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Nutrification of Frozen Preplated School Lunches is Needed

DOROTHY MISKIMIN, JAMES BOWERS, and PAUL A. LACHANCE

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The purpose of this paper is to show that frozen preplated Type A meals supplied for the school lunch program by outside suppliers also do not provide 1/3 the RDA—and that to comply with a suitable nutrient standard for such meals based on the RDA, nutrification of such meals is needed.

NUTRIENT CONTENT CALCULATED

Menu cycles of frozen preplated meals from three nationally known companies were coded and their nutritive value tallied in a computer program which compared the nutritional data of the meals to one-third of the NAS/NRC RDA for boys and girls 10–12 years of age. We have previously shown that the 1/3 RDA values closely approximate those for a family of four, and in many cases, the U.S. RDA (Lachance, 1972c).

In addition to energy (calories), the nutrients coded were protein, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin equivalents, and vitamin C. In addition, data for vitamin B_6 were obtained for 80 meals from one company.

Company A provided nutritional data for the two sections (hot and cold packs) of its meals. Companies B and C provided information on the amounts of the components of each of their meals, and we calculated the nutritional data, utilizing Agriculture Handbook No. 8 (Watt and Merrill, 1963). The data from Company A represented 80 meals in a 16-week menu cycle, and data were calculated on 51 meals in a 10-week menu cycle from Company B and on 25 meals in a 5-week menu cycle from Company C.

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Our calculations of the nutritive value of 156 frozen preplated Type A meals reveal that the amount of energy provided and several nutrients are consistently below the goal of 1/3 RDA. Table 1 shows the frequency (in percent) that meals met or failed to reach the goal. All meals always provided 1/3 RDA for protein, niacin equivalents, and riboflavin, but, in increasing order of frequency, vitamin C, phosphorus, vitamin A, calcium, thiamine, calories, and iron were found lacking.

Table 2 shows the average percentage that these nutrients were found to be above or below the 1/3 RDA goal. In other words, Table 2 describes the degree to which, if all the components of the meals were ingested, the resultant nutritive value would be positive or negative in terms of the 1/3 RDA goal. The meals as a composite were adequate in terms of vitamin C, protein, niacin equivalents, riboflavin, vitamin A, and phosphorus. In contrast, and in increasing order, calcium, calories, thiamine, and iron would definitely not assure the expected 1/3 RDA levels. On the basis of Company A data, we would also have to add vitamin B_6 to this list.

Table 3 compares the products of the three companies in terms of the frequency of the meals below the 1/3 RDA goal. The results are fairly consistent, as should be expected since all were planned in accordance with the Type A guideline. Company A has the practice of utilizing vitamin C-fortified dessert products, and therefore the frequency of meals below the 1/3 RDA goal is low.

Table 4 compares the products of the three companies in terms of the average percentage of nutrients above or below the 1/3 RDA goal. Again, the results between companies are fairly consistent. Note that

*Table 1—***FREQUENCY** *with which 156 Type A meals were below ⅓ RDA for children 10–12 years of age for specific nutrients*

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Phosphorus	24.3
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Company A meals contain considerable vitamin C. This value is magnified because an attempt was made by the company to assure the total RDA for vitamin C (40 mg) rather than 1/3 RDA (13 mg). Although there is no harm in the full RDA being present in the case of vitamin C, it is in our opinion wiser to balance the meals to assure 1/3 RDA for *all* nutrients. Company A has since attempted such a practice and has found it to be feasible and suitable. The resultant meal not only complies with the Type A definition, in terms of variety of foods, but also assures 1/3 RDA for all of the RDA nutrients.

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Analyzing the results by the individual nutrients yields the following:

• **Iron.** Iron is recognized as a nutrient difficult to obtain in sufficient quantities in normal diets (NAS/NRC, 1968). A few meals provided by Company B approximated 95% of the 1/3 RDA goal for iron (6 mg). However, for this to occur, each meal had to include, in addition to a slice of enriched bread or an equivalent roll, the combination of at least three servings of the following foods: beef, raisins, red kidney beans, peas, lima beans, or enriched pasta products. Very significant is the role of enriched pasta products, since they are served as entrees having an acceptance greater than that for legumes.

