGP, $170,000. Characterization of wheat starch A- and B-type granule microstructure and reactivity across normal, partial waxy, and waxy backgrounds, 9/15/03-9/14/06.

K.C. Huber, A. McDonald, and P. Singh. USDA-NRICGP, $25,000. Simultaneous microstructural and calorimetric characterization of food and biomaterials using thermal microscopy, 9/15/03-9/14/04.

K.C. Huber, and J.E. Nelson, Heinz Frozen Foods, $20,000. Influence of refrigerated storage on the tissue characteristics of a mashed potato product, 7/1/03-6/30/04.

K.C. Huber, J.E. Nelson, and S. Love, Idaho Potato Commission, $10,000. Objective discrimination of potato quality and processability, 7/1/03-6/30/04.

A. Hristov, and K.C. Huber, Agrichem, $3,769. Effect of Grain Prep® surfactant on starch composition, characteristics, and availability in vitro within flaked corn material, 7/1/03-6/30/04.

K.C. Huber, A. McDonald, and R. Wandruska, NSF EPSCOR, $15,500. Acquisition of a dual molecular weight detector, 10/1/02-1/15/03.

K.C. Huber, USDA-NRICGP, $25,000. A single particle optical sensor for characterization of starch granule size, 10/1/01-9/30/02.

K.C. Huber, J.E. Nelson, and S. Love, Idaho Potato Commission, $10,000. Objective discrimination of potato quality and processability, 7/1/02-6/30/03.

K.C. Huber, University of Idaho Travel Grant, $900. 9/1/01-12/31/01.

K.C. Huber and J.E. Nelson, Heinz Frozen Foods, $15,000. Influence of variable processing parameters on the quality of a mashed potato product, 7/1/01-6/30/02.

K.C. Huber, and J.E. Nelson, Idaho Wheat Commission, $24,877. Starch factors governing the quality and functionality of soft wheat flour, 7/1/01/-6/30/02.
K.C. Huber, J.E. Nelson, and S. Love, Idaho Potato Commission, $10,000. Objective discrimination of potato quality and processability, 7/1/01-6/30/02.
K.C. Huber, University of Idaho Travel Grant, $900. 9/1/00-12/31/00.
K.C. Huber, USDA-NRICGP, $75,000. Understanding variant soft wheat starch behavior due to genotype and environment. 12/1/00-11/30/03.
K.C. Huber, Idaho Wheat Commission, $25,877. Starch factors governing the quality and functionality of wheat. 7/1/00-6/30/01.
K.C. Huber and S. Love, Idaho Potato Commission, $10,000. Discrimination of potato quality and processability using the the Rapid Viscoanalyzer. 7/1/00-6/30/01.
K.C. Huber, USDA-NRICGP, $25,000. Acquisition of a Rapid Viscoanalyzer for characterization of starch properties. 10/1/99-9/30/00.
K.C. Huber, University of Idaho Research Council, $6,000. Determination of cross-linking efficiency in chemically modified starch. 7/1/99-12/31/00.

Honors and Awards

Potato Processing Faculty Research Fellowship Recipient (Basic American Foods), 2010

SERVICE:

Major Committee Assignments:

Department Search Committees:

