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## INTERNATIONAL FOOD PATTERNS FOR SPACE FOOD

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### Introduction

The food pattern of a given group of people originates from the availability of foods in the country where they live (11). Food patterns are interwoven with the culture of the people, and are the response of individuals or groups to social and cultural pressures in selecting, consuming, and using portions of the available food supply (7,8). Food patterns are based on edible materials a culture considers to be food, as well as on the type of food production and service in a country (10).

A country's food patterns are molded by its agricultural resources, technical progress, buying power, and cultural patterns. In trying to understand the food habits of a people, one needs to learn about the country from which they come (9). The quest for space exploration is shared by cosmonauts and astronauts from American, Asian, and European countries (6). Thus, space exploration has not only become international, but also a multicultural affair. It is, therefore, necessary that scientists involved in space research investigate the multicultural backgrounds of cosmonauts and astronauts in order to learn more about food patterns of representative countries. This type of research is important in order to understand the cosmonauts' and astronauts' food habits, so appropriate menus can be developed to better serve the space explorers.

In 1982, Soviet scientist V.P. Bychkov, researched the diet of crews in Salyut-6 Orbital Space Station. He confirmed that conventional and familiar foods such as fresh fruits and vegetables have positive psychological effects as they alleviate the monotony of the processed, unconventional food common on long duration missions (5). Food consumption and psychological wellness are significantly improved by familiarity (4). Familiar foods normally enhance morale (1).

Based on the above studies, it is important to have knowledge of the food patterns of space explorers to ensure psychological well being and enhance morale. Therefore, the intent of this research is to investigate the integration of international food patterns in space nutrition programs. It is

speculated that nutritionally balanced, cross-cultural diets can be provided to meet the needs of space explorers from various cultural and ethnic backgrounds.

### **Statement of the Problem**

The purpose of this research effort is (a) to obtain basic data on ethnic foods by studying dietary patterns and multicultural foods, and (b) to determine nutritional status of multicultural space explorers by evaluating dietary, clinical, biochemical, and socioeconomic factors.

### **Objectives**

1. To study food patterns of selected countries' ethnic groups and cross-cultural aspects of foods' suitability for space explorers.
2. To identify appropriate foods for selected ethnic groups in terms of preparation needs, nutritional benefits, preservation, and packaging requirements.
3. To evaluate and analyze selected food items recommended for space nutrition programs.
4. To integrate selected foods into an international space food system.

### **Justification of the Study**

The study will play a significant role in providing nutritional research for space explorers of different ethnic backgrounds. It will provide scientific background information by bringing together cross-cultural dietary and nutritional information from different ethnic groups. Results of this study will also help the health care personnel including physicians, dietitians, and nutritionists to better understand and assist patients from other cultures during illness. Also, the results will provide data which will help in the development of future food plans for long duration flights involving manned exploration to Mars and lunar base colonies.

### **Methodology**

A literature review will determine ethnic food patterns for international crew members. Foods vary in their nutrient composition. Some have high nutrient density in relation to energy. Even ethnic foods which are familiar may not, by themselves, be nutritionally sufficient; therefore, a nutritional analysis of multicultural foods will also be conducted. The study will be conducted in four tasks (Table 1).