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In actual practice, this situation is aggravated because the consumption of vegetable component is often the poorest of all the Type A food components (Miskimin et al., 1973). Of the meals we scrutinized that did meet the 1/3 RDA for thiamine, six contained a combination of an enriched pasta product and legumes.

• **Vitamin B_6.** Vitamin B_6 is gaining increasing attention, but nutritive data for the vitamin in frozen foods are not extensive (FDA, 1973). Since vitamin B_6 is intimately associated with protein metabolism, and its requirement is known to be increased in the case of certain drugs (Luhby et al., 1971; Goodman and Gilman, 1970), there is a need for this vitamin to be more closely titrated to the RDA, if not the protein level of the diet. It is conceivable that the consistently elevated protein intake exceeding the RDA—as in Type A meals and in the American dietary in general (Lachance, 1972b)—probably increases the requirement for vitamin B_6 (Baker et al., 1964). This is even more important in view of the work of Schroeder (1971) demonstrating that frozen foods often provide less than half the expected vitamin B_6 values.

• **Energy.** The fact that Type A meals do not assure 1/3 RDA for energy should not be alarming. Children, except possibly those from very low income families, invariably have many food contacts per day. Most of these contacts involve foods which provide energy but may not provide concomitant micronutrients.

Table 2—**AVERAGE PERCENTAGE** *by which 156 Type A meals were above or below ⅓ RDA for children 10–12 years of age for specific nutrients*

Nutrient	Average percentage
Calories	−19.0
Calcium	− 4.0
Phosphorus	+12.0
Iron	−42.7
Vitamin A	+37.3
Thiamine	−21.7
Vitamin C	+158.7
Protein	+72.3
Niacin equivalents	+67.7
Riboflavin	+52.3

Table 3—**FREQUENCY (BY COMPANY)** *with which 156 Type A meals were below ⅓ RDA for specific nutrients*

	Frequency (%)		
Nutrient	Company A (N = 80)	Company B (N = 51)	Company C (N = 25)
Calories	82	100	100
Calcium	85	90	76
Phosphorus	38	28	8
Iron	100	98	100
Vitamin A	51	65	60
Thiamine	88	86	88
Vitamin C	10	24	32
Vitamin B_6	68	N/A	N/A

Table 4—**AVERAGE PERCENTAGE (BY COMPANY)** *by which 156 Type A meals were above or below ⅓ RDA for specific nutrients*

	Average percentage		
Nutrient	Company A (N = 80)	Company B (N = 51)	Company C (N = 25)
Calories	− 9	−29	−19
Calcium	− 7	− 8	+ 3
Phosphorus	+ 9	+ 8	+20
Iron	−49	−39	−40
Vitamin A	+11	+86	+15
Thiamine	−21	−23	−21
Vitamin C	+342	+72	+62
Vitamin B_6	−15	N/A	N/A
Protein	+78	+68	+71
Niacin equivalents	+74	+64	+65
Riboflavin	+53	+51	+53

One could argue that providing increased food quantities to meet the energy goal might also rectify some of the micronutrient deficiencies. This would, of course, depend upon the source of these calories. If they were to be derived from all the Type A food components, it might be significant. De-emphasis on dietary fat, particularly saturated fat, may have led to some of the observed deficit. In the final analysis, with one in five children in the U.S. being overweight (Deutsch, 1971), there appears to be little need for emphasis on calories.

• **Calcium and Phosphorus.** Although the average percentage of calcium below the 1/3 RDA goal was found to be small (−4%), the frequency of meals below the 1/3 RDA goal was high. This occurs in spite of the mandated inclusion of a half-pint of milk in the Type A menu pattern requirement. This could be easily remedied with increased calcium fortification of standardized bread products, for which it is an optional enrichment practice.

More important is the invariably high phosphorus to calcium ratio. A substantial part of this imbalance, which should be reversed, is the result of the higher intakes of meat, poultry, and fish. To make matters worse, it is very likely that the other meals and snacks consumed daily also provide more phosphorus than calcium, further aggravating the phosphorus to calcium ratio.

