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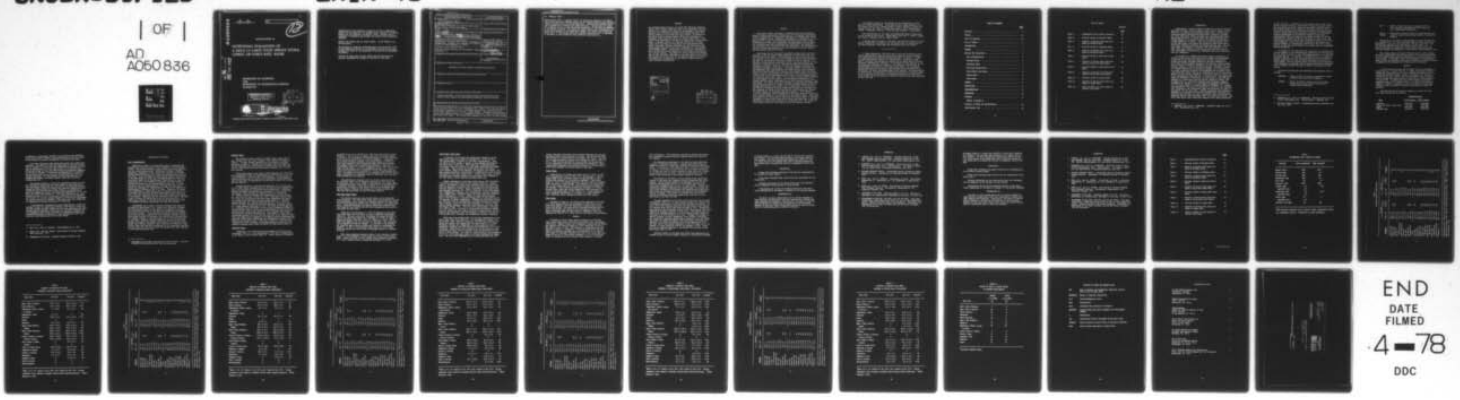

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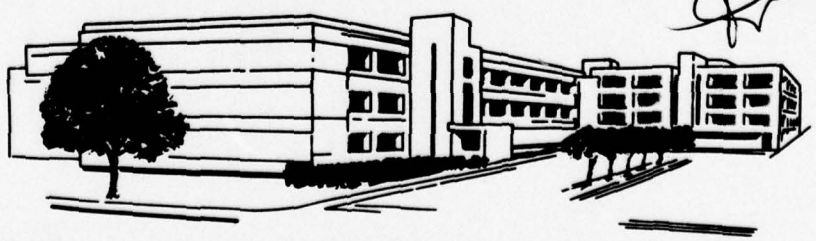
INSTITUTE REPORT 48

NUTRITIONAL EVALUATION OF A BAS/A LA CARTE FOOD SERVICE SYSTEM LORING AIR FORCE BASE, MAINE

DEPARTMENT OF NUTRITION
AND
DEPARTMENT OF INFORMATION SCIENCES

DECEMBER 1977



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The enlisted dining facility at Loring AFB, Maine was surveyed before (22-24 Oct 1974) and after (17-21 Nov 1975) conversion (on 1 January 1975) from the conventional mixed subsistence-in-kind (SIK)/basic allowance for subsistence (BAS) food service system to an all BAS/a la Carte system. Conversion to the BAS/a la Carte system reduced dining hall attendance at breakfast (19%), noon-time (17%), and supper (26%) meals. The item-pricing component of the BAS/a la Carte system

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reduced plate waste. A greater variety of foods were offered at the short-order lunch line under the new system, and the expanded menu greatly increased customer preference for the short-order line. Item-pricing decreased citrus juice consumption at midnight and breakfast meals. Item-pricing per se had only moderate effects on the nutritional composition of the meals as consumed by the average customer. The impact of reduced dining hall attendance on the nutritional adequacy of the total daily intake (both inside and outside the dining hall) of individuals should be carefully evaluated prior to expansion of the BAS/a la Carte system at other military installations.

ABSTRACT

The enlisted dining facility at Loring AFB, Maine was surveyed before (22-24 October 1974) and after (17-21 November 1975) conversion (on 1 January 1975) from the conventional mixed subsistence-in kind (SIK)/basic allowance for subsistence (BAS) food service system to an all BAS/a la Carte system. Conversion to the BAS/a la Carte system reduced dining hall attendance at breakfast (19%), noon-time (17%), and supper (26%) meals. The item-pricing component of the BAS/a la Carte system reduced plate waste. A greater variety of foods were offered at the short-order lunch line under the new system, and the expanded menu greatly increased customer preference for the short-order line. Item-pricing decreased citrus juice consumption at the midnight and breakfast meals. Item-pricing per se had only moderate effects on the nutritional composition of the meals as consumed by the average customer. The impact of reduced dining hall attendance on the nutritional adequacy of the total intake (both inside and outside the dining hall) of individuals should be carefully evaluated prior to expansion of the BAS/a la Carte system at other military installations.

PREFACE

This survey report represents a combined effort by the Bioenergetics Division, Department of Nutrition, and the Systems Applications Division, Department of Information Sciences, of Letterman Army Institute of Research (LAIR), Presidio of San Francisco, California, in conjunction with a team from USAFSAM/VNE, Brooke Air Force Base, Texas. Bioenergetics Division was responsible for food intake and food waste data collection and data interpretation; USAFSAM/VNE was responsible for individual tray photography and film development, and Systems Applications Division was responsible for calculation of nutrient intakes and statistical reduction of data.

While the scope of the survey described in this report is limited compared to that of other surveys conducted by USAMRNL and LAIR, the data are felt to be useful. The limitation of the scope of the study was dictated by the very brief time between the time of notification of the need for the study and the date on which it had to commence. In addition, it was further complicated by the then recent move of the Department of Nutrition from U.S. Army Medical Research and Nutrition Laboratory in Denver, Colorado, to LAIR with resultant shortages in personnel secondary to that move. On or about Friday, 4 October 1974, the Commander, LAIR, was called by LTC Dennis Farley, DCSRDA (Project Officer for the DOD Food RDT&E Program), who inquired about the feasibility of LAIR's participation in a before and after study of the nutritional impact of the implementation of a BAS/a la Carte feeding system at Loring Air Force Base, Maine. The Air Force had neglected to include the requirements for the study of the nutritional evaluation of the feeding system in their submission to the Joint Nutrition Research Planning Board. LTC Farley was most interested in obtaining more data about the nutritional impact of the BAS a la Carte feeding system and had requested that the Air Force invite LAIR to participate in the study by the School of Aerospace Medicine scheduled to begin on 22 October 1974. The personnel in charge of food service for the Strategic Air Command were most helpful in arranging that participation. On 10 October, C. Frank Consolazio, Chief, Bioenergetics Division, Department of Nutrition, went to Loring Air Force Base for a preliminary visit. Based upon his evaluation of what could be done with the limited number of personnel available to obtain useful data in the short time available, a team was dispatched to Loring Air Force Base on 15 October 1974. The results of that initial study and the follow-up study are described herein.

