Dairy Center 2021 Contract Report – Project 4

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Project 4 - Identification of sources of undesirable flavors in aseptic (UHT) milk

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Dairy Center 2021 Contract Report – Project 4 - Background

Protein beverages and consumer desires

- Desirable flavor, texture, appearance, and clean label/simple ingredients are key consumer beverage attributes
  - Understand how processing parameters impact **flavor** of beverages
  - Understand how processing parameters impact **functionality** of beverages
  - Understand how added ingredients affect beverage functionality

- Milk research continuum – fluid milk beverages through high milk protein beverages

REQUIRES A RESEARCH PLATFORM APPROACH

LOOKING BACK

Dairy Protein Beverages

- Effect of dairy protein type (MPC and MCC) on ***beverage flavor and physiochemical properties***
  (Vogel et al. 2021)
- ***Viscosity*** and gel formation of MCC
  (Dunn, Pranata et al. 2021)
- Effect of MCC purity on ***sulfur-eggy flavor*** in protein beverages
  (Whitt, Pranata et al. 2022)

LOOKING FORWARD

Dairy Protein Beverages

- Role of mineral composition, pH, and added minerals on ***heat stability*** and acid gelation of MPC
- ***Dipotassium phosphate*** impact on milk beverage viscosity and color
  (Hoyt and Pranata 2022 et al.)
- The impact of cold UF (vs hot) on ***mineral balance and heat stability*** of MPC
- The role of ***retort vs. DSI UP*** on physical and sensory qualities of protein beverages
  (Liu 2022 et al.)

LOOKING BACK

Milk Beverages

- The influence of UP by *indirect versus direct steam injection* on skim and 2% milk flavor (Lee et al. 2017)
- Flavor chemistry difference among milk processes by *HTST or UP* (Jo et al. 2018)
- Identification of the *source of volatile sulfur* compounds produced in milk during thermal processing (Jo et al. 2019)
- Hunter vs CIE *color measurement* systems for analysis of milk based beverages. (Cheng et al. 2019)
- Effects of milk **fat, casein, and serum protein** concentrations on sensory properties of milk-based beverages (Cheng et al. 2019)

LOOKING FORWARD

Milk Beverages

- Role of *complete lactose removal*, fat and protein on physical and sensory properties of milk beverages (Hernandez 2022 et al.)
- *Milkfat preference* in HTST unflavored and chocolate milk by kids (Keefer 2021 et al.)
- Role of *packaging on HTST* unflavored and chocolate milk *flavor* (Cadwallader 2022 et al.)
- Role of packaging, cooling and storage on the flavor of of aseptic milk (Cadwallader et al.)
- *Reducing sugar in school lunch chocolate milk* (Nakamura, Keefer 2022 et al.)

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Objectives

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.

This portion of the project needs to be done with packaging materials, equipment, processing conditions, and product in a factory that produces both ESL and shelf-stable UHT product from the same milk in the same day. ***COVID-19 has delayed this.***

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2) Determine the impact of time of storage (aseptic milk is stored longer than ESL) and temperature of storage (ESL is cooled immediately and stored at refrigeration temperature, while aseptic only cooled to room temperature) on sensory quality and consumer acceptance of 1% milk.

We have done some controlled studies at the University to allow us to make progress, while we are delayed by COVID for the work with a commercial processor. ***Preliminary results indicate that cooling UHT product immediately to 4°C changes the chemistry of the process of off-flavor development during subsequent storage.***

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A PLATFORM APPROACH

Project 4 forms one of piece of a larger overall long term goal of our research platform on fluid milk and milk based beverages.

Protein standardization (like Fairlife) was a vision of one outcome of this work that was carried out in our lab in the mid-1990's. We had the technology, but consumers, processors, and the market place was not ready at that time. Today, protein standardization by filtration is a reality due to differences in consumer desires and market place change today versus the later 1990's..

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A PLATFORM APPROACH

The next step in the vision is development of an approach to produce a great tasting shelf-stable (refrigerate prior to use) white and various flavored versions (some may be nontraditional) of milk adjusted to both kids market and adult market segments.

To achieve this we need to build the flavor, appearance, mouthfeel, nutrient content, and eliminate label unfriendly ingredients, all delivered in a package and format that serves various market segments, but has an modern image and identity across all segments. This is not achieved in one research project, there are many parts that ultimately need to be merged and transferred into practice in the dairy industry.

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Thank you for your support of this project!

If you have questions, please send them to me by e-mail and I will be prepared to answer them at the March 1, 2022 meeting.

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