School of Food Science Director, School of Food Science, 2008-2009; 2009-2010.
Manuscript Editor, Dept. of Food Science and Toxicology, 2008.
Administrative Assistant II, Dept. of Food Science and Toxicology, 2007.
Food Processing Faculty Member, Dept. of Food Science and Toxicology, 2006-2007.
Teaching/Outreach Faculty Member (Search Chair), Dept. of Food Science and Toxicology, 2006-2007.
Food Engineering Faculty Member, Dept. of Food Science and Toxicology, 2006.
Senior Scientist, USDA Western Wheat Quality Lab (WSU), 2004.
Research Support Scientist, Dept. of Food Science and Toxicology, 2004.
Research Support Scientist, Dept. of Food Science and Toxicology, 2003.
Scientific Aide, Dept. of Food Science and Toxicology, 2003.
Scientific Aide, Dept. of Food Science and Toxicology, 2002.
Scientific Aide, Dept. of Food Science and Toxicology, 2001.
Administrative Assistant, Dept. of Food Science and Toxicology, 2000.
Postdoctoral Researcher, Dept. of Food Science and Toxicology, 2000.
Scientific Aide, Dept. of Food Science and Toxicology, 2000.
Scientific Aide, Dept. of Food Science and Toxicology, 2000.
Cereal Chemist, Dept. of Food Science and Human Nutrition (WSU), 1999-2000.
Department Head, Dept. of Food Science and Toxicology, 1999-2000.
Food Microbiologist, Dept. of Food Science and Toxicology, 1999-2000.
Food Science Extension Specialist, Dept. of Food Science and Toxicology, 1999-2000.
Food Biotechnologist, Dept. of Food Science and Toxicology, 1999.
Secretary, Dept. of Food Science and Toxicology, 1999.
Scientific Aide, Dept. of Food Science and Toxicology, 1998-1999.

Department Service:

Graduate Curriculum Committee Chair, School of Food Science, 2008-present.
Safety Committee Chair, Jan.-Aug. 2005.
Administrator Review Team, 2005.
Mentoring Committee Chair (FST), 2004-2005 (1 faculty), 2007-2008 (2 faculty), 2008-2009 (2 faculty); 2009-2010 (2 faculty).
Curriculum Committee, 2000-present.
Graduate Committee, 1998-present.
3rd Year Review Committee Chair (FS), 2009.
3rd Year Review Committees (FST), 2003, 2005.
Promotion and Tenure Committee Member, Food Science and Toxicology, 2001-2003, 2006.

Student Recruitment Efforts

FFA Food Science Career Development Event, 2007, 2008, 2009
4-H Teen Conference, 2001, 2002: provided one lecture and lab in a department-coordinated effort to promote the Food Science field to visiting High School students.
UI Majors Fair, 2001, 2002, 2003, 2004, 2005, 2006
Vandal Friday, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010
Vandal Transfer Day, 2002

College Service:

Search Committee Member, Animal Nutritionist Faculty Member, Dept. of Animal and Veterinary Science, 2008.
CALS Strategic Plan Committee, 2007-2008.
CALS Outstanding Student Award Selection Committee, 2005-2006.
College Unit Safety Committee, Sept. 2004-Aug. 2005
Search Committee Member, Experiment Station Director, College of Agricultural and Life Sciences, 2003-04.
3rd Year Review Committee (Biol./Agric. Engineering), 2003.
Mentoring Committee (Biol./Agric. Engineering), 2002-2006.
Promotion and Tenure Committee Member, Department of Agricultural Extension, 2007.
Promotion and Tenure Committee Member, Department of Biological and Agricultural Eng., 2006.
Promotion and Tenure Committee Member, College of Agricultural and Life Sciences, 2001; 2006.
Awards Review Criteria Committee, August 2001-January 2002.
Academic Programs Advisory Committee, January 2000-August 2001.
Search Committee Member, Agricultural Engineering Faculty Member, Dept. of Biological and Agricultural Engineering, 2000.
Attended Ricks College Transfer Day with the College of Agriculture, October 1999.

University Service:

Faculty Senator, University of Idaho, August 2008-present.
University Budget and Finance Committee, Sept.-Dec. 2008.
Search Committee Member, Confocal Microscopist (UI Research Office), 2006-2008.
Advisory Committee to the Registrar on Tools for Advising, 2007.
Chair, Safety and Loss-Control Committee, Sept. 2005-Aug. 2006.
Safety and Loss-Control Committee Member, Sept. 2003-Aug. 2006.
University Commencement Committee, 2000-2003.