• **Vitamins A and C.** The frequency of meals failing to provide 1/3 RDA for vitamins A and C should also be of concern, even though on the average the levels appeared to be adequate. Vitamin C has a short biological half life (Hodges et al., 1971), and since many children do not have breakfast or have an inadequate breakfast (Bauman, 1971), the daily sources of vitamin C are often compromised. Furthermore, the vegetables providing some vitamin C are often rejected by children.

Only 10% of the meals of Company A were below 1/3 RDA for vitamin C. All of these meals contained an unfortified commodity fruit product—applesauce. The other meals included a fortified gelatin or pudding product. One additional meal contained applesauce, but the mashed potatoes had been fortified with vitamin C (56.2 mg of ascorbic acid per 100 g).

Although vitamin A is known to be dynamically stored in the liver, the average American intake (and therefore body stores) is considered marginal (Raica et al., 1972). As with vitamin C, we are faced with the vegetable component of the diet being a significant source of the vitamin (Hansen, 1971). It would appear wiser to have all Type A meals assure a minimum quantity of the vitamin.

NUTRIENT STANDARD MEALS

One solution to the problem is to adopt a nutrient standard for meals based on the RDA, as advocated by the White House Conference on Food, Nutrition and Health. Such a guideline has been adopted by HEW for its elderly feeding programs (HEW, 1972a). The need for a nutrient standard definition can best be demonstrated by specific example meals:

• Table 5 provides a nutrient profile for the following menu:

Macaroni and Cheese
Peas
Peaches in Gelatin
Enriched Roll
Butter or Margarine
Whole Milk

This meal does not meet the Type A requirement for protein, but exceeds 1/3 RDA for protein by 50%. It also meets the 1/3 RDA for calcium and vitamin A but is low in iron. Substitution of the whole milk with an instant breakfast-type preparation; higher fortification of the bread and macaroni with iron; inclusion of iron in the dessert component; and/or substitution of a nutrified dessert such as a cream-filled cake would resolve the iron problem.

• Table 6 provides the nutrient profile for the following menu:

Frankfurter
Cooked Beans
Apple
Potato Salad
Enriched Bread
Butter or Margarine
Whole Milk

This meal is lacking in vitamin A and iron. A realistic vehicle for enhancing the vitamin A would be to use a tomato sauce in the cooked beans rather than a sugar-based sauce. This could also be accomplished by a change in choice of dessert.

It should be evident that a nutrient definition does not assure acceptable organoleptic characteristics, just as the specification of particular commodities does not assure a balanced nutritive value. With the combination of both nutritive and broad menu planning specifications, however, it becomes possible to assure nutritive value and enhance organoleptic acceptance, i.e., match the preferences of the market better.

Table 5—**NUTRIENT PROFILE** *for Macaroni, Cheese meal*

Nutrient	1/3 RDA		Meal	Percentage by which meal is above or below 1/3 RDA
Calories	835	kcal	642.4 kcal	−23
Protein	17	g	25.5 g	+50
Calcium	400	mg	594.0 mg	+49
Phosphorus	400	mg	510.6 mg	+28
Iron	6	mg	2.4 mg	−60
Vitamin A	1,500	IU	1,762 IU	+17
Thiamine	0.45	mg	0.4 mg	− 5
Riboflavin	0.45	mg	0.8 mg	+73
Niacin equivalents	6	mg	6.8 mg	+14
Vitamin C	13	mg	14.6 mg	+13

Table 6—**NUTRIENT PROFILE** *for Frankfurter, Beans meal*

Nutrient	1/3 RDA		Meal	Percentage by which meal is above or below 1/3 RDA
Calories	835	kcal	697.7 kcal	−16
Protein	17	g	24.9 g	+47
Calcium	400	mg	367.4 mg	− 8
Phosphorus	400	mg	473.9 mg	+18
Iron	6	mg	4.3 mg	−28
Vitamin A	1,500	IU	585.9 IU	−61
Thiamine	0.45	mg	0.4 mg	− 7
Riboflavin	0.45	mg	0.7 mg	+49
Niacin equivalents	6	mg	8.1 mg	+34
Vitamin C	13	mg	17.2 mg	+32

FDA GUIDELINES NOT SATISFACTORY

On March 14, 1973, the Food and Drug Administration promulgated regulations called nutritional quality guidelines for frozen "heat and serve" dinners (FDA, 1973). The manufacturer is in compliance if a minimum level of certain nutrients (shown in Table 7) is provided from specified servings of protein and vegetables (a total of three), specifically excluding the nutrient contribution of appetizer, bread or roll, dessert, soup, etc.