The diligent efforts of all members of the Bioenergetics survey team are deeply appreciated. These members were Joseph Dramise, Ph.D.; 1LT Terrel M. Hill, MSC; Messers Robert D. Fults, Kenneth W. Kiker, and Michael Morris; SP5 David C. Welsh; SP4s Roger H. Gant, Dennis Reilly, Yvonne C. LeTellier, William J. Floering, and Nicholas E. Scordalakes.

The contributions of the team from USAFSAM/VNE added significantly to the success of the survey. These members were CAPT J. Carter Crigler, CAPT Mary A. Saunders, and Mr. Donald Tucker.

A special note of thanks to CAPT Best, Food Service Officer and TSGT Taylor, Dining Hall Supervisor, and the entire staff of Dining Hall #5 for their excellent cooperation and assistance during the survey.

* * * * * * * * *

C. Frank Consolazio, 1913-1976, one of the world's foremost nutritional physiologists, began his scientific career in 1929 as a laboratory technician at the Harvard Fatigue Laboratory in Boston. In 1947, he joined the Federal Service as a physiologist. He served at Army medical nutrition laboratories in Chicago and in Denver where he became the Chief, Bioenergetics Division. He continued in this capacity at the Letterman Army Institute of Research, San Francisco, where he was an active member of the staff at the time of his death. Mr. Consolazio authored more than 200 scientific publications and participated in approximately 100 human nutrition-related field studies. His contributions to science and, in particular, to military nutrition are a lasting memorial to a man who was not only an outstanding scientist, but also a beloved friend, and an inspiration to those who knew him and were privileged to work with him.

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

Traditionally, military feeding systems have provided enlisted personnel food and a place in which to eat it at no direct cost to them, i.e., a system of subsistence-in-kind (SIK). Officers and selected enlisted personnel have been given a monetary allowance for their subsistence (Basic Allowance for Subsistence/BAS) which gives them the option to obtain their food outside the military feeding system or to receive a meal in the military dining hall at a fixed charge for the meal. With only a few limitations, both SIK and BAS diners could select and consume as many food items in relatively unlimited quantities as desired from the menu. In the late 1960s, the feeding of personnel cost the Department of Defense (DOD) approximately $6 billion per year when the costs of food procurement, transportation, equipment, and service personnel were all considered.

In an effort to conserve DOD assets, enhance utilization of military dining halls, and continue to provide a nutritious appetizing diet to the personnel authorized to subsist within DOD dining facilities, selected elements of DOD have undertaken to field test certain proposed changes to the military feeding system. The Air Force is currently evaluating the basic allowance for subsistence (BAS)/a la Carte food service system. The BAS/a la Carte is a system under which all personnel assigned to an installation are given a military allowance for subsistence and provided a military dining hall where food can be purchased on an a-la-carte basis, similar to the civilian cafeteria. This system, BAS/a la Carte, was first implemented at Shaw AFB, SC, in October 1972. The nutritional impact of conversion to the BAS/a la Carte system at Shaw AFB was assessed by a short-term nutrition survey conducted in March 1973, by teams from U.S. Army Natick Research and Development Command (NARADCOM, MA, formerly U. S. Army Natick Development Center) and U.S. Air Force School of Aerospace Medicine (USAFSAM), TX. Because "pre-conversion" data were not available, a dining hall at Bergstrom AFB, operating on the traditional field ration system, was used as the control for the test base. Consumer acceptance data gathered by NARADCOM (1) indicated that Shaw AFB consumers were generally more satisfied with the BAS/a la Carte system than their counterparts at Bergstrom AFB who were subsisting under the traditional system. However, what effect other concurrent changes in the dining facilities

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1. Siebold, J.R., and A.L. Meiselman. Technical Report No. 75-77-FSU. USA Natick Lab., 1974

at Shaw AFB (e.g., increasing the food service staff, major renovation of dining facility, and improved cooking equipment) may have had on consumer attitudes cannot be ascertained from this study. The 24-hour dietary recall technique was used by USAFSAM (2) to estimate the percentage of airmen who consumed the minimum quantities of various food groups projected to satisfy the nutrient allowances recommended by the National Research Council (3). A significantly lower percentage of the airmen at Shaw AFB than at Bergstrom AFB consumed sufficient quantities of milk, fruit, and bread-cereal groups to satisfy the criterion of adequacy for these food categories. Based upon these techniques, the vitamin and mineral intakes of a significant proportion of the BAS/a la Carte patrons at Shaw AFB were estimated to be lower than the recommended dietary allowances.

The results of the Shaw AFB study could not be considered conclusive because of the aforementioned limitations but did encourage the Air Force to request a more comprehensive study to be conducted at Loring AFB, ME. In contrast to the Shaw AFB study, elements of NARADCOM, USAFSAM, and LAIR were requested to survey the existing feeding system prior to and following conversion to the BAS/a la Carte system. Only the minimal amount of dining facility modifications necessary to implement the new feeding system were performed so as to prevent biasing the data in favor of the BAS/a la Carte system.

The action laboratories and responsibilities assigned were as follows:

NARADCOM - Effect of BAS/a la Carte on consumer and worker attitudes and dining hall attendance.

USAFSAM - Effect of BAS/a la Carte on in- and outside-dining hall nutrient intake utilizing the 24-hour recall technique.

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2. Klebanoff, M.O., and J.E. Vanderveen. Nutrition Survey of Food Service Development Test. Interim Report. USAFSAM, 1973

3. National Research Council. Recommended Dietary Allowances (8th rev. ed.), 1974

LAIR - Effect of BAS/a la Carte on average in-dining hall nutrient consumption and plate waste, by use of gravimetric techniques.

LAIR & USAFSAM - Comparison of 24-hour recall and photographic techniques to record the nutrient intakes of individual patrons.

Conversion to the BAS/a la Carte system at Loring AFB was made on 1 January 1975. The "pre" and "post" BAS/a la Carte surveys by NARADCOM were conducted during November 1974 and March 1975. LAIR and USAFSAM conducted their "pre" survey during October 1974. USAFSAM performed an independent "post" survey during March 1975. LAIR and USAFSAM collaborated on a "post" survey during November 1975.

This interim report will be limited in scope to LAIR's responsibility of determining the effects of BAS/a la Carte feeding system on the in-dining hall nutrient consumption of the average patron and food wastage. A subsequent report will encompass the collaborative study of LAIR and USAFSAM on the nutrient intake of individual patrons as assessed by photographic and 24-hour recall techniques.

METHODS

A 3-day nutrition survey (22-24 October 1974) was conducted at Dining Hall No. 5, Loring AFB, ME, to assess the average nutrient intakes and plate waste by Air Force personnel subsisting under the traditional military feeding system. The October 1974 survey is defined as the "pre" survey, as it was conducted prior to conversion of Loring AFB dining facility to the BAS/a la Carte system on 1 January 1975. An identical 5-day "post" survey was conducted during the period 17-21 November 1975. The "post" survey was extended to 5 days to minimize the effects on nutrient intake data created by one or two days of serving a food high in a specific nutrient.