Professional and Scholarly Organizations

Memberships:

Institute of Food Technologists (IFT)

Paper Competition Judge, Carbohydrate Division, 2008-2009.
Annual Meeting Review Committee, 2006-2007.
Past Chair, Carbohydrate Division, 2005-2006.
Carbohydrate Division Graduate Fellowship Committee Chair, 2005-2006.
Session Chair, Carbohydrate Technical Session, IFT Annual Meeting, New Orleans, July 2005.
Chair, Carbohydrate Division, 2004-2005.
National Bylaws Committee, August 2001-August 2004.
Chair Elect, Carbohydrate Division, 2003-2004.
Technical Program Committee Representative, Carbohydrate Division, 2003-2004.
Symposia Chair, Carbohydrate Division, 2004 annual meeting.
-organized two symposia
1. *Alternative Carbohydrate Sweeteners for Diabetic and Low-Calorie Food Applications*
2. *Starch-Hydrocolloid Interactions in Food Systems*

Paper Competition Chair, Carbohydrate Division, 2003 annual meeting.
2nd Chair Elect, Carbohydrate Division, 2002-2003.
Intermountain Section Membership Chair, 2001-2003.
Interim Paper Competition Chair, Carbohydrate Division, 2001 annual meeting.
Chair, Carbohydrate Technical Session, IFT Annual Mtg, New Orleans, LA, June, 2001.
Session Chair, Carbohydrate Technical Session, IFT Annual Meeting, Dallas, TX, June 2000.

Nominated and elected to Carbohydrate Division Executive Committee, 2000-2001.
Student Representative to IFT Carbohydrate Division, 1995-1996, 1996-1997.

American Association of Cereal Chemists/AACC International
Paper Competition Judge, Carbohydrate Division, 2008-2009.
Past Chair, Carbohydrate Division, 2006-2007
Chair, Carbohydrate Division, 2005-2006.
Program Chair, Carbohydrate Division, 2004-2005.
-organized and moderated symposium entitled, *Looking Beyond Food: Generation of Novel Starch- and Biopolymer-based Materials*
Session Chair, Carbohydrate Technical Session, AACC Annual Meeting, Charlotte, NC, October 2000.

Starch Round Table
Session Chair/Organizer, 2005.

Third International Wheat Quality Conference, Organizing Committee, 2005

Phi Tau Sigma
President, Hoosier Chapter, 1997-1998.
Treasurer, Hoosier Chapter, 1996-1997.

Editorial Services:
Carbohydrate Polymers
Journal of Applied Microbiology
Cereal Chemistry
Food Research International
Journal of Cereal Science
Journal of Food Processing and Preservation
Journal of Agricultural and Food Chemistry
Journal of the Science of Food and Agriculture
Journal of American Potato Research
Italian Journal of Food Science
Lebensmittel, Wischenschaft und Technologie
Starch/Staerke
USDA-NRI ad-hoc proposal reviewer
USDA SBIR ad-hoc proposal reviewer
USDA-ARS (conducted a program review of an ARS Scientist, biopolymer focus)
USDA Cool Season Food Legumes ad-hoc proposal reviewer
National Research Council ad-hoc proposal reviewer
IMPACT Program (Washington State University) ad-hoc proposal reviewer
Institute of Food Technologists 2004 Annual Meeting Technical Program Reviewer (66 abstracts)
Institute of Food Technologists 2002 Annual Meeting Technical Program Reviewer (94 abstracts)
External Examiner, M.S. Thesis, University of Pretoria, 2006.
External Reviewer, Tenure and Promotion Packet (Dept. Food Science, Texas Tech Univ.), 2008

Outreach Service:
Potato Processing
Starch Modification
Miscellaneous starch-related analyses for industrial clients
Food Labeling Assistance
Process/Product Development
Fielding of miscellaneous food-related questions posed by extension educators, industry personnel, commodity commissions, consumers, etc.

Community Service:
Youth Basketball Coach, 2006, 2007, 2008, 2009, 2010.
Youth Ecclesiastical Leader, 2010-present.
Ecclesiastical Organization Leader, 2001-2004.

Ecclesiatical Organization President, 2004-2010
Ecclesiastical Organization Executive Secretary, 1999-2001.
Early Morning Seminary Instructor, 1995-1997.
Boy Scout Coach/Leader, 1992-1994.