A specific example which negates the feasibility of these guidelines can be made for niacin. In our study, the average value of niacin per se for all 156 meals was 5.2 mg. However, when niacin was calculated in mg equivalents, accounting for the conversion of tryptophan from the more than adequate amounts of protein in these meals, the average percentage was above the 1/3 RDA goal by 60%. In fact, none of the 156 meals tallied was below the 1/3 RDA of 6.0 mg equivalents of niacin.

The FDA regulation requires that the total of the three principle components (meat, vegetable, and potato or rice) add up to a minimum of 3.4 mg of niacin. However, the niacin value would not meet this minimum even when the following menu combinations are made:

Macaroni and Cheese and Peas (1.0 mg)
Frankfurters, Corn, and Potatoes (3.0 mg)
Corned Beef, Potatoes, and Celery (1.3 mg)
Hamburger, Red Beans, and Tomatoes (2.3 mg)
Frankfurter, Beans, and Carrots (2.1 mg)
Beef, Peas, Potatoes, and Carrots Stew (2.9 mg)

We are at a loss to understand how the FDA arrived at the minimum guideline values.

In the same regulation, the FDA argues that the addition of vitamin C, and conceivably other RDA nutrients to such meals, would be "counterproductive from the standpoint of nutrition education." We do not believe that such a practice is counterproductive because the consumer looks for vitamin C fortification. It is probably one of the most successful aspects of nutrition education because the consumer knows he needs vitamin C.

We believe that in view of the American dietary needs for particular limiting nutrients, their addition to these meals would lead the consumer to correctly "conclude that such fortification increased the dietary value of the product." It is ironic that we are allowed to sell the consumer balanced pet foods but are given guidelines for "dinners" which do not permit a balanced product for humans.

RECOMMEND NUTRIFICATION

We are evidently faced with a faulty rationale; to wit, that nutrient deficiencies in the Type A school lunch can be made up in other meals fed to the child at home. Many parents depend upon school lunch, knowing that their children are receiving at least one balanced meal a day. Even knowledgeable parents who are attempting to supply their children with balanced meals assume that the school serves a balanced meal and would not try to make up any deficiencies. We believe a similar rationale has been applied to the frozen "heat and serve" dinners, in spite of the consumers' nutrition awareness to the contrary.

Table 7—**MINIMUM LEVELS OF NUTRIENTS** *specified in FDA's guidelines for frozen "heat and serve" dinners*

Nutrient	Amount per 100 kcal of principal components[a]	Amount per total principal components[a]
Protein (g)	4.60	16.0
Vitamin A (IU)	150.00	520.0
Thiamine (mg)	0.05	0.2
Riboflavin (mg)	0.06	0.2
Niacin (mg)	0.99	3.4
Pantothenic acid (mg)	0.32	1.1
Vitamin B_6 (mg)	0.15	0.5
Vitamin B_{12} (mcg)	0.33	1.1
Iron (mg)	0.62	2.2

[a] Meat, vegetable, and potato or rice

The nutritive imbalance of frozen preplated Type A meals we have reported confirms the observations of others (Ostenso, 1972). It would appear logical to promote the nutrification of such meals, particularly since evidence exists for non-optimal intakes of a number of the RDA nutrients, and since menu planning alternates are often not feasible from the viewpoint of acceptance and/or economics. The concept of nutrification is the practice of assuring balanced nutritive value for RDA nutrients on the basis of utilizable protein content in individual products or product situations wherein the protein source is invariably complemented by the product being nutrified (Lachance, 1972a).