The meals served and hours of operation for both the "pre" and "post" survey were as follows:

	Operating Hours	
Meal	"Pre" Survey	"Post" Survey
Breakfast	0530-0800	0430-0800
Dinner and Short Order Lunch	1030-1300	1030-1300
Supper	1500-1900	1500-1900
Midnight Meal	2300-0100	2300-0200

In addition, a continental breakfast was available from 0800-0900 during both surveys; however, this meal was not included in either survey because of minimal utilization (5-10 patrons per meal).

The survey techniques used during each survey were essentially identical. The amount of each food item taken by the total population of patrons at a given meal was determined by weighing or counting (as appropriate) all food items placed on the serving lines before and during the meal and subtracting the quantities remaining at the end of the meal. Plate waste was determined by separating the left-over items on the trays and transferring each item to a labeled container. The total amount of each item taken but not consumed was weighed, including inedible items such as bones, orange peels, etc.

The average quantity of each food consumed per patron per meal was computed by subtracting the total amount of plate waste from the total amount served and then dividing by the observed headcount. Average nutrient intakes per dining hall meal were computed by utilizing the LAIR Nutrient Factor File, which is a compilation of many food composition tables, including USDA Handbook No. 8 (4), and Bowes and Church Food Values (5). Each food item served was categorized into one of the 17 food group classifications as suggested in TM 8-501 (6), and the average quantity of each food type consumed per patron per meal was computed. Plate waste data were summarized by computing the percent plate waste by food type.

A non-parametric statistical routine (Mann-Whitney U Test) was selected to test for significant effects of the BAS/a la Carte system upon average nutrient intakes and food type consumption per meal. Because data on individual patrons are not currently available due to programming limitations, the number of observations (meals) for statistical purposes is limited to 3 per meal-period in the "pre" study and 5 per meal-period in the "post" study.

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4. Watt, B.K., and A.L. Merrill. USDA Handbook No. 8, 1963

5. Bowes, A.D., and C.F. Church. Food Values of Portions Commonly Used (11th ed.), 1970

6. Department of the Army. Technical Manual, TM 8-501, 1961

RESULTS AND DISCUSSION

Data Interpretation

There are a number of factors which must be recognized and considered in the evaluation of data presented in the following tables. The values are based on group rather than individual dining hall patron observations. Estimates of variance (standard deviation), therefore, do not refelct the variation in nutrient intakes among individuals, but rather the variation among days of the study. Since the number of observations (meals) is quite low (3 per meal-period in 1974, and 5 per meal-period in 1975), the statistical power of the Mann-Whitney U Test applied to test for significant ($P < 0.05$) effects of the BAS/a la Carte system on selected variables is also correspondingly quite low. In fact, the values for all observations in 1974 must have been either greater or less than all observations in 1975 for the means to be statistically different at the 0.05 leval. Therefore, the potential probability of committing a Type II statistical error (i.e., concluding that the BAS/a la Carte system had no effect when, in fact, there were effects) because of the small sample size cannot be overlooked. Headcounts are not adjusted to the size of the population at Loring AFG authorized to eat at the dining hall. We assume that the size of the potential dining hall population was not markedly different between the 1974 and 1975 surveys.

Recommended daily dietary nutrient allowances have been established by the military (7). One-third of the daily allowance for each nutrient (Table 1) was used as the standard to assess the nutritional adequacy of the meals as consumed by the average dining hall patron. It was assumed that average nutrient intakes per patron per meal, computed as total quantity consumed (served minus waste) divided by headcount, are comparable to average nutrient intakes computed as the mean intake of all individual patrons at that meal. Average nutrient intakes per patron per meal that equaled or exceeded the standard (one-third of the military-recommended daily dietary allowance) were considered as adequate. Even though a meal was evaluated as adequate for all nutrients, this does not mean that each and every patron who attended that meal consumed a nutritionally adequate diet.

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7. Departments of The Army, The Navy, and The Air Force. AR 40-25/ BUMEDINST 10110.3E/AFR 160-95, 1976 (as corrected)

Midnight Meals

The average nutrient intakes at midnight meals during the 3-day, October 1974, and 5-day, November 1975, surveys are shown in Table 2. The mean intakes expressed as % of standard, are also presented in Table 2. Intakes at the midnight meal were adequate for all nutrients with the exception of niacin (6.87 mg, 1974, and 5.84 mg, 1975) which was below the military allowance of 7.0 mg in both surveys.

During both surveys, the niacin intakes expressed per 1000 kcal, were considerably below the recommended 6.6 mg/1000 kcal (75 and 70% of the standard in 1974 and 1975, respectively). The percentage of calories derived from fat sources was considerably higher than the goal of less than 40% expressed by the military in both 1974 (44.9%), and 1975 (48.2%).

Average headcount at the midnight meals was 56.0 in 1974, and 72.4 in 1975, after implementation of the BAS/a la Carte system; however, this increase was not statistically significant. Riboflavin intakes, expressed as mg/1000 kcal, increased ($P = 0.04$) under the new system. This increase was primarily due to a significant ($P = 0.04$) increase in average milk consumption per patron (Table 3), from 342 g in 1974, to 459 g in 1975. There was a strong trend ($P = 0.07$) for carbohydrate and niacin (mg) consumption per patron to decrease under the BAS/a la Carte system (Table 2). Although average ascorbic acid intakes decreased from 95.7 mg in 1974, to 33.6 mg in 1975, the means were not statistically different because of a large standard deviation in 1974. The large variation was due to a similarly large deviation in citrus juice consumption (Table 3). During the 1974 survey, citrus juices were served at only two of the midnight meals, grape juice (which is low in ascorbic acid content) was served at the other midnight meal. When served, citrus juice consumption averaged 267 g in 1974 and only 40.0 g per patron in 1975. Thus, the item-pricing component of the BAS/a la Carte system markedly decreased citrus juice consumption and concomitantly ascorbic acid intakes at the midnight meals. There was a trend ($P = 0.07$) for the consumption of white potatoes to decrease and grain products to increase at midnight meals under the BAS/a la Carte system (Table 3).

Breakfast Meals

Headcounts at the breakfast meals decreased by 28% (153.3 patrons/meal, 1974, vs. 109.2 patrons/meal, 1975) after implementation of the BAS/a la Carte system (Table 4). Niacin intakes at breakfast

expressed as mg or as mg/1000 kcal, were below the military recommendation. The low level of niacin under the conventional system (5.03 mg or 72% of standard) further decreased (P = 0.07) under the BAS/a la Carte system (4.54 mg or 65% of standard). Compared to the military dietary standards, the average energy and iron intakes were marginally low at breakfast meals during both surveys. The intakes of all other nutrients were adequate. There was a significantly higher (P = 0.04) consumption of fat (54.7 vs. 46.9 g) under the new system, with a corresponding increase (P = 0.04) in percent fat calories and a decrease (P = 0.04) in carbohydrate intake. The percent fat calories of the breakfast meal in 1975 (47.1%) greatly exceeded the recommended level of less than 40% of the calories derived from fat sources.

The substitution of grape juice for citrus juices at one of the breakfast meals in 1974 tended to obscure the fact that, with item-pricing, citrus juice (Table 5) and ascorbic acid intake (Table 4) markedly decreased. There was a slight, but not statistically significant, increase in milk intake (Table 5) at breakfast under the new system. However, the increase in riboflavin intake per 1000 kcal was significant at the 0.04 level (Table 4).

