

Fiscal Year:	FY 2005	Task Last Updated:	FY 05/10/2005
PI Name:	Perchonok, Michele Ph.D.		
Project Title:	Thermostabilized Food Study (former title--Shelf Life Determination of Thermally Processed Foods)		
Division Name:	Human Research		
Program/Discipline:	ADVANCED HUMAN SUPPORT TECHNOLOGIES		
Program/Discipline--Element/Subdiscipline:	ADVANCED HUMAN SUPPORT TECHNOLOGIES--Advanced life support		
Joint Agency Name:	TechPort:	No	
Human Research Program Elements:	(1) SHFH :Space Human Factors & Habitability (archival in 2017)		
Human Research Program Risks:	(1) Food :Risk of Performance Decrement and Crew Illness Due to an Inadequate Food System		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Organization Name:	NASA Johnson Space Center		
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City:	Houston	State:	TX
Zip Code:	77058	Congressional District:	22
Comments:			
Project Type:	GROUND	Solicitation / Funding Source:	Directed Research
Start Date:	08/01/2001	End Date:	09/30/2005
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	0	No. of Master' Degrees:	0
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
Contact Monitor:	Contact Phone:		
Contact Email:			
Flight Program:			
Flight Assignment:	NOTE: Moved to Space Human Factors Habitability/Advanced Food Technology in 2006--new title is "Thermostabilized Food Study" ; element/risk/gap is a reflection of that program change (jvp 12/2010 info from PI)		
Key Personnel Changes/Previous PI:	0		
COI Name (Institution):			
Grant/Contract No.:			
Performance Goal No.:			
Performance Goal Text:			

	<p>The National Aeronautics and Space Administration (NASA) is working towards future long duration manned space flights beyond low earth orbit. The duration of these missions may be as long as 2.5 years and will likely include a stay on a lunar or planetary surface. For these long duration missions, a shelf life of 3 to 5 years for the prepackaged transit food system is required.</p> <p>Of the preservation methods currently being used at NASA for the Shuttle and International Space Station food systems, the thermostabilized items will have the longest shelf life. Currently four approved International Space Station thermostabilized packaged foods are undergoing accelerated shelf life testing in the Space Food Systems Laboratory (SFSL) at NASA/Johnson Space Center. The foods, bread pudding, carrot coins, tuna noodle casserole, and apricot cobbler, are being stored in controlled temperature chambers at 40oF, 72oF, and 95oF. Analytical tests to measure color, texture, pH, and water activity will be correlated with the sensory tests to determine the changes occurring in the foods. The sensory tests will measure the difference from control (40oF) as well as overall acceptability. Nutritional analysis will be completed three times during the shelf life test.</p> <p>The objective of this research is to continue the shelf life determination of these four thermostabilized food items. Sensory and analytical data will be collected every four months on the four food items that will be stored at 40oF, 72oF, and 95oF for approximately 3 years. The shelf life test will be terminated after 3 years or whenever the product becomes unacceptable, if before 3 years. In addition to determining the shelf life of these foods, a better understanding of the chemical and physical changes that can occur throughout their shelf life will be learned.</p> <p>Also, as part of this year's tasks, a document describing the accelerated shelf life testing protocol for NASA/JSC will be completed. It will combine the practical portions of a sensory protocol written in FY01 (SFSL Sensory Protocol, 2001) and the analytical tests that have been developed in Fiscal Year 2002. The objective of this project was to continue the accelerated shelf life testing of four thermostabilized food items: apricot cobbler, tuna noodle casserole, bread pudding, and carrot coins. Sensory and analytical data were collected every four months on the four food items stored at 40oF, 72oF, and 95oF. To provide an accelerated shelf life test protocol for thermally processed pouches with a potential 3 - 5 year shelf life.</p>
Task Description:	
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Extended shelf life foods will be important for third world countries, camping environments, and survival experiences.
Task Progress:	<p>The three year accelerated shelf life test on bread pudding was completed in FY2004. The other items are two years old. A summary of the results is as follows:</p> <ul style="list-style-type: none"> • Bread Pudding: <ul style="list-style-type: none"> o Color: A sharp decline in lightness values was seen between months 7 through 12 indicating the product became darker over this time period. o Sensory: Sixteen months was the last testing point that the 95oF sample was still acceptable. The 40 degree and 72 degree samples continued to score above the 6.0 standard (out of 9 on a hedonic scale) until the 36-month test conclusion. The decline in overall flavor, level of sweetness, level of vanilla, and overall aftertaste may all be due to Maillard reactions. The Maillard reactions are a series of reactions of free amino groups and reducing sugar resulting in a brown color and toasted flavor. The three most prevalent ingredients; skim milk, sugar and egg, would provide sufficient amounts of free amino groups and reducing sugar to allow for these reactions to occur. It may be hypothesized that these reactions attributed the changes seen in both color and flavor related characteristics. <p>The Q10 is a measure of how the rate changes for every 10oC change in temperature. The Maillard reaction has different Q10 values depending upon the stage of the reaction. The $Q_{10}^{initial} = 2$, while flavor intermediate Q_{10}'s range from 2 to 5, and brown color formation Q_{10}'s range from 3 to 8. Using $Q_{10} = 2$ (worse case scenario), the 72 degree samples would not reach the same level of degradation until approximately 48 months of storage. The refrigerated, 40 degree F (4.4 degree C) samples would not reach the same level of degradation until approximately 166 months of storage.</p> <ul style="list-style-type: none"> • Tuna Noodle Casserole: Only acceptability tests were conducted at 20 months for all temperatures since both 72 degree F and 95 degree F had shown significant differences from control at 16 months. At 20 months, the 95oF samples failed the acceptance sensory test. <p>At two years of accelerated shelf life testing, the samples stored at 40oF and 72oF are still acceptable. The overall acceptability scores were 7.33 and 6.82 out of a 9-point hedonic scale, for 40oF and 72oF, respectively at 24 months.</p> <ul style="list-style-type: none"> • Apricot Cobbler: At 16 months, the difference from control tests showed significant differences at 72 degree F and 95 degree F. When the acceptability tests were run, the 95oF sample failed the sensory test. The 40oF and 72oF samples passed acceptability tests at 20 months and 24 months. The overall acceptability scores were 6.92 and 6.40 out of a 9-point hedonic scale, for 40oF and 72oF, respectively at 24 months. • Carrot Coins: At 16 months, the difference from control tests showed significant differences. However, when the acceptability tests were run, the all three temperature samples passed. At 20 months, the 95oF sample failed the sensory test. The 40oF and 72oF samples passed acceptability tests at 20 months and 24 months. <p>The accelerated shelf life test will continue in FY'05 with the 40oF and 72oF samples.</p>
Bibliography Type:	Description: (Last Updated: 01/30/2012)