

PROGRAM LEADER

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- ❖ **VISION:** Be a key resource in cereal chemistry research and education.
- ❖ **MISSION:** Provide excellence in research and education in cereal chemistry.
- ❖ **GOAL:** Develop nutritious and innovative cereal grain foods and food ingredients and provide relevant education and meaningful technical service.
- ❖ **RESEARCH AREAS:**
 - Functional cereal grain foods and bakery science
 - Cereal food innovation, including gluten-free products
 - Cereal protein chemistry, modification, and functional properties
 - Cereal grain protein hydrolysates & bioactive peptides
 - Food nanotechnology

FACILITY GLANCE



RESEARCH PROJECTS

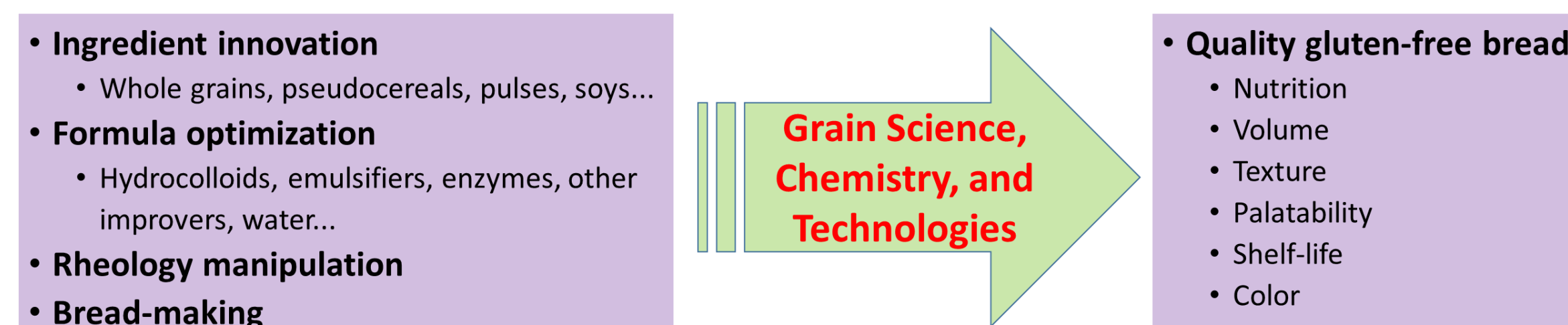
❖ Developing Quality Whole Grain Products:

- **Background:** Whole grain is excellent source of many essential nutrients with health benefits, but only 10—12% population consumes Dietary Guidelines recommended amount of whole grains.
- **Problems:** Barriers to whole grain consumption include product availability, palatability, appearance, cost, shelf life, convenience, etc.
- **Objectives:** This project is addressing some challenges of whole grain wheat products, particularly focusing on enhancing whole wheat flour storage-stability, improving dough rheological properties and bread texture, understanding interactions among the components and their correlations with dough and bread properties, developing whole wheat frozen doughs, and improving the antioxidant potential of whole wheat bread.