Main-Line Dinner Meals

Two serving lines were open during midday at the Loring AFB dining facility. The short-order lunch line served primarily hot and cold sandwiches, chili, salads, and desserts, whereas the food items served at the main-line dinner were as prescribed by the 42-day menu cycle. Separate headcounts and amounts served were obtained from both lines so that nutrient and food type consumption data could be calculated for each line.

There was a 45% decrease (P = 0.04) in headcount at the main-line dinner meal after the BAS/a la Carte system was implemented (Table 6). The only statistical difference in average nutrient intake at the main-line dinner was a decrease (P = 0.07) in energy intake per patron (1369 kcal, 1974, vs. 1060 kcal, 1975). The intakes were adequate for all nutrients at this meal, with the exception of marginal intakes of thiamin. In contrast to the midnight and breakfast meals, niacin intakes were above the recommended allowances. At one of the main-line dinner meals in 1974, T-bone steak was served, and this raised the average percent fat calories to 47.2%.

Food type consumption analyses (Table 7) did indicate a significant (P = 0.04) decrease in milk intake per patron in the second study. Under the BAS/a la Carte system, soup consumption increased (P = 0.04), whereas dessert consumption decreased (P = 0.04).

Short-Order Lunch Meals

In contrast to the main-line dinner meal, headcount at the short-order lunch meal (Table 8) increased ($P = 0.04$) in 1975 (182 patrons/meal), compared to 1974 (84.0 patrons/meal). With the BAS/a la Carte system, a number of menu changes were made for the short-order lunch line. Food items such as barbecued beef, tuna salad, bacon and lettuce, and egg salad sandwiches were added to the menu. Other popular new items served were fish sticks, fried chicken, french fried potatoes, and macaroni and cheese. The menu changes apparently contributed to a marked shift in the patrons' preference for the short-order lunch. In the first survey, 17.2% of the noon-time customers selected the short-order line, whereas in the 1975 survey, 44.9% selected the short-order line.

Energy consumption in the short-order line in 1974 was higher (1734 kcal) than other meals in both surveys (Table 8). Consequently, the intakes of most other nutrients were also quite high, with the exception of ascorbic acid (15.3 mg) which was below the military standard of 20 mg. Energy consumption at the short-order line markedly decreased ($P = 0.04$) to 1131 kcal in the 1975 survey. The consumptions of protein, fat, carbohydrate, calcium, phosphorus, iron, thiamin (mg), riboflavin (mg), and niacin (mg) were significantly decreased ($P = 0.04$). Vitamin A intake did not change. Most of the decreases in nutrient intakes were in proportion to the 35% decrease in energy consumption. Thiamin and riboflavin intakes per 1000 kcal were not significantly different between the two surveys; whereas, niacin per 1000 kcal increased ($P = 0.04$) in 1975. Calcium intake, however, decreased proportionately much more (65%) than energy intake (35%). The Ca:P ratio also tended to increase ($P = 0.07$) in 1975. In spite of these marked decreases in average nutrient intakes per meal under the BAS/a la Carte system, the intakes of all nutrients, with the exception of thiamin (0.52 mg and 0.46 mg/1000 kcal), exceeded the recommended allowance standards.

There were also marked shifts in food type consumptions at the short-order lunch line (Table 9). The consumptions of meat, fish and poultry, grain products, desserts, milk and milk products, tomatoes and catsup, and legumes and nuts significantly ($P = 0.04$) decreased, whereas the consumptions of leafy, green and yellow vegetables, potatoes, and fats and gravies significantly ($P = 0.04$) increased. These shifts were primarily due to the previously mentioned modifications made to the menu after implementation of the BAS/a la Carte system. The effect of item-pricing on the consumption of milk vs. other beverages cannot be directly assessed from these data. The soft drink dispenser was not operating during the 1974

survey, and punch (imitation fruit-flavored beverage) was the only beverage offered as an alternative to milk. Soft drinks and punch were offered as alternatives in the November 1975 survey. How much of the large decrease in average milk consumption (563 g, 1974, vs. 244 g, 1975) was attributable to item-pricing, and how much was due to competition from soft drinks cannot be determined. The decreased milk consumption did contribute greatly to the previously noted large decrease in calcium intake at this meal.

Supper Meals

Headcounts at the supper meal were lower (P = 0.04) in 1975 (277.4 patrons/meal) than in 1974 (373.7 patrons/meal). The average intake of all nutrients (Table 10) was adequate in both studies when compared to the military standards. There was a trend (P = 0.07) for energy intake and the Ca:P ratio to increase under the BAS/a la Carte system. The intakes of all other nutrients at the supper meal did not differ statistically between the two surveys. Grain products consumption increased (P = 0.04), whereas leafy, green and yellow vegetables intake decreased (P = 0.04) at the supper meal in 1975 (Table 11). A functioning soft drink dispenser contributed to a greater (P = 0.04) beverage (soft drink and punch) consumption during the 1975 survey.

Plate Waste

As shown in Table 12, the item-pricing component of the BAS/a la Carte system reduced the percentage of plate waste of all food types examined, with the exception of desserts and citrus fruits and juices. The plate waste (including inedibles such as bone) of milk and milk products, fish and poultry, grain products, beverages, eggs and egg products, legumes and nuts, and tomatoes was reduced by at least 40% with the BAS/a la Carte system.

SUMMARY

The BAS/a la Carte system reduced headcounts at breakfast (19%), short-order lunch, plus main-line dinner (17%), and supper (26%) meals. Overall dining hall attendance (considering all meals) was reduced 19.3% from an average of 1070.7 meals/day in 1974 to 864 meals per day in 1975. The reduction in attendance may have been due to one or a combination of three possibilities: (a) the number of potential customers may have decreased; (b) a significant number of personnel converted from SIK to BAS status may have chosen to eat all of their meals elsewhere; or (c) a significant number of customers may have reduced their frequency of dining

hall utilization. The information required to explain why dining hall attendance decreased was not obtained during the course of our surveys.

The item-pricing component of the BAS/a la Carte system was a factor in reducing plate waste. Reduced plate waste has the beneficial effects of conserving resources and reducing operating costs. It is apparent from these data that a patron is less likely to select a food item and then discard all or a large proportion of it when the item is priced separately rather than just included in the overall cost of a meal. Food items selected but not consumed do not contribute to nutritional content of the meal.

The effects of the BAS/a la Carte system on the nutritional content of the meals (as consumed) varied in magnitude and in direction. Niacin intakes tended to be somewhat low at both the midnight and breakfast meals in the 1974 survey and were even lower after implementation of the a la Carte system. Citrus juice consumption markedly decreased with item-pricing, but average ascorbic acid intakes at the midnight and breakfast meals were still well above the standards derived as one-third of the recommended dietary allowance. The percent of calories derived from fat sources at breakfast meals was higher after a la Carte (47.1%) than before a la Carte (41.0%).