PROFESSIONAL DEVELOPMENT:

Teaching:

Faculty Web/Advising Workshop (Fall 1999)
College Teaching Workshop (10 two hour sessions) (March-April 1998 at West Lafayette, IN)

Scholarship:

USDA Project Director Meeting, Chicago, IL, July, 2010.
SPIE (Scanning Microscopy) annual meeting, Monterrey, CA.
USDA Project Director Meeting, Anaheim, CA, June, 2009.
AACC International Annual Meeting, Baltimore, MD, September 2009.
Starch Round Table international meeting, Baltimore, MD, September, 2009.
Idaho Milk Processors Association annual meeting, Sun Valley, ID, August, 2009.
State of the Science: Slow Release Glycemic Carbohydrates and Physiologic Response, Purdue University, West Lafayette, IN, Nov., 2009.
USDA Project Director Meeting, New Orleans, LA, June, 2008.
Institute of Food Technologists Annual Meeting, New Orleans, LA, June/July, 2008.
American Chemical Society Annual Meeting, Philadelphia, PA, August, 2008.
AACC International Annual Meeting, Honolulu, HI, September 2008.
Institute of Food Technologists Annual Meeting (July 2007 at Chicago, IL).
Starch Round Table International Meeting (October 2007 at San Antonio, TX).
AACC International Annual Meeting (October 2007 at San Antonio, TX).
Prepared Foods New Products Conference (October 2007 at Naples, FL).
AACC International Annual Meeting (September 2006 at San Francisco, CA).
Grant Management Conference (July 2005 at Moscow, ID).
USDA Grant Writing Conference (September 2005 at Moscow, ID).
AACC International Annual Meeting (September 2005 at Orlando, FL).
Starch Round Table (September 2005 at Orlando, Fl).
Institute of Food Technologists Annual Meeting (July 2005 at New Orleans, LA).
American Association of Cereal Chemists Annual Meeting (October 2004 at San Diego, CA).
Institute of Food Technologists Annual Meeting (July 2004 at Las Vegas, NV).
American Association of Cereal Chemists Annual Meeting (October 2003 at Portland, OR).
Stars of Institute of Food Technologists Leadership Conference, (August 2003, Chicago, IL).
Institute of Food Technologists Annual Meeting (July 2003 at Chicago, IL).
American Association of Cereal Chemists Annual Meeting (October 2002 at Montreal, Canada).
University of Idaho/BRIN-sponsored grant writing workshop (August 2002 at Moscow, ID)
Institute of Food Technologists Intermountain Section Meeting (March 2002 at Sun Valley, ID).
American Association of Cereal Chemists Pacific Northwest Section Meeting (Jan. 2002 at Carson City, NV).
Pacific Northwest Wheat Quality Council (Jan. 2002 at Carson City, NV).
Western Regional Committee – 81 (Jan. 2002 at Carson City, NV).
Starch Round Table (October, 2001 at Charlotte, North Carolina).
American Association of Cereal Chemists Annual Meeting (October 2001 at Charlotte, North Carolina).
Institute of Food Technologists Annual Meeting (June 2001 at New Orleans, Louisiana).
Institute of Food Technologists Intermountain Section Meeting (March 2001 at Sun Valley, ID).
American Association of Cereal Chemists Annual Meeting (November 2000 at Kansas City, Missouri).
Institute of Food Technologists Annual Meeting (June 2000 at Dallas, TX).
Washington State University/University of Idaho-sponsored grant writing workshop (featuring Dr. Robert Lowman, Associate Vice Provost for Research, University of North Carolina) entitled "Twelve Keys to Successful Grant Writing" and "Building a Winning Team." (April 2000 at Pullman, WA).
Institute of Food Technologists Intermountain Section Meeting (March 2000 at Sun Valley, ID).
Idaho Grain Growers Conference (2000 at Post Falls, ID).
American Association of Cereal Chemists Annual Meeting (November 1999 at Seattle, WA).
Starch Round Table (October, 1999 at Seattle, WA).
University of Idaho Promotion and Tenure Workshop (December 1998 at Moscow, ID).
USDA/CSREES Grant Writing Workshop (November 1998 at Kansas City, MO).

