

Whistler Center Short Course Agenda

Purdue University Stewart Center

October 20-22, 2009

Tuesday, October 20, 2009

8:00 a.m.	-	8:30 a.m.	Registration Stewart Center 214A/B
8:30 a.m.	-	10:00 a.m.	Introduction to structures and properties of polysaccharides, J. BeMiller
10:00 a.m.	-	10:20 a.m.	Break
10:20 a.m.	-	10:55 a.m.	Polysaccharide architecture, R. Chandrasekaran
10:55 a.m.	-	11:25 a.m.	Starch granule structure and properties, J. BeMiller
11:25 a.m.	-	12:10 a.m.	Solution properties of polysaccharides, C. Yang
12:10 p.m.	-	1:30 p.m.	Lunch
1:30 p.m.	-	2:30 p.m.	Chemical modification of polysaccharides, J. BeMiller
2:30 p.m.	-	3:15 p.m.	Enzymatic and physical modification of starch, Y. Yao
3:15 p.m.	-	3:45 p.m.	Break
3:30 p.m.	-	4:30 p.m.	Sweeteners and polyols, Y. Yao
4:30 p.m.	-	5:45 p.m.	Tour of Whistler Center Laboratories (optional)

Wednesday, October 21, 2009

The Advance sessions on Wednesday and Thursday will each be offered twice (i.e. 1A and 1B are the same session) so that you may pick four sessions to attend during the two days.

(Drinks and refreshments will be available in STEW 214A. You may take them back to the classroom with you.)

Advanced Sessions – Please choose to attend one morning session and one afternoon session

Morning Session: 8:30 a.m. – 11:30 a.m.	STEW 214B Session 1A – Advances in starch modification J. BeMiller	STEW 202 Session 2A – Beverage emulsions, including nanoparticulates G. Narsimhan	STEW 214C Session 3A – Polysaccharide architecture and functionality including starch R. Chandrasekaran	STEW 214D Session 4A – Dietary fiber structure, form and incorporation into foods M. Kale, B. Patel, B. Hamaker
11:30 a.m. – 1:00 p.m.	Lunch			
Afternoon Session: 1:00 p.m. – 4:00 p.m.	STEW 214D Session 5A – Genetic modification of plant carbohydrates Y. Yao, C. Weil	STEW 202 Session 6A – Complex carbohydrate structure analysis (non-starch) B. Reuhs	STEW 214C Session 7A – Glycemic carbohydrate digestion and physiologic consequences A. Lin, B. Hamaker	STEW 214B Session 8A - Design of dietary fibers/prebiotics for colon function A. Kaur, P. Rumpagaporn, B. Hamaker

Thursday, October 22, 2009

The Advance sessions on Wednesday and Thursday will each be offered twice (i.e. 1A and 1B are the same session) so that you may pick four sessions to attend during the two days.

(Drinks and refreshments will be available in STEW 214A. You may take them back to the classroom with you.)

Advanced Sessions – Please choose to attend one morning session and one afternoon session

Morning Session: 8:30 a.m. – 11:30 a.m.	STEW 214B Session 1B – Advances in starch modification J. BeMiller	STEW 202 Session 2B – Beverage emulsions, including nanoparticulates G. Narsimhan	STEW 214C Session 3B – Polysaccharide architecture and functionality including starch R. Chandrasekaran	STEW 214D Session 4B – Dietary fiber structure, form and incorporation into foods M. Kale, B. Patel, B. Hamaker
11:30 a.m. – 1:00 p.m.	Lunch			
Afternoon Session: 1:00 p.m. – 4:00 p.m.	STEW 214D Session 5B – Genetic modification of plant carbohydrates Y. Yao, C. Weil	STEW 202 Session 6B – Complex carbohydrate structure analysis (non-starch) B. Reuhs	STEW 214C Session 7B – Glycemic carbohydrate digestion and physiologic consequences A. Lin, B. Hamaker	STEW 214B Session 8B - Design of dietary fibers/prebiotics for colon function A. Kaur, P. Rumpagaporn, B. Hamaker

(1A/B) Advances in Starch Modification, J. BeMiller:

1. Factors affecting starch derivatization (influences of channels, influences of reaction conditions)
2. Location of reaction sites within granules
3. Differences in substitution on amylose and amylopectin molecules
4. Thermal treatments (annealing, heat-moisture treatments, dry heating)
5. Preparation of resistant and slowly digesting starches
6. Reactive extrusion
7. New reactions

(2A/B) Beverage emulsions, including nanoparticulates, G. Narsimhan:

1. Beverage emulsions formulation
2. Formation of beverage emulsions
 - homogenization
3. Different Mechanisms of emulsion destabilization
 - Creaming
 - Brownian flocculation
 - Disproportionation
 - Coalescence
4. Interparticle forces
 - van der Waals interaction
 - Electrical double layer
 - Steric interaction

- Depletion forces due to free macromolecules
- 5. Colloid stability
 - Stability ratio
 - Critical flocculation concentration
- 6. Destabilization due to shear and temperature
- 7. Particle characterization
 - Particle size measurements
 - light scattering, Coulter Counter, microscopy
 - Particle electrophoresis
 - zeta potential

(3A/B) Polysaccharide architecture and functionality including starch, R. Chandrasekaran:

1. Morphology of polysaccharides
 - Charge-based classification
 - Chitosan
 - Pectins
 - Alginates
 - Gellan family
 - Carrageenans
 - Xanthan
 - Synergy between polysaccharides
2. Starch
 - Granule architecture
 - Crystalline, semi-crystalline and amorphous regions
 - Estimation of crystallinity
 - A, B and C types
 - Effect of crystallinity on functional properties

(4A/B) Dietary fiber structure, form and incorporation into foods, M. Kale, B. Patel, B. Hamaker:

1. Increasing dietary fiber content in diets
2. Dietary fiber types and structures
3. Modification of fibers to improve functionality
 - Physical
 - Enzymatic
 - Chemical
4. Effect of fiber incorporation on rheological properties

(5A/B) Genetic modification of plant carbohydrates, Y. Yao, C. Weil:

1. Molecular Weight, Chain Length Distribution, and Starch Fine Structure (Y. Yao)
 - Fine Structure and Chain Length Distribution
 - Molecular Weight
 - High-performance size exclusion chromatography (HPSEC)
 - Fluorophore-assisted carbohydrate electrophoresis (FACE)

- High-performance anion exchange chromatography (HPAEC)
 - Multi-angle laser light scattering (MALLS)
2. Why use genetics to modify starches? (C. Weil)
 3. Going from altered starch to the genes that cause the change--forward genetics
 - Association Mapping
 4. Looking through randomly made mutations for those in starch-related genes--reverse genetics
 5. Rational Design of Starch: Biosynthesis and Genetic Modifications of Starch (Y. Yao)
 - An introduction from maize kernel to amylopectin clusters
 - Functional behaviors of enzymes synthesizing starch
 - Mutant starches of maize, single mutants
 - Mutant starches of maize, multiple mutants
 - Mutant starches of maize, patents associated with foods
 - Genetic starch modifications, challenges
 - Genetic starch modifications, our approaches

(6A/B) Complex carbohydrate structure analysis (non-starch), B. Reuhs:

1. Origins of non-starch polysaccharides:
 - Plant cell walls
 - Bacterial culture
2. Initial extractions
3. Crude and fine separation
4. Structural analysis
 - PAGE and MS
 - GC and GC-MS
 - NMR

(7A/B) Glycemic carbohydrate digestion and physiologic consequences, A. Lin, B. Hamaker:

1. Concept of glucose delivery and its effect on physiologic health
 - Pros and cons
2. Types and structures of glycemic carbohydrates
3. Control of glycemic carbohydrate digestion rate
 - α -Amylase level
 - Mucosal enzyme level
4. Potential physiologic and health-related consequences

(8A/B) Design of dietary fibers/prebiotics for colon function, A. Kaur, P. Rumpagaporn, B. Hamaker:

1. Desirable functions of prebiotic and non-prebiotic fibers in the colon
2. Dietary fiber and prebiotic types and structures
3. Background on colonic microbiota and examples of microbiota shifts following fermentation with dietary fibers/prebiotics
4. Conceptualized design of dietary fibers/prebiotics for improved colon function

