EFFECT OF PROCESSING AND SUBSEQUENT STORAGE ON NUTRITION

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OBJECTIVE
- To determine the effects of thermal processing, freeze drying, irradiation, and storage on the nutritional content of food
- To evaluate the nutritional content of the food items currently used on the International Space Station and Shuttle
- To establish the need to institute countermeasures

BACKGROUND
- Food products for space feeding systems are processed to commercial quality.
- While heat sterilization is the most effective food preservation process, it affects vitamin and protein quality.
- The dehydration process has the smallest impact on nutrients.
- Micronutrient stability is dependent upon the composite macronutrients matrix.
- A kinetic model only provides an estimate of the remaining processing time.
- It is difficult to extrapolate between systems.
- Food Composition Database does not take into account the effects of processing.

JUSTIFICATION
- Food with a 3-5 year shelf-life will be required for a mission to Mars.
- Nutrient loss during processing and subsequent storage can be significant.
- Nutrition requirements are delivered via the food system.
- The quantity of nutrients, e.g. vitamins, at consumption is currently unknown.
- Nutrients play a vital role in facilitating the capability of astronauts to tolerate physiological changes.
- Nutrient density increases, physiology changes gain importance.

DELIVERABLES
- Conduct a literature review to better understand the potential effects of retorting, freeze drying and irradiation on nutrient loss.
- Determine the effect of processing on representative flight food products by comparing the calculated nutritional content to the actual nutrient content one month after processing.
- Determine the effect of subsequent storage on nutrition by comparing the one month nutrition analysis results with those at 1 year and 3 years.
- Determine the capability of the current food system to provide adequate nutrition for long duration missions.

Exploring COUNTERMEASURES
- Optimization of process, packaging, and storage conditions for nutrient retention
- Exploration of alternative sterilization methods
- Selection of available nutrients by reformulation using ingredients with dense intrinsic nutrients
- Treatments with food additives to provide nutrients, e.g. antioxidants
- Fortification with stable nutrient forms, e.g. encapsulation, chelating, analogs, etc.
- Cultivation of quick growing fruits, vegetables, yeasts to deliver essential nutrients

REFERENCES
- http://www.nal.usda.gov/fnic/foodcomp