Continuing and New Research Projects

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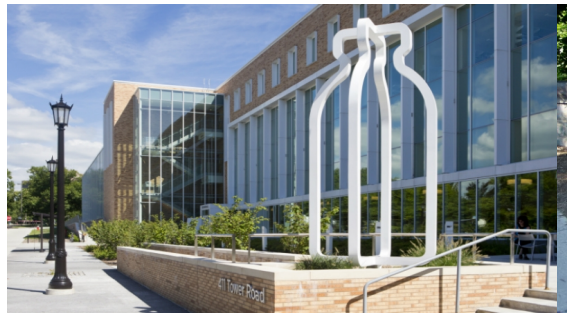
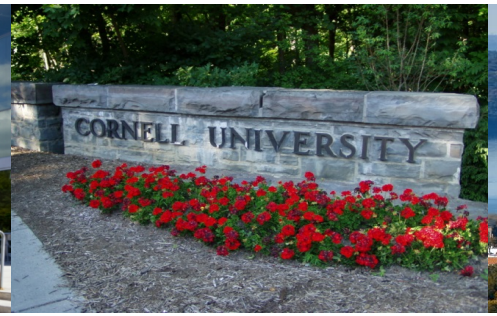
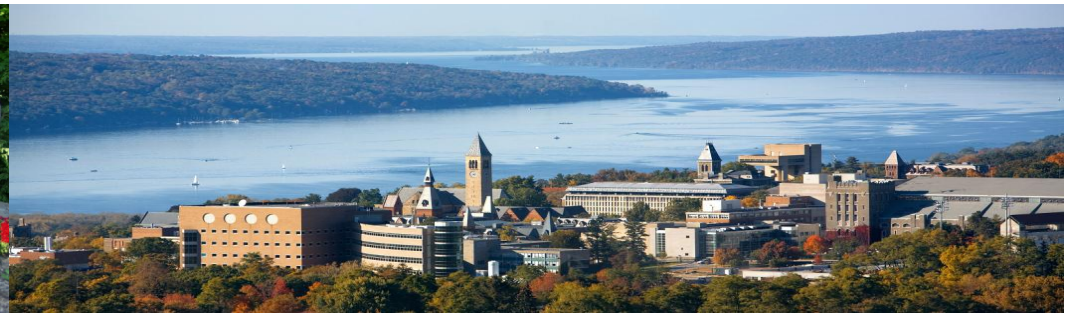
September 8, 2020







Continuing Projects Requested for 2021

Project 1 – Technology Transfer (Dairy Center – Barbano) $52,274

Project 4 – Identification of sources of undesirable flavors in UHT milks (Barbano/Drake) $72,729

Project 1 – Technology Transfer (Dairy Center – Barbano) $52,274 (continuing)

The 2020 activities of this project focus on getting NYS companies to implement results of Northeast Dairy Center research.

1. **Raw Milk Testing:** We are currently working with milk testing laboratories in the Northeast to implement the new milk analysis tools (de novo, mixed origin, performed fatty acids) to improve fat and protein content of milk produced at the farm level to keep our dairy processing facilities competitive. Previously, St Albans Cooperative, Cayuga Marketing, and Agrimark had implemented this testing. In 2020 we worked with DairyOne and Upstate Milk Cooperative. Both have implemented the new testing technology. As the use of the rapid analytical tools for milk fatty acid analysis (de novo, mixed origin, and preformed fatty acids) developed at Cornell become more common, we will start to explore the possibility that raw milk high in de novo milk fatty acid content may be used to produce NYS cheeses with improved aged flavor characteristics.

Project 1 – Technology Transfer (Dairy Center – Barbano) $52,274

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2. Milk Filtration Technology: Microfiltration (MF) and combinations of ultrafiltration (UF) to convert milk to a family of higher value intermediate dairy protein ingredients for use both in dairy and nondairy food applications is being done. Joint research at Cornell and NC State has shown that removal of whey proteins from milk allows micellar casein concentrate (MCC) to be produce beverages with sulfur-eggy off flavors when processed with high heat and produce better tasting shelf stable milk based beverages. We have been making prototype milk based beverages for companies for their review to achieve interest in implementation of this approach.

Project 1 – Technology Transfer (Dairy Center – Barbano) $52,274

The 2020 activities of this project focus on getting NYS companies to implement results of Northeast Dairy Center research.

3. Cheese Analysis Technology: Research at the NEDFRC on the development of new, more accurate, method of cheese analysis using mid infrared technology was develop for process control and published in the Journal of Dairy Science. We are working with a large Cheddar cheese factory in NYS to implement this technology. Once the base technology for composition analysis becomes routine in an aged Cheddar cheese factory, then we want to take the next step in research to determine if we can use the spectral finger print of the cheese to predict which batches of cheese will age well from a flavor development perspective and which batches will not.

Project 1 – Technology Transfer (Dairy Center – Barbano) $52,274

The new 2021 activities of this project focus on getting NYS companies to continue to implement results of Northeast Dairy Center research.