The menu expansion at the short-order lunch line that occurred concomitantly with the a la Carte system resulted in a marked shift in customer preference to this line from the main-line dinner. In 1974, 17% of the customers preferred the short-order line, whereas 45% selected this line at the noon-time meal in 1975. Average energy intake at the short-order line in 1974 was excessive (1734 kcal compared to military standard of 1067 kcal). The changes that occurred with implementation of a la Carte reduced energy intake at this meal to a more desirable 1131 kcal. Although the average intake of protein, calcium, phosphorus, iron, thiamin, riboflavin, and niacin also decreased significantly compared to the 1974 study, the intakes of these nutrients at the short-order line were still adequate. The intake of ascorbic acid at the short-order line was only 76% of the military standard in the 1974 study, but it increased to a more desirable 140% of the standard in 1975. There was also a desirable decrease in the percent fat calories at the short-order line in 1975.

Nutrient intakes at the main-line dinner were essentially unchanged by the a la Carte system, except for a significant decrease

in energy intake to a level that was 99% of the military standard. The intakes of all nutrients were adequate at the supper meals in both studies. The only statistically significant effects of the a la Carte system at the supper meal were to increase average energy intake and to increase the calcium to phosphorus ratio of the meal.

CONCLUSIONS

Dining hall attendance decreased following the implementation of the BAS/a la Carte system.

Plate waste decreased when item-pricing was implemented in the dining hall.

Customer preference for the short-order lunch line increased with an expansion in the variety of foods offered.

Item-pricing per se had only moderate effects on the nutritional composition of the meals as consumed by the average customer.

RECOMMENDATIONS

The BAS/a la Carte system should not be broadly expanded to other military installations until more comprehensive studies have been conducted and evaluated. Specifically, the impact of the observed reduction in dining hall utilization on the nutritional adequacy of the total daily intake (both inside and outside dining hall) of individuals must be carefully evaluated.

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in energy intake to a level that was 99% of the military standard. The intakes of all nutrients were adequate at the supper meals in both studies. The only statistically significant effects of the a la Carte system at the supper meal were to increase average energy intake and to increase the calcium to phosphorus ratio of the meal.

CONCLUSIONS

Dining hall attendance decreased following the implementation of the BAS/a la Carte system.

Plate waste decreased when item-pricing was implemented in the dining hall.

Customer preference for the short-order lunch line increased with an expansion in the variety of foods offered.

Item-pricing per se had only moderate effects on the nutritional composition of the meals as consumed by the average customer.

RECOMMENDATIONS

The BAS/a la Carte system should not be broadly expanded to other military installations until more comprehensive studies have been conducted and evaluated. Specifically, the impact of the observed reduction in dining hall utilization on the nutritional adequacy of the total daily intake (both inside and outside dining hall) of individuals must be carefully evaluated.

REFERENCES

1. SIEBOLD, J.R., and A.L. MEISELMAN. Customer Evaluation of Cash Food Systems: Shaw Air Force Base. Technical Report No. 75-77-FSU. Natick, Massachussets: U.S. Army Natick Laboratories, 1974.

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APPENDIX

TABLE 1

RECOMMENDED DAILY DIETARY ALLOWANCE

NUTRIENT	DAILY ALLOWANCE[1]	MEAL STANDARD[2]
Energy (kcal)	3200.	1067.
Protein (gm)	100.	33.
Calcium (mg)	800.	267.
Phosphorus (mg)	800.	267.
Iron (mg)	18.	6.
Vitamin A (IU)	5000.	1667.
Thiamin (mg)	1.6	0.53
(mg/1000 kcal)	0.5	
Riboflavin (mg)	2.0	0.67
(mg/1000 kcal)	0.6	
Niacin (mg)	21.	7.
(mg/1000 kcal)	6.6	
Ascorbic Acid (mg)	60.	20.

[1]Male military personnel (17-25 years of age), moderately active, in a temperate climate. [2]One-third of daily allowance.

TABLE 2

NUTRIENT INTAKE AT MIDNIGHT MEALS

NUTRIENT	OCT 1974 Mean ± SD[2]	OCT 1974 % of Standard[3]	NOV 1975 Mean ± SD[2]	NOV 1975 % of Standard[3]	P-VALUE[1]
Quantity (gm)	1020 ± 84		901 ± 77		0.07
Energy (kcal)	1385 ± 119	130	1261 ± 71	118	NS
Protein (gm)	56.5 ± 4.1	171	53.2 ± 4.5	161	NS
Fat (gm)	69.3 ± 8.9		67.5 ± 5.5		NS
(% Fat Calories)	44.9 ± 1.9		48.2 ± 3.2		NS
Carbohydrate (gm)	134 ± 6.9		111 ± 15.0		0.07
Fiber (gm)	0.87 ± 0.06		1.00 ± 0.23		NS
Ash (gm)	11.1 ± 1.3		11.0 ± 0.9		NS
Calcium (mg)	736 ± 47	276	798 ± 64	299	NS
Phosphorus (mg)	998 ± 104	374	996 ± 76	373	NS
(Ca:P)	1:1.35 ± 0.07		1:1.26 ± 0.16		NS
Iron (mg)	7.4 ± 1.2	123	6.7 ± 0.6	112	NS
Sodium (mg)	1765 ± 101		1901 ± 128		NS
Potassium (mg)	1718 ± 338		1466 ± 120		NS
Vitamin A (IU)	2859 ± 786	172	2491 ± 265	149	NS
Thiamin (mg)	0.87 ± 0.11	164	0.80 ± 0.06	151	NS
(mg/1000 kcal)	0.63 ± 0.05	126	0.63 ± 0.06	126	NS
Riboflavin (mg)	1.41 ± 0.12	210	1.48 ± 0.13	221	NS
(mg/1000 kcal)	1.02 ± 0.005	170	1.18 ± 0.13	197	0.04
Niacin (mg)	6.87 ± 0.59	98	5.84 ± 0.48	83	0.07
(mg/1000 kcal)	4.96 ± 0.19	75	4.65 ± 0.51	70	NS
Ascorbic Acid (mg)	95.7 ± 65.8	478	33.6 ± 7.5	168	NS
(Headcount)	56.0 ± 9.8		72.4 ± 16.3		NS

[1]Mann-Whitney U Test. [2]Values are total consumed (served minus waste) ÷ headcount for 3 meals in Oct 1974 (before BAS/a la Carte), and 5 meals in Nov 1975 (after BAS/a la Carte). [3]Mean ÷ standard (1/3 military daily allowance) x 100.

