Exploration missions beyond low Earth orbit greatly limit allowable consumables and require development of innovative low maintenance, reconfigurable, reusable, or self-sufficient food production. Since regularly timed resupply will not be possible for a Mars mission, all the prepackaged shelf-stable food, ingredients, and equipment to provide a complete diet for six crewmembers for more than three years will have to be provided at the beginning of the mission. Advancements are necessary to develop a combination of extended duration shelf-life stored foods augmented with fresh foods.

Safe, nutritious, acceptable, and varied shelf-stable foods with a shelf life of 3 - 5 years will be required to support the crew during future exploration missions to the Moon or Mars. Development of shelf-stable food items that use high-quality ingredients is important to maintaining a healthy diet and the psychosocial well being of the crew. Shelf-life extension may be attained through new food preservation methods and/or packaging. Once on the lunar or planetary surface, it may be possible to use bulk packaging of meals or snack items. These food products will require specialized processing conditions and packaging materials.

Current food packaging technologies represent a potentially significant trash-management problem for exploration-class missions to the Moon or Mars. New food packaging technologies are needed that minimize waste by using high barrier packaging with less mass and volume and/or by using packaging. Another opportunity would be development of a packaging material that can readily be reused by the crew to make objects of value to the space flight mission. All packaging materials must have adequate oxygen and water barrier properties to maintain the foods’ 3 - 5 year shelf life.

Food preparation systems will be required to heat and rehydrate the shelf stable food items and to prepare meals from the processed and resupplied items. Technologies to support on-orbit crew meal storage, preparation, dining activities, and trash dispensing are being sought.

Food quality and safety are essential components in the maintenance of crew health and well-being. Efforts should be focused on control of food spoilage and food quality throughout the entire shelf life of the food. Effects of radiation on the stored food system quality are also needed. Food quality and safety efforts should be focused on identification and control of microbial agents of food spoilage, including the development of countermeasures to...
ameliorate their effects through food processing and food packaging.