1. Achieve technology transfer of microfiltration (MF) and ultrafiltration (UF) for fluid milk and milk based beverages. The key advantages is removal of whey proteins from milk eliminates cooked sulfur flavors particularly in UP and UHT beverages. There is a lot of interest in complete lactose removal from milk by filtration and we are working with NYS companies to achieve this with UF.
2. We are working actively with cheese factories in NYS and the Northeast to implement these new technologies. We hope to have the first NYS Cheddar cheese factory using this in 2020 and we would like to expand the application to Mozzarella cheese process control in 2021.
3. In 2020 or in the first half of 2021 (due to COVID19 delays), the following funded projects will be completed: (Abbaspourrad) Nutritious Spreads and Fillings using Milk Ingredient, (Moraru) Vacuum Microwave treatments, (Alcaine) Improving UHT milk shelf-life, (Barbano) Rapid method for milk protein and fat quality. Dave Barbano will help identify and facilitate contacts for the PI's of each of the finishing projects to work with individual companies to achieve implementation of their results/technologies.

Project 4 – Identification of sources of undesirable flavors in UHT milks (Barbano/Drake) $72,729 (2021 – request for funding of year 2 of 2)

Year 1 – Project was initiated in January 2020. This is a project jointly funded by NYS MPB, DMI, and Danone. This project was impacted by the COVID shutdown. Originally, a pallet of aseptic milk was going to be produced in Dallas (Barbano and graduate student on site), then shipped Danone's R&D lab in Colorado to do aseptic transfer into sterile prismas of the different packaging material (Barbano and graduate student on site), and then a portion of the product was to be shipped to Cornell and NC State. COVID travel restrictions have blocked this and we developing a new strategy when limit travel is allowed. Also both at Cornell and NC State graduate students were not allowed back in the labs until June/July. Danone has confirmed it's support for the project but their employees are not allowed to travel until the end of the year and Danone employees are allowed in plants or the R&D center until later in 2020. We are working on different strategies to accomplish the objectives by doing the part of the work that was going to take place in Denver in the clean room facility at Cornell. This project will need a no cost extension.

Objectives:

Determine differences between aseptic and ESL milk and understand the origin of those differences:

1. Determine the impact of differences in packaging (oxygen permeability of ESL and aseptic packaging material are different) on sensory quality and consumer acceptance of 1% milk.
2. Determine the impact of time of storage (aseptic milk is stored longer than ESL) and temperature of storage (ESL is stored at refrigeration temperature and aseptic at room temperature) on sensory quality and consumer acceptance of 1% milk.

New Project Request for 2021

Project 12 - Development of kids milks: school lunch, food service, and retail. (Barbano/Drake) $76,269 (year 1 of 2)

Long Term Goal:
This project is the beginning of building a family of fluid milk products that are more appealing to children and to provide a platform for milk beverage innovation.

The first step that is novel in the current project is to refine the processing and formulation technology to start with a lactose free milk base (*where lactose has been removed, not hydrolyzed*) and then build back the characteristics of milk to achieve higher sensory liking scores by children while controlling fat and carbohydrate content and delivering more protein and calcium.

Once these formulations are developed, then a follow up project will be proposed to convert these beverages to a UHT shelf-stable product that maintains high sensory appeal with children. The goal with shelf stable is to reduce delivery and distribution costs to schools relative to conventional refrigerated milk. This may require adjustment of the ratio of types of proteins (i.e., caseins versus milk derived whey proteins) in milk using filtration technology to eliminate cooked-sulfur off-flavors that are objectionable to children.

New Project Request for 2021

Project 12 - Development of kids milks: school lunch, food service, and retail. (Barbano/Drake) $76,269 (year 1 of 2)

View into the Future: Steps in the strategy of this trajectory of research (1 and 2 are current project. If we successfully accomplish this, then the future vision we want to follow is given in 3 and 4).

1) Remove virtually all of the lactose from milk (our preliminary ultrafiltration work in August 2020 has demonstrated the proof of concept that we can achieve this).

2) Replace the lactose [12 g/ 240 g (eight ounce) serving] with 12 grams or sucrose. This will achieve a higher sweetness intensity than same grams of lactose and should achieve higher liking scores without increasing the calories from carbohydrates in 1% fat chocolate milk. We expect the mouthfeel to not have the viscosity that kids are used to for chocolate milk. This would be an HTST product.

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3) Increase the protein content by ultrafiltration to have 1% fat and 6 to 7% protein (to build mouthfeel, achieve a calcium and protein per serving higher than regular milk, and bring the product to a milk solids-not-fat that would allow it comply with standard of identity for milk and to be labeled lactose-free ultrafiltered milk. This would be an HTST product.

4) Increase the protein content by ultrafiltration by a combination of ultrafiltration and microfiltration. Microfiltration removes milk derived whey proteins from milk. The milk derived whey proteins have been identified in our research as the ones that cause the objectionable cooked sulfur flavors in UHT milks. Our goal is to remove these proteins to build a milk that will taste good to children and meeting nutrition guidelines while being shelf-stable. This will reduce shipping and distribution costs for milk by reducing the number of deliveries and the need to separate refrigerated delivery to schools.

New Project Request for 2021

Project 12 - Development of kids milks: school lunch, food service, and retail. (Barbano/Drake) $76,269 (year 1 of 2)

Funding: We are requesting funding from the NYS Milk Promotion board (about $76K per year for 2 years) for the portion of the project carried out at Cornell.

H. P. Hood (fluid milk processor from the Northeast) has committed to provide $50,000 per year for 2 years to support the portion of this project being conducted at NC State.

DMI will be asked to provide approximately $20,000 to $30,000 provide funding for the half of the project being conducted at NC State.