# SCHEMATIC DIAGRAM OF METHODOLOGY

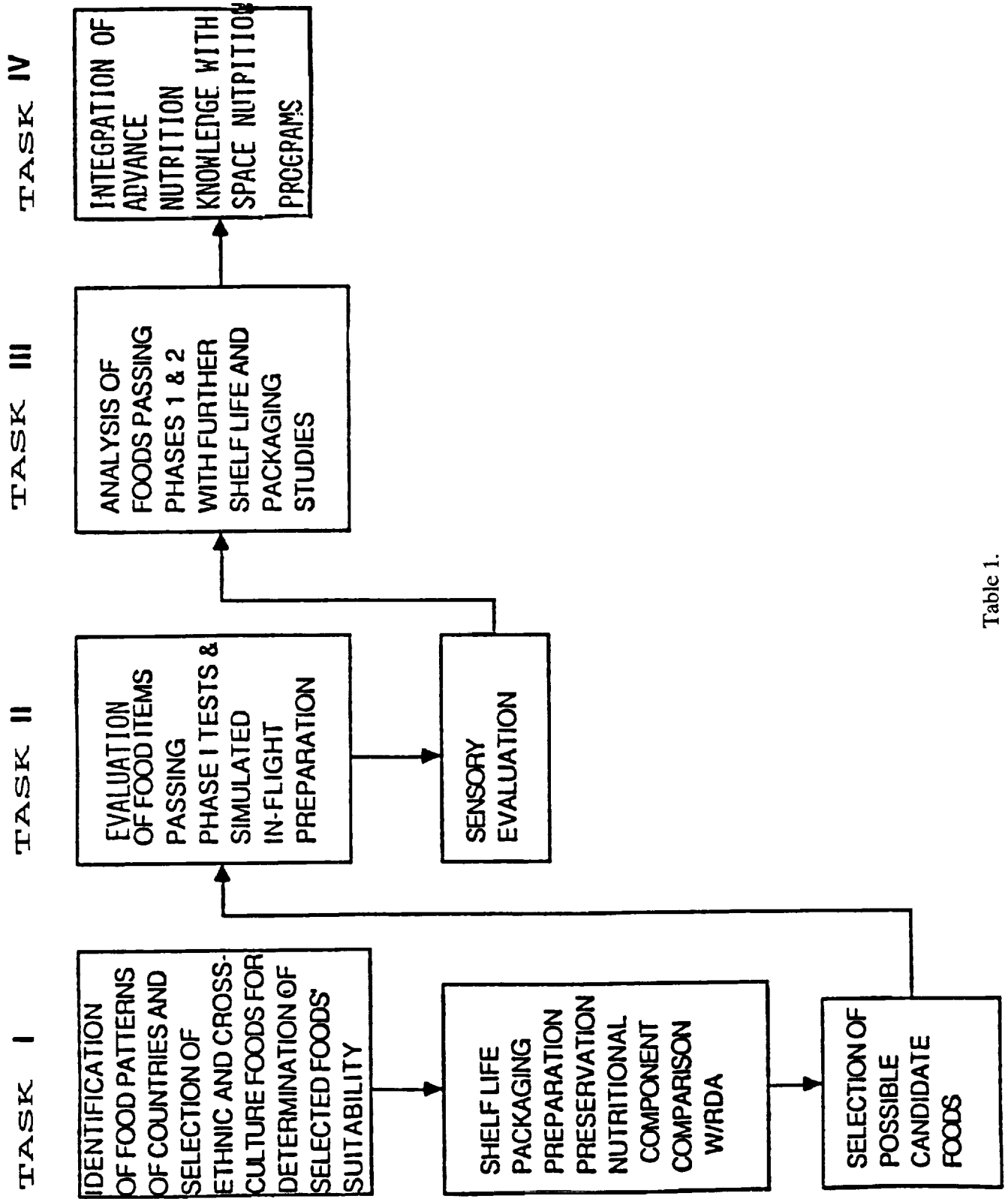


Table 1.

In task one the identification of the countries and determination of their typical dietary practices will be evaluated. Foods which provide cross-cultural satisfaction will be studied. The study will also determine food handling characteristics such as shelf life, packaging, preparation, preservation, and the nutrient content of foods from different ethnic origins.

Task two will include food preparation (in flight) and sensory evaluation by Research Guidance Panels (a mechanism to measure the acceptance of food products by using organoleptic testing).

## **Task I**

Identification of the countries and determination of their typical dietary practices will be one of the parts of task one. Task one will also identify the foods which provide cross-cultural satisfaction and can be recommended for astronauts of different ethnic backgrounds. In order to identify food for the space food and nutrition programs, the following food handling characteristics will be considered.

### **A. Shelf Life Determination**

Shelf life is the study of the keeping quality of food. The process involves keeping food at various desirable temperatures for different lengths of time. The maximum shelf life study will last up to 90 days for the following temperatures:

-20 degrees F frozen

40 degrees F refrigerated

70 degrees F ambient

After each shelf life study, the foods will go through acceptability tests by sensory evaluation. Food will also be tested for chemical and microbiological safety parameters. Nutritional analysis will also be considered.

### **B. Packaging**

Packaging possibilities for the foods will be reviewed for compatibility with the Space Food Service Systems (3).

### **C. Preparation**

Processing requirements for in-flight meal preparation will be used as a criterion in the identification of suitable foods for the space food programs.

## **D. Preservation**

Different techniques to preserve the quality of food and retain nutritional values will be considered. Freezing, freeze drying, pre-cooking, dehydrating, etc., are all preservation methods to be evaluated in developing a menu for space food service systems for astronauts of different ethnic origin.

## **E. Nutritional Analysis**

In order to determine the suitability of food for the space food programs, nutrition analysis is essential. It can help when planning the daily menus for the astronauts. Comparison of each complete menu with recommended dietary allowances is also necessary.

## **Task II**

Preparation of food items passing task one tests will be examined in task two. Task two will consist of the following steps:

### **A. Preparation (In-Flight)**

Food preparation prior to eating, e.g., cutting, peeling, adding water, chilling, and heating are the various methods of in-flight preparation to be reviewed to help select the appropriate food for the space food programs. (2)

### **B. Sensory Evaluation**

Sensory evaluation of the foods will be conducted by technical taste panels.

## **Task III**

The experimental foods which pass the sensory evaluation will be selected for final studies of shelf life and packaging. Foods will be packaged in appropriate containers and placed in controlled storage and evaluated at predetermined intervals.

## **Task IV**

The ultimate goal of this study is to select suitable foods for astronauts from different ethnic backgrounds. The scientific data derived will be integrated to advance knowledge of space nutrition programs for future endeavors.

### **Discussion:**

Based on the Johnson Space Center's selection of astronauts, the researcher selected the countries to be studied. Presently, the countries that have been selected are European countries: Sweden, West Germany, Italy, Poland, and the USSR; and Asian countries: India, Bangladesh, Pakistan, Japan, Philippines, and Thailand. The foods for these countries have also been selected.

In April 1989, ground base studies of the quality characteristics of food patterns will start. Progression of the study as indicated by the schematic diagram of methodology will be completed systematically.

### **Summary**

The purpose of the research effort is to (a) obtain basic data on ethnic foods by studying dietary patterns and multicultural foods, and (b) to determine the nutritional status of multicultural space explorers by evaluating dietary, clinical, biochemical and socioeconomic factors.

The study will be conducted in four tasks which include identification of the countries and determination of their typical dietary practices. The study will also identify the foods which provide cross-cultural satisfaction and can be recommended for astronauts of different ethnic backgrounds. In order to identify foods for the space food and nutrition programs, the following food handling characteristics will be considered: shelf life determination, packaging, preparation, preservation, and nutritional analysis. Menu recommendations from the selected foods will also be developed.

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