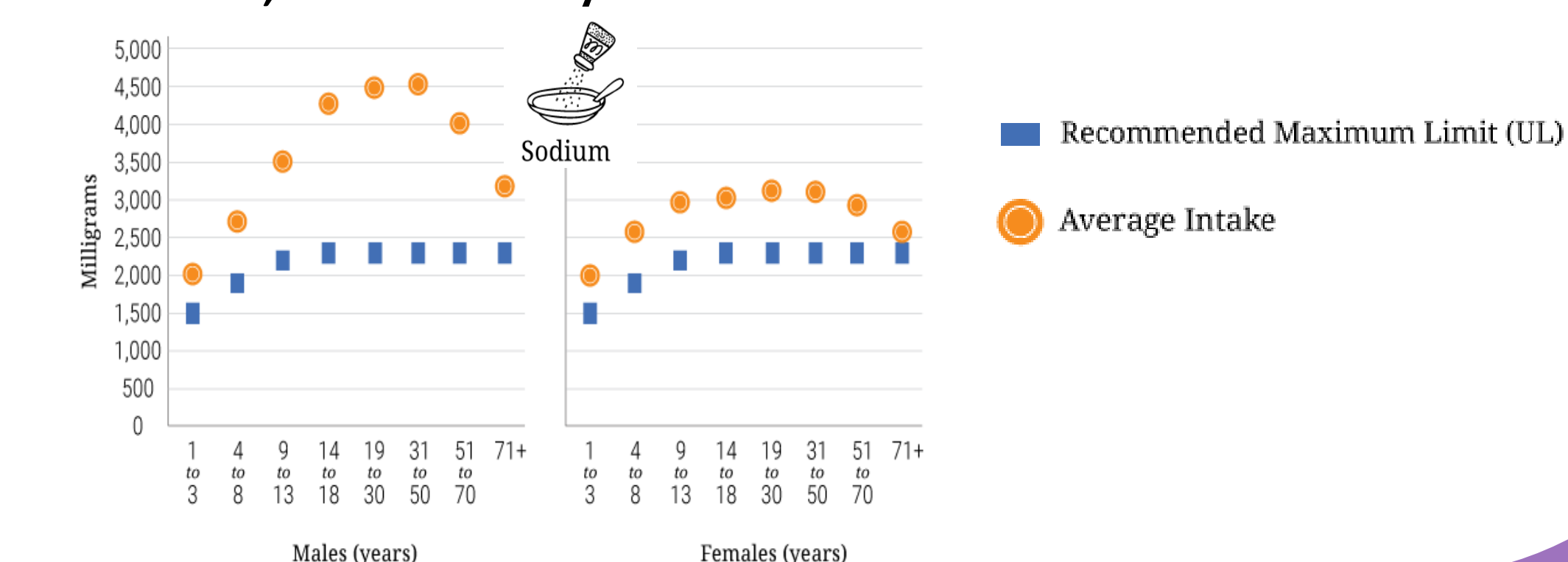
❖ Developing Quality Gluten-Free Breads (GFBs):

- **Background:** The gluten-free market has been steadily expanding and growing for years, driven by the needs of celiac patients, gluten allergenic individuals, and people who choose to avoid gluten in their diets. Bakery products account for 55% of the market volume, particularly with a high demand of gluten-free bread.
- **Problems:** Current GFBs, mostly based on flours and starches from rice, corn, potato, and/or tapioca, often have low nutritional value, poor texture, and short shelf-life. Palatable, nutritious, and stable GFBs are needed.
- **Objectives:** This project is developing essential science and technology for the production of quality GFBs from whole grains, pseudocereals, pulses, and soy products.



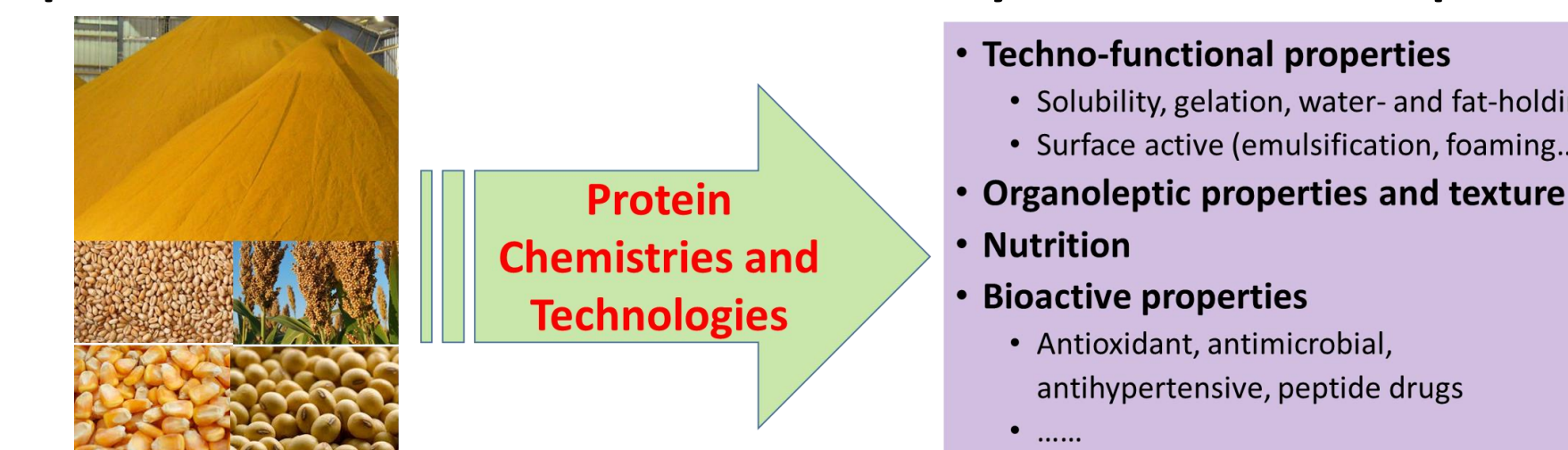
❖ Salt Functions and Reductions in Wheat Products:

- **Background:** Sodium is an essential nutrient, but excessive intake increases blood pressure and risk of cardiovascular disease. Bread and other cereal products contribute 35% of daily sodium salt intake. There is an urgent need to reduce the salt in breads.
- **Problems:** Considerable lack of fundamental knowledge regarding salt's technological functions in dough and bread limits the development of appropriate salt alternatives and salt reduction in bakery products.
- **Objectives:** This project will precisely define the chemical and physical interactions mediated by salt in doughs and breads and develop better approaches to mimic salt functions and improve cereal food quality, nutrition, and safety.



❖ Functional Cereal Grain Protein Hydrolysates:

- **Background:** Plant proteins have advantages over animal proteins in terms of availability, less production cost and low environmental impact. They have been under-utilized because of lacking nutritional, functional, and/or organoleptic properties.
- **Problems:** 1/3 of US corn and sorghum are used in biorefinery, producing 90 billion pounds of distiller's grains (DG) each year. DG proteins possess antioxidative peptide sequences and structural domains.
- **Objectives:** This project is focusing on manipulated enzymatic hydrolysis of DG and other plant proteins to produce antioxidative peptides and identifying peptide composition-structure - activity relationships.



LAB CAPABILITY

- ❖ **CONTRACT RESEARCH:** Cereal science- and chemistry-related research, including cereal grains and individual component processing, fractionation, modification, analysis, cereal food development and testing, and scientific literature compilation, use of our facilities and technical assistance.
- ❖ **TECHNICAL CONSULT:** Provide technical solutions to solve problems related to cereal science and grain products.
- ❖ **SHORT COURSES & TRAINING:** Cereal/grain science & chemistry, baking science, protein chemistry and technology, grain product analysis, etc.
- ❖ **TESTING:** Sample preparation (centrifuge, freeze drier, sonicator, homogenizer, dialysis, ducted fume hood, etc.); Characterization (HPLC, GC-MS, SDS-PAGE, spectrophotometer, microplate reader, FTIR, DSC, protein analysis & characterization, protein functional properties, texture analyzer, etc.); Flour/dough/bakery testing and baking; Other accessible facilities (milling, rheometer, viscometer, TGA, DMA, AFM, SEM, TEM, NMR, etc.)

CCL Team Members (2017.08.26)



❖ From Left to Right: Dr. Gengjun Chen (postdoc, since 01/2017), Kristen Jensen (undergraduate researcher, since 09/2016), Lauren Tebben (MS student, since 08/2017), Dr. Yonghui Li (PI, since 01/2016), Shiwei Xu (MS student, since 08/2016), Ruijia Hu (MS student, since 08/2017), Yanting Shen (research intern, since 06/2017), Wenfei Tian (PhD student, since 08/2017)