Jong-Yea, Kim

Department of Food Science and Toxicology, University of Idaho **Telephone: 509-715-9499**
P. O. Box 442312, Moscow, Idaho 83844 **Fax:**
E-mail: trs.jykim@gmail.com

CURRENT POSITION:

Visiting Research Scientist, University of Idaho

EDUCATION:

Ph.D. in Graduate School of Biotechnology, March 2004~ February 2009

Korea University, Seoul, Rep. of Korea

Major: Carbohydrate chemistry

Dissertation Title: Preparation and characterization of starch based nano-particles

Advisor: Professor Seung-Taik, Lim

Master of Science, March 2002~ February 2004

Korea University, Seoul, Rep. of Korea

Major: Biotechnology

Thesis Title: Alcoholic hydrolysis and ultrasonication for granular size reduction of waxy rice starch

Advisor: Professor Seung-Taik, Lim

Bachelor of Science, March 1998~ February 2002

Korea University, Seoul, Rep. of Korea

Major: Life sciences and Biotechnology

WORK EXPERIENCE:

Korea University, Mar. 2009-July, 2010

Post-doctoral research associate

Center for Advanced Food Science and Technology, September 2002-December 2006

Assistant Researcher

RESEARCH EXPERIENCE:

Post-doctoral research associate, 2009-2010

1. Preparation of nano-sized dextrin complex by phase preparation of between aqueous dextrin solution and *n*-butanol
2. Preparation of nano-sized water soluble β-carotene particles using complex formation with starch-dextrin

3. Preparation of nano-sized water soluble Co-Q10 particles using complex formation with starch-dextrin

Doctoral Student (Research Assistantship), 2004~2009

1. Fragmentation of waxy rice starch granules by enzymatic hydrolysis
2. Preparation of nano-sized starch particles by complex formation with *n*-butanol
3. Preparation of starch-based nano particles by the complex formation of dextrin and *n*-butanol

Masters Student (Research Assistantship), 2002~2004

1. Alcoholic hydrolysis and ultrasonication for granular size reduction of waxy rice and corn starch
2. Preparation of absorbable dusting powder

PUBLICATIONS

■ **Five Select Publications**

1. Jong-Yea Kim, Seung-Taik Lim (2010) Complex formation between amylomaize dextrin and *n*-butanol by phase separation system. *Carbohydrate Polymers* 82(5):264-269
2. Jong-Yea Kim, Jae-Wook Yoon, Seung-Taik Lim (2009) Formation and isolation of nanocrystal complexes between dextrins and *n*-butanol. *Carbohydrate Polymers* 78(3):626-632
3. Jong-Yea Kim, Seung-Taik Lim (2009) Preparation of nano-sized starch particles by complex formation with *n*-butanol. *Carbohydrate Polymers* 76(1):110-116
4. Eun Young Park, Hyun-Na Kim, Jong-Yea Kim, Seung-Taik Lim (2009) Pasting Properties of Potato Starch and Waxy Maize Starch Mixtures. Starch-Stärke 61(6):352-357
5. Jong-Yea Kim, Seung-Taik Lim (2008) Fragmentation of Waxy Rice Starch Granules by Enzymatic Hydrolysis. *Cereal Chemistry* 85(2):182-187

Patents

1. Jong-Yea Kim, Seung-Taik Lim (2009) Crystal nano starch -alcohols complex, and preparing method of crystal nano starch particles using the same. Korean patent, Unex. Pub. No. 10-2009-0054547
2. Jong-Yea Kim, Seung-Taik Lim (2009) Functional nano starch complexes and their preparation methods. Korean patent, Application No. 10-2009-0062789
3. Jong-Yea Kim, Seung-Taik Lim (2008) Methods for preparing nano-sized starch particle. Korean patent, Publication No. 10-0873015-0000
4. Jong-Yea Kim, Seung-Taik Lim (2009) Functional nano starch complexes and their preparation methods. PCT, Application No. PCT/KR2009/007598

