The objective of this project is to determine the shelf life and point of various food items by means of actual measurement or mathematical projection. The primary goal of the Advanced Food Technology Project in these long duration exploratory missions is to provide the crew with a palatable, nutritious and safe food system while minimizing volume, mass, and waste. The Mars missions could be as long as 2.5 years with the potential of the food being positioned prior to the crew arrival. Therefore, it is anticipated that foods that are used during the Mars missions will require a 5 year shelf life.

Shelf life criteria are safety, nutrition, and acceptability. Any of these criteria can be the limiting factor in determining the food’s shelf life. Due to the heat stabilization process used for the thermostabilized food items, safety will be preserved as long as the integrity of the package is maintained. Nutrition and acceptability will change over time. Since the food can be the sole source of nutrition to the crew, a significant loss in nutrition may determine when the shelf life endpoint has occurred. Shelf life can be defined when the food item is no longer acceptable. Acceptability can be defined in terms of appearance, flavor, texture, or aroma. Results from shelf life studies of the thermostabilized food items suggest that the shelf life of the foods ranges from 0 months to 8 years, depending on formulation.

RESULTS AND DISCUSSION

**Entrées (Pork Chops, Tuna Noodle Casserole)**
- Meats in general
  - Texture is the most altered quality attribute due to denaturation of the muscle proteins and the migration of free water, cross-linking of proteins and napping protein solubility contributes to the toughness of meat.
  - Fatty tissues and pork, with higher unmaturated lipid content are more susceptible to oxidation

**Grilled Pork Chops**
- Vitamin B6, nicotinic and pantethenic acid showed linear decline as the holding temperature increased.
- Shelf life projected to be 87 months at 72°F

**Tuna Noodle Casserole**
- Product failure was attributed to declining scores for handling of moisture and declining color during the 36 month study.
- Vitamin B6, nicotinic acid and pantethenic acid showed linear decline as the holding temperature increased.
- Shelf life projected to be 48 months at 72°F

**Vegetables (Carrot Coins)**
- Gradual decreases in all related color values for all temperatures over the storage period, yellow in particular.
- Overall acceptability of carrot coins declined gradually over the storage period with the comments as “too mushy”
- Shelf life projected to be 48 months at 72°F

**Eggs (Broccoli Soufflé, Vegetable Omelet)**
- It is difficult to predict a thermostabilized egg product due to sugar-amino reaction produces dark pigments, decreasing the nutritive value of the proteins and resulting in a hardening of the texture.
- Both products were unacceptable shortly after production indicating a shelf life of 0 months.
- Testing was conducted to analytical data to try to better understand where the deterioration happens

**Vegetable omelet**
- Sensory panel did not find the 0 month (baseline) product to be acceptable, due to battery texture and brown color.
- Color continued to darken over time but the texture did not change.
- Vitamin E, B1, B6, pantethenic acid and folic acid demonstrated a clear linear decline with time and temperature.

**Broccoli Soufflé**
- Sensory testing shortly after production yielded an overall acceptance score below the established acceptance level.
- Overall decline of product color over time and a decreased in green color for samples held at 90°F and 72°F

**REFERENCES**