TABLE 3

QUANTITY OF VARIOUS FOOD TYPES

CONSUMED AT MIDNIGHT MEALS (GM/PATRON)[1]

FOOD TYPE	OCT 1974	NOV 1975	P-VALUE[2]
Meat, Fish & Poultry	92.0 ± 7.5	81.4 ± 14.5	NS
Grain Products	63.7 ± 18.9	93.0 ± 16.9	0.07
Vegetables (leafy, green, & yellow)	1.3 ± 0.6	0.2 ± 0.4	NS
Vegetables, Other	1.0 ± 0	0	NS
Potatoes	60.0 ± 3.6	45.6 ± 10.9	0.07
Soups	0	0	-
Desserts	3.3 ± 5.8	3.2 ± 7.2	NS
Eggs & Egg Products	139.7 ± 37.6	98.0 ± 21.6	NS
(Eggs)	133.7 ± 27.3	94.8 ± 22.2	NS
Milk & Milk Products	358.7 ± 15.6	472.8 ± 52.3	0.04
(Milk)	342.0 ± 15.1	459.0 ± 52.8	0.04
Citrus (fruits & juices)	179.3 ± 157.5	51.4 ± 17.0	NS
(Citrus Juices)	178.0 ± 156.0	40.0 ± 10.3	NS
Soft Drinks & Punch	0	2.8 ± 6.3	NS
(Punch)	0	0	-
Fruits & Grape Juice	92.0 ± 152.5	38.4 ± 16.8	NS
Tomatoes & Catsup	2.7 ± 2.3	0.2 ± 0.4	NS
Syrups & Jellies	21.0 ± 16.0	8.0 ± 2.9	NS
Margarine	4.7 ± 2.5	5.6 ± 0.9	NS
Legumes & Nuts	0	0.6 ± 0.5	NS
Fats & Gravies	0	0	-
Miscellaneous	0	0	-

[1]Mean ± S.D. of 3 meals in Oct 1974, and 5 meals in Nov 1975. Values represent total quantity consumed (served minus waste)/headcount. [2]Mann-Whitney U. Test.

TABLE 4

NUTRIENT INTAKE AT BREAKFAST MEALS

NUTRIENT	OCT 1974 Mean ± SD[2]	OCT 1974 % of Standard[3]	NOV 1975 Mean ± SD[2]	NOV 1975 % of Standard[3]	P-VALUE[1]
Quantity (gm)	794 ± 19		727 ± 54		NS
Energy (kcal)	1032 ± 36	97	1045 ± 52	98	NS
Protein (gm)	39.0 ± 1.4	118	42.4 ± 2.3	128	NS
Fat (gm)	46.9 ± 2.3		54.7 ± 3.1		0.04
(% Fat Calories)	41.0 ± 2.5		47.1 ± 0.5		0.04
Carbohydrate (gm)	114 ± 11.3		96 ± 3.9		0.04
Fiber (gm)	0.70 ± 0.17		0.64 ± 0.09		NS
Ash (gm)	7.93 ± 0.42		8.62 ± 0.33		0.07
Calcium (mg)	552 ± 40	207	611 ± 59	229	NS
Phosphorus (mg)	729 ± 19	273	803 ± 51	301	0.04
(Ca:P)	1:1.33 ± 0.12		1:1.32 ± 0.05		NS
Iron (mg)	5.6 ± 0.6	93	5.6 ± 0.3	93	NS
Sodium (mg)	1214 ± 139		1558 ± 70		0.04
Potassium (mg)	1296 ± 256		1172 ± 56		NS
Vitamin A (IU)	2026 ± 472	122	2153 ± 146	129	NS
Thiamin (mg)	0.70 ± 0.12	132	0.66 ± 0.04	125	NS
(mg/1000 kcal)	0.68 ± 0.14	136	0.63 ± 0.02	126	NS
Riboflavin (mg)	1.05 ± 0.05	157	1.15 ± 0.08	172	NS
(mg/1000 kcal)	1.02 ± 0.01	170	1.10 ± 0.04	183	0.04
Niacin (mg)	5.03 ± 0.31	72	4.54 ± 0.21	65	0.07
(mg/1000 kcal)	4.89 ± 0.41	74	4.35 ± 0.20	66	NS
Ascorbic Acid (mg)	90.3 ± 66.3	452	39.4 ± 4.9	197	NS
(Headcount)	153.3 ± 4.0		109.2 ± 9.0		0.04

[1]Mann-Whitney U Test. [2]Values are total consumed (served minus waste) ÷ headcount for 3 meals in Oct 1974 (before BAS/a la Carte), and 5 meals in Nov 1975 (after BAS/a la Carte). [3]Mean ÷ standard (1/3 military daily allowance) x 100.

TABLE 5

QUANTITY OF VARIOUS FOOD TYPES

CONSUMED AT BREAKFAST MEALS (GM/PATRON)[1]

FOOD TYPE	OCT 1974	NOV 1975	P-VALUE[2]
Meat, Fish & Poultry	50.3 ± 3.8	56.6 ± 4.6	NS
Grain Products	70.0 ± 21.8	82.8 ± 7.3	NS
Vegetables (leafy, green, & yellow)	0.8 ± 1.4	2.0 ± 1.7	NS
Vegetables, Other	0	0	-
Potatoes	22.7 ± 3.8	29.2 ± 3.4	NS
Soups	0	0	-
Desserts	2.0 ± 3.5	0	NS
Eggs & Egg Products	98.7 ± 16.5	92.8 ± 5.4	NS
(Eggs)	84.7 ± 27.1	85.2 ± 5.8	NS
Milk & Milk Products	265.0 ± 47.9	321.8 ± 43.3	NS
(Milk)	254.0 ± 47.4	308.0 ± 42.1	NS
Citrus (fruits & juices)	173.0 ± 151.6	73.6 ± 11.1	NS
(Citrus Juices)	155.3 ± 134.6	71.6 ± 10.5	NS
Soft Drinks & Punch	0	0	-
(Punch)	0	0	-
Fruits & Grape Juice	87.0 ± 104.3	56.8 ± 10.6	NS
Tomatoes & Catsup	1.3 ± 0.6	0	NS
Syrups & Jellies	18.3 ± 5.9	9.4 ± 1.9	0.04
Margarine	3.3 ± 0.6	3.8 ± 0.8	NS
Legumes & Nuts	0	0.2 ± 0.4	NS
Fats & Gravies	0	0	-
Miscellaneous	0	0	-

[1]Mean ± S.D. of 3 meals in Oct 1974, and 5 meals in Nov 1975. Values represent total quantity consumed (served minus waste)/headcount. [2]Mann-Whitney U Test.

TABLE 6

NUTRIENT INTAKE AT MAIN-LINE DINNER MEALS

NUTRIENT	OCT 1974 Mean ± SD[2]	OCT 1974 % of Standard[3]	NOV 1975 Mean ± SD[2]	NOV 1975 % of Standard[3]	P-VALUE[1]
Quantity (gm)	981 ± 59		899 ± 28		0.07
Energy (kcal)	1369 ± 213	128	1060 ± 113	99	0.07
Protein (gm)	52.9 ± 4.7	160	50.3 ± 6.8	152	NS
Fat (gm)	73.4 ± 27.3		48.3 ± 11.1		NS
(% Fat Calories)	47.2 ± 10.2		40.6 ± 5.0		NS
Carbohydrate (gm)	128 ± 12		108 ± 8		NS
Fiber (gm)	1.63 ± 0.25		2.58 ± 1.36		NS
Ash (gm)	8.43 ± 0.49		8.38 ± 1.28		NS
Calcium (mg)	670 ± 138	251	570 ± 144	213	NS
Phosphorus (mg)	881 ± 74	330	775 ± 83	290	NS
(Ca:P)	1:1.34 ± 0.18		1:1.40 ± 0.23		NS
Iron (mg)	7.17 ± 1.00	120	6.58 ± 0.50	110	NS
Sodium (mg)	1341 ± 442		1454 ± 269		NS
Potassium (mg)	1730 ± 415		1450 ± 192		NS
Vitamin A (IU)	4307 ± 4295	258	3549 ± 784	213	NS
Thiamin (mg)	0.52 ± 0.11	98	0.54 ± 0.04	102	NS
(mg/1000 kcal)	0.39 ± 0.10	78	0.51 ± 0.06	102	NS
Riboflavin (mg)	1.31 ± 0.30	196	1.06 ± 0.13	158	NS
(mg/1000 kcal)	0.99 ± 0.36	165	1.00 ± 0.12	167	NS
Niacin (mg)	10.50 ± 2.92	150	9.02 ± 1.74	129	NS
(mg/1000 kcal)	7.84 ± 2.87	119	8.50 ± 1.39	129	NS
Ascorbic Acid (mg)	30.7 ± 3.8	154	32.8 ± 10.6	164	NS
(Headcount)	403.7 ± 67		223.0 ± 18.7		0.04

[1]Mann-Whitney U Test. [2]Values are total consumed (served minus waste) ÷ headcount for 3 meals in Oct 1974 (before BAS/a la Carte), and 5 meals in Nov 1975 (after BAS/a la Carte). [3]Mean ÷ standard (1/3 military daily allowance) × 100

TABLE 7

QUANTITY OF VARIOUS FOOD TYPES

CONSUMED AT MAIN LINE DINNER MEALS (GM/PATRON)[1]

FOOD TYPE	OCT 1974	NOV 1975	P-VALUE[2]
Meat, Fish & Poultry	122.0 ± 34.7	140.8 ± 50.1	NS
Grain Products	39.3 ± 30.3	111.1 ± 99.1	NS
Vegetables (leafy, green, and yellow)	54.3 ± 30.7	33.0 ± 23.3	NS
Vegetables, Other	24.0 ± 28.8	25.0 ± 16.5	NS
Potatoes	98.7 ± 17.7	62.4 ± 29.4	NS
Soups	11.3 ± 3.2	23.6 ± 6.1	0.04
Desserts	67.0 ± 18.5	20.2 ± 2.3	0.04
Eggs & Egg Products	0	0	-
(Eggs)	0	0	-
Milk & Milk Products	403.7 ± 8.5	334.8 ± 45.4	0.07
(Milk)	381.7 ± 22.1	315.6 ± 22.1	0.04
Citrus (fruits & juices)	0	0.4 ± 0.9	NS
(Citrus Juices)	0	0	-
Soft Drinks & Punch	88.3 ± 12.9	94.0 ± 33.5	NS
(Punch)	88.3 ± 12.9	28.4 ± 41.6	NS
Fruits & Grape Juice	28.0 ± 23.6	4.4 ± 2.3	NS
Tomatoes & Catsup	1.3 ± 2.3	9.0 ± 12.0	NS
Syrups & Jellies	0	0	-
Margarine	4.3 ± 1.2	2.0 ± 1.2	0.07
Legumes & Nuts	0	11.8 ± 11.3	NS
Fats & Gravies	37.7 ± 24.0	24.4 ± 11.5	NS
Miscellaneous	0	1.4 ± 0.9	0.04

[1]Mean ± S.D. of 3 meals in Oct 1974, and 5 meals in Nov 1975. Values represent total quantity consumed (served minus waste)/headcount. [2]Mann-Whitney U Test.

TABLE 8

NUTRIENT INTAKE AT SHORT-ORDER LUNCH MEALS

NUTRIENT	OCT 1974 Mean ± SD[2]	OCT 1974 % of Standard[3]	NOV 1975 Mean ± SD[2]	NOV 1975 % of Standard[3]	P-VALUE[1]
Quantity (gm)	1184 ± 191		889 ± 128		NS
Energy (kcal)	1734 ± 71	163	1131 ± 134	106	0.04
Protein (gm)	78.8 ± 11.3	239	48.2 ± 5.6	146	0.04
Fat (gm)	85.2 ± 4.9		50.5 ± 5.8		0.04
(% Fat Calories)	44.2 ± 1.2		40.2 ± 1.0		0.04
Carbohydrate (gm)	165 ± 8.4		123 ± 16.9		0.04
Fiber (gm)	1.57 ± 0.21		1.64 ± 0.25		NS
Ash (gm)	13.10 ± 1.77		8.36 ± 1.03		0.04
Calcium (mg)	1020 ± 302	382	460 ± 84	172	0.04
Phosphorus (mg)	1279 ± 258	479	698 ± 94	261	0.04
(Ca:P)	1:1.28 ± 0.13		1:1.53 ± 0.09		0.07
Iron (mg)	9.63 ± 0.21	160	6.78 ± 0.68	113	0.04
Sodium (mg)	2108 ± 36		1423 ± 212		0.04
Potassium (mg)	2031 ± 303		1331 ± 107		0.04
Vitamin A (IU)	1756 ± 510	105	1839 ± 872	110	NS
Thiamin (mg)	0.77 ± 0.06	145	0.52 ± 0.05	98	0.04
(mg/1000 kcal)	0.45 ± 0.01	90	0.46 ± 0.01	92	NS
Riboflavin (mg)	1.74 ± 0.40	260	0.92 ± 0.12	137	0.04
(mg/1000 kcal)	1.00 ± 0.19	167	0.81 ± 0.04	135	NS
Niacin (mg)	12.30 ± 0.61	176	9.44 ± 0.99	135	0.04
(mg/1000 kcal)	7.09 ± 0.09	107	8.36 ± 0.28	127	0.04
Ascorbic Acid (mg)	15.3 ± 1.5	76	28.0 ± 4.6	140	0.04
(Headcount)	84.0 ± 31.1		182.0 ± 11.5		0.04

[1]Mann-Whitney U Test. [2]Values are total consumed (served minus waste) ÷ headcount for 3 meals in Oct 1974 (before BAS/a la Carte), and 5 meals in Nov 1975 (after BAS/a la Carte). [3]Mean ÷ standard (1/3 military daily allowance) x 100.

TABLE 9

QUANTITY OF VARIOUS FOOD TYPES

CONSUMED AT SHORT-ORDER LUNCH MEALS (GM/PATRON)[1]

FOOD TYPE	OCT 1974	NOV 1975	P-VALUE[2]
Meat, Fish & Poultry	183.3 ± 7.4	128.6 ± 15.6	0.04
Grain Products	109.3 ± 13.3	73.0 ± 7.3	0.04
Vegetables (leafy, green, and yellow)	4.7 ± 3.1	31.6 ± 21.5	0.04
Vegetables, Other	12.0 ± 4.6	10.8 ± 5.2	NS
Potatoes	5.3 ± 6.8	85.6 ± 18.6	0.04
Soups	6.0 ± 5.2	19.6 ± 12.9	NS
Desserts	69.3 ± 18.8	20.4 ± 2.1	0.04
Eggs & Egg Products	0	5.8 ± 1.8	0.04
(Eggs)	0	3.4 ± 1.3	0.04
Milk & Milk Products	605.0 ± 230.6	267.2 ± 55.3	0.04
(Milk)	562.7 ± 206.5	244.0 ± 17.7	0.04
Citrus (fruits & juices)	0	0.4 ± 0.9	NS
(Citrus Juices)	0	0	-
Soft Drinks & Punch	91.3 ± 10.4	172.6 ± 66.7	0.07
(Punch)	88.3 ± 12.9	28.4 ± 41.6	NS
Fruits & Grape Juice	0.7 ± 1.2	4.4 ± 2.3	0.07
Tomatoes & Catsup	32.3 ± 11.0	14.6 ± 6.7	0.04
Syrups & Jellies	0	0	-
Margarine	0	2.4 ± 0.5	0.04
Legumes & Nuts	51.0 ± 2.6	23.0 ± 9.8	0.04
Fats & Gravies	5.0 ± 1.0	23.0 ± 4.1	0.04
Miscellaneous	8.7 ± 3.2	5.4 ± 1.1	NS

[1]Mean ± S.D. of 3 meals in Oct 1974, and 5 meals in Nov 1975. Values represent total quantity consumed (served minus waste)/headcount. [2]Mann-Whitney U Test.

TABLE 10

NUTRIENT INTAKE AT SUPPER MEALS

NUTRIENT	OCT 1974 Mean ± SD[2]	OCT 1974 % of Standard[3]	NOV 1975 Mean ± SD[2]	NOV 1975 % of Standard[3]	P-VALUE[1]
Quantity (gm)	956 ± 4		1022 ± 83		NS
Energy (kcal)	1198 ± 24	112	1311 ± 94	123	0.07
Protein (gm)	52.1 ± 4.8	158	61.1 ± 6.5	185	NS
Fat (gm)	57.9 ± 5.1		63.8 ± 7.1		NS
(% Fat Calories)	43.4 ± 3.0		43.7 ± 2.3		NS
Carbohydrate (gm)	121 ± 2.1		125 ± 8.4		NS
Fiber (gm)	1.87 ± 0.35		1.84 ± 0.30		NS
Ash (gm)	8.97 ± 0.40		9.82 ± 0.88		NS
Calcium (mg)	715 ± 87	268	607 ± 142	227	NS
Phosphorus (mg)	854 ± 69	320	904 ± 113	339	NS
(Ca:P)	1:1.20 ± 0.15		1:1.52 ± 0.20		0.07
Iron (mg)	6.87 ± 0.72	114	9.12 ± 3.15	152	NS
Sodium (mg)	1519 ± 266		1686 ± 234		NS
Potassium (mg)	1671 ± 225		1699 ± 141		NS
Vitamin A (IU)	5775 ± 2707	346	3508 ± 1533	210	NS
Thiamin (mg)	0.68 ± 0.09	128	0.70 ± 0.11	132	NS
(mg/1000 kcal)	0.57 ± 0.08	114	0.53 ± 0.05	106	NS
Riboflavin (mg)	1.38 ± 0.20	206	1.41 ± 0.45	210	NS
(mg/1000 kcal)	1.15 ± 0.16	192	1.08 ± 0.33	180	NS
Niacin (mg)	9.47 ± 1.81	135	11.9 ± 2.53	170	NS
(mg/1000 kcal)	7.92 ± 1.68	120	9.13 ± 1.97	138	NS
Ascorbic Acid (mg)	34.3 ± 5.7	172	30.8 ± 8.0	154	NS
(Headcount)	373.7 ± 18.0		277.4 ± 25.1		0.04

[1]Mann-Whitney U Test. [2]Values are total consumed (served minus waste) ÷ headcount for 3 meals in Oct 1974 (before BAS/a la Carte), and 5 meals in Nov 1975 (after BAS/a la Carte). [3]Mean ÷ standard (1/3 military daily allowance) x 100.

TABLE 11

QUANTITY OF VARIOUS FOOD TYPES

CONSUMED AT SUPPER MEALS (GM/PATRON)[1]

FOOD TYPE	OCT 1974	NOV 1975	P-VALUE[2]
Meat, Fish & Poultry	128.7 ± 44.4	176.0 ± 14.9	NS
Grain Products	36.0 ± 12.5	93.2 ± 25.4	0.04
Vegetables (leafy, green, & yellow)	55.7 ± 12.4	31.4 ± 8.6	0.04
Vegetables, Other	24.0 ± 8.2	16.0 ± 9.2	NS
Potatoes	91.0 ± 21.7	77.4 ± 27.4	NS
Soups	19.0 ± 6.2	21.2 ± 4.9	NS
Desserts	59.7 ± 30.7	26.6 ± 4.8	NS
Eggs & Egg Products	0	2.4 ± 0.9	0.04
(Eggs)	0	1.4 ± 0.9	0.07
Milk & Milk Products	443.3 ± 24.1	381.8 ± 112.8	NS
(Milk)	435.3 ± 26.5	357.2 ± 72.7	NS
Citrus (fruits & juices)	0	0	-
(Citrus Juices)	0	0	-
Soft Drinks & Punch	34.7 ± 41.1	122.4 ± 21.6	0.04
(Punch)	34.7 ± 41.1	70.4 ± 22.7	NS
Fruits & Grape Juice	17.3 ± 7.2	0.8 ± 1.1	0.04
Tomatoes & Catsup	0.7 ± 0.6	10.0 ± 6.3	0.04
Syrups & Jellies	0	0	-
Margarine	4.3 ± 1.2	2.0 ± 1.2	NS
Legumes & Nuts	9.3 ± 16.2	24.6 ± 11.6	NS
Fats & Gravies	31.7 ± 10.4	31.0 ± 8.6	NS
Miscellaneous	0.3 ± 0.6	2.6 ± 0.9	0.04

[1]Mean ± S.D. of 3 meals in Oct 1974, and 5 meals in Nov 1975. Values represent total quantity consumed (served minus waste)/headcount. [2]Mann-Whitney U Test.

TABLE 12

EFFECT OF BAS/A LA CARTE SYSTEM

ON PERCENT PLATE WASTE[1]

FOOD TYPE	BEFORE A LA CARTE (%)	AFTER A LA CARTE (%)
Milk & Milk Products	5	2
Meat, Fish & Poultry	15	8
Grain Products	15	6
Beverages	8	3
White Potatoes	10	8
Eggs & Egg Products	6	3
Desserts	11	13
Vegetables (leafy, green, & yellow)	26	19
Citrus Fruits & Juices	6	8
Fruits, Other	9	6
Legumes & Nuts	24	10
Tomatoes	23	10
Soups	15	10

[1]Includes inedible waste.

GLOSSARY OF TERMS AND ABBREVIATIONS

BAS	Basic Allowance for Subsistence (personnel receive cash in lieu of meal pass)
BUMEDINST	Bureau of Medicine Instruction
Ca:P	Calcium-phosphorus ratio
kcal	Kilocalories
LAIR	Letterman Army Institute of Research
NARADCOM	United States Army Natick Research and Development Command
P	Probability
SIK	Subsistence-in-Kind (personnel issued meal pass)
USAFSAM	United States Air Force School of Aerospace Medicine
USDA	United States Department of Agriculture

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