References:

1. Taylor, G., Patterson, P., Guenthner, J. and Widner, L. 2007. Contribution of the Potato Industry to Idaho's Economy. University of Idaho, Department of Agricultural Economics and Rural Sociology, Bulletin CIS 1143.
2. Eborn, B., Patterson, P. and Taylor, G. 2009. The Financial Condition of Idaho Agriculture: 2009 Projections. University of Idaho Extension, Moscow, ID, Annual Financial Condition Report No. 7.
3. Kendall, C.W., Emam, A., Augustin, L.S., Jenkins, D.J. 2004. Resistant starches and health. AOAC International 87:769-774.
4. Sloan, A.E. 2004. The top 10 functional food trends 2004. Food Technol. 58(4):28-51.
5. Lempert, P. 2007. Cashing in on the premise of probiotics. Facts, Figures & and the Future (December, 2007).
6. Sloan, A.E. 2010. The top 10 functional food trends 2010. Food Technol. 64(4):23-41.
7. Jenkins, D.J., Wolever, T.M, and Buckley, G. 1988. Low glycemic index starchy foods in the diabetic diet. American Journal of Clinical Nutrition, 48:248-254.
8. Englyst, H.N., Kingman, S.M., and Cummings, J.H. 1992. Classification and measurement of some nutritionally important starch fractions. Eur. J. Clin. Nutrit. 46:S33-S50.
9. Champ, M.J. 2004. Physiological aspects of resistant starch and in vivo measurements. AOAC International 87:749-755.
10. Wong, J.M., and Jenkins, D.A. 2007. Carbohydrate digestibility and metabolic effects. Journal of Nutrition 137:2539S-2546S.
11. Topping, D. 2007. Cereal complex carbohydrates and their contribution to human health. Journal of Cereal Science 46:220-229.
12. Sharma, A, Yadav, B.S., and Ritika. 2008. Resistant starch: physiological roles and food applications. Food Reviews International 24:193-234.
13. Frost and Sullivan. 2008. U.S. Starch Market. N107-01. www.frostandsullivan.com Oct. 2008.
14. Yu, W.-C. 2010. Development of a Multifunctional Potato Ingredient with Enhanced Resistant Starch Content and a Moderated Glycemic Response. University of Idaho, M.S. thesis.

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FOOD GROUP

October 29, 2010

Idaho Higher Education Research Council
Attn Patty Sanchez
P.O. Box 83720
Boise, Idaho 83720-0037

Dear HERC members:

I support the resistant potato starch research efforts of Dr. Kerry Huber of the University of Idaho's College of Agriculture and Life Sciences. Dr. Huber's research focus on resistant potato starch could provide the Idaho potato industry with significant benefits. The value added potato processing industry has benefitted over the years from basic and applied research efforts from researchers based at the University of Idaho.

Dr. Huber's current and future work on resistant potato starch is of particular importance to the Simplot Company and other Idaho-based potato companies. Potato starch is readily and quickly digestible when cooked thus leading to potato products being viewed as high on the glycemic index. The high glycemic index status of cooked potatoes has been of concern to our industry and thus far there have not been readily available solutions to this issue. Dr. Huber's work could lead to new value added products possessing reduced glycemic index benefits. I believe Dr. Huber's work could provide short term new product opportunities for the potato industry. I also think there are longer term opportunities that will be uncovered over time that could go beyond just solving the glycemic index challenge.

The Simplot Company has agreed to collaborate with Dr. Huber and his team on this project. Simplot will convert prototype resistant starch samples into commercial products using Simplot Food Group's pilot plant line. Commercial products Simplot could produce include mashed potatoes and potato croquettes.

I am very willing to respond to questions or provide additional feedback if desired. My thanks to the Idaho Higher Education Research Council for your consideration of my endorsement of Dr. Huber's research efforts on resistant potato starch.

Sincerely,

Steve Vernon

Vice President of Quality and Innovation
J.R. Simplot Company Food Group
208-454-4663