Food Science Students Develop Oral Supplements to Address Taste Fatigue and Cost

Burford, B., Alvarez, C., Franks, K., Beck, C., Butts, A., Henington, A., Horne, M., Howard, K., Johnson, K., Koenig, H., Lau, A., Levitt, N., Pennywell, M., Park, M., Sesser, M., Ware, K., Whiteman, E., Yan, C., Camel, S., Fontenot, C.

College of Applied and Natural Sciences
School of Human Ecology
Nutrition and Dietetics Programs

BACKGROUND

Research estimates 30-50% of patients are malnourished at hospital admission and 38% of well-nourished patients experience nutritional decline during their hospitalization. Commercially prepared oral nutritional supplements can decrease medical complications, mortality, and hospital re-admissions. However, due to limited flavors and diverse palates, patients may develop taste fatigue and reduce or eliminate the intake of this nutrition support. Future Registered Dietitian Nutritionists' education aims to develop critical thinking, research, and practice skills. Advanced Food Science students were tasked with designing affordable, oral supplements with expanded flavor profiles by integrating of food science, medical nutrition therapy, food service, and research concepts.

PURPOSE

The purpose of this food science course research project was to: to address the cost and limited flavors available from commercial companies, that contribute to taste fatigue, and reduced intake of those prescribed supplements.

Supplements were formulated to provide specific nutrient profiles analogous to commercial products, which included nutrient and Calorie dense formulas, enhanced micronutrients for wound healing, allergen-free, vegan, moderate carbohydrate, and clear liquid formulations in both sweet and tart flavors.

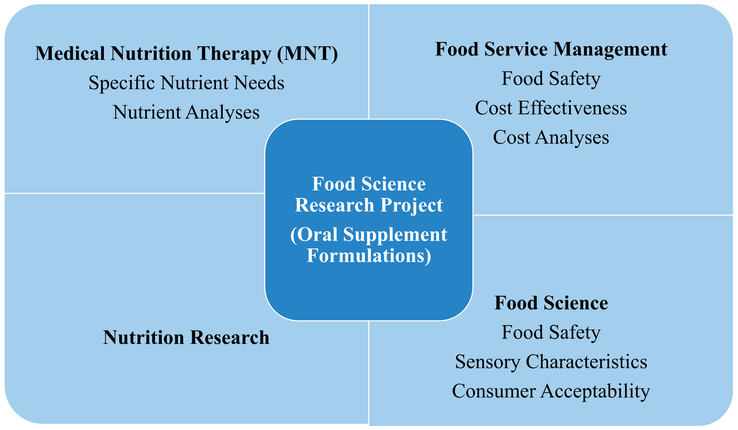
METHOD

The Advanced Food Science students from Winter 2020-21 were presented project guidelines for developing nutrient specific home-prepared oral supplements. Expectations included: recipe standardization, sensory evaluations with external students and faculty over three laboratory periods, data analysis and reformulation of recipes each time. It was expected that each team would explore different flavor combinations excluding vanilla, strawberry and chocolate. Lab field notes and testing scores along with nutrient and cost analysis were analyzed. For the final formulation, faculty assessed ease of preparation.

Additional project guidelines:

- Cost of no more than $1.25 / 8 oz. serving
- Have an ease of preparation score of 4 or less
- Receive an overall acceptability score of 4 or greater from the sensory panel
- Meet 90% or more of the target nutrients compared to analogous commercial supplements; or less than 90% for target nutrients that were restricted
- Utilization of whole foods readily purchased at local grocery stores

Food Science Oral Supplement Undergraduate Research Project Foundational Knowledge Overlap



Oral Supplement Categories
Low lactose
High protein/high Calorie: 1.5 Calories/cc
High protein/low Calorie: 20-30 grams carbohydrate
Low potassium/low sodium
High Calorie/high protein: 2.0 Calories/cc
Clear liquid: 12 grams/8 oz.
Allergen-free (i.e. Nut, Soy, Egg & Lactose Free)
Vegan
Low carbohydrate/moderate fat: 1.5 Calories/cc
High protein with vitamins and minerals to support wound healing

RESULTS

Students created flavor profiles such as sparkling cranberry, fig and honey, lemon ice-box pie, peanut butter and jelly, and very berry cheesecake. Sensory evaluation panels for 17 recipes included an average of 13 panelists. Overall supplement ratings (range: 0-5) improved 30.5%; nutrient and cost targets were met by 40-50%. Ease of preparation (summed number of ingredients and preparation steps) averaged 7.79 (range: 6-11). The most frequent number of preparation steps was six (36.84%). An average of 1.5 specialty ingredients (liquid vitamins/minerals, protein powder) per supplement was included in the final recipe formulations. Faculty noted that 58% of recipes could be altered to further decrease costs

Sensory Scores of Supplement Flavors (N= 19)

Oral Supplement Flavors	Final Mean Score	Oral Supplement Flavors	Final Mean Score
Peanut Butter & Jelly	3.78	Citrus Berry Cheesecake	4.2
Banana S'mores	2.33	Raspberry Creamsicle	3.25
Pumpkin Chocolate Chip	3.23	Apple Honey	3.75
Lemon Ice Box Pie	4.92	Hibiscus Berry Lemonade	2.73
Key Lime Pie	3.0	Berry	3.88
Cranberry Mango	3.25	Peanut Butter Cup	3.86
Coffee	3.00	Fig and Honey	4.0
Apple Cider	4.86	Orange Dreamsicle	4.0
Sparkling Cranberry	4.75	Pink Lemonade	*missing
Very Berry Cheesecake	4.43		

CONCLUSIONS

Students were able to develop novel flavors of oral supplements while following most project guidelines and utilizing food science evaluation strategies. Course content integration was demonstrated by student reflections: "The most valuable aspect of the research project was the opportunity to apply my knowledge to a real-world scenario. It showed me what I am capable of as a dietetics student," and "the creative flavors made us all think outside the box for substitutions and flavor additions" and "It was one of the hardest classes I have taken and I felt extremely challenged to do better all the time."