Industry and government should be aware that nutrification of meals is feasible and suitable. Bread and rolls are suitable vehicles for calcium, iron, and other nutrients. Vegetable and entree sauces are suitable vehicles for vitamins A and E, thiamine, vitamins B_6 and B_{12}, and niacin, pantothenic acid, and biotin. Desserts are suitable vehicles for vitamin C. An alternate approach is to serve a menu component which is inherently nutrified (e.g., cream-filled cake, peanut butter pastry, pudding) to round out the nutritive value of the meal (Lachance et al., 1972).

The untoward fear of oversupplementation and marketing horsepower races is due to lack of experience. The simplest regulatory solution is to not permit nutrification above utilizable protein level or 50% of the U.S. RDA, whichever occurs first.

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Protein	+72.3
Niacin equivalents	+67.7
Riboflavin	+52.3

Table 3—**FREQUENCY (BY COMPANY)** *with which 156 Type A meals were below ⅓ RDA for specific nutrients*

	Frequency (%)		
Nutrient	Company A (N = 80)	Company B (N = 51)	Company C (N = 25)
Calories	82	100	100
Calcium	85	90	76
Phosphorus	38	28	8
Iron	100	98	100
Vitamin A	51	65	60
Thiamine	88	86	88
Vitamin C	10	24	32
Vitamin B_6	68	N/A	N/A

Table 4—**AVERAGE PERCENTAGE (BY COMPANY)** *by which 156 Type A meals were above or below ⅓ RDA for specific nutrients*

	Average percentage		
Nutrient	Company A (N = 80)	Company B (N = 51)	Company C (N = 25)
Calories	− 9	−29	−19
Calcium	− 7	− 8	+ 3
Phosphorus	+ 9	+ 8	+20
Iron	−49	−39	−40
Vitamin A	+11	+86	+15
Thiamine	−21	−23	−21
Vitamin C	+342	+72	+62
Vitamin B_6	−15	N/A	N/A
Protein	+78	+68	+71
Niacin equivalents	+74	+64	+65
Riboflavin	+53	+51	+53

One could argue that providing increased food quantities to meet the energy goal might also rectify some of the micronutrient deficiencies. This would, of course, depend upon the source of these calories. If they were to be derived from all the Type A food components, it might be significant. De-emphasis on dietary fat, particularly saturated fat, may have led to some of the observed deficit. In the final analysis, with one in five children in the U.S. being overweight (Deutsch, 1971), there appears to be little need for emphasis on calories.

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• **Calcium and Phosphorus.** Although the average percentage of calcium below the 1/3 RDA goal was found to be small (−4%), the frequency of meals below the 1/3 RDA goal was high. This occurs in spite of the mandated inclusion of a half-pint of milk in the Type A menu pattern requirement. This could be easily remedied with increased calcium fortification of standardized bread products, for which it is an optional enrichment practice.

More important is the invariably high phosphorus to calcium ratio. A substantial part of this imbalance, which should be reversed, is the result of the higher intakes of meat, poultry, and fish. To make matters worse, it is very likely that the other meals and snacks consumed daily also provide more phosphorus than calcium, further aggravating the phosphorus to calcium ratio.

• **Vitamins A and C.** The frequency of meals failing to provide 1/3 RDA for vitamins A and C should also be of concern, even though on the average the levels appeared to be adequate. Vitamin C has a short biological half life (Hodges et al., 1971), and since many children do not have breakfast or have an inadequate breakfast (Bauman, 1971), the daily sources of vitamin C are often compromised. Furthermore, the vegetables providing some vitamin C are often rejected by children.

Only 10% of the meals of Company A were below 1/3 RDA for vitamin C. All of these meals contained an unfortified commodity fruit product—applesauce. The other meals included a fortified gelatin or pudding product. One additional meal contained applesauce, but the mashed potatoes had been fortified with vitamin C (56.2 mg of ascorbic acid per 100 g).

Although vitamin A is known to be dynamically stored in the liver, the average American intake (and therefore body stores) is considered marginal (Raica et al., 1972). As with vitamin C, we are faced with the vegetable component of the diet being a significant source of the vitamin (Hansen, 1971). It would appear wiser to have all Type A meals assure a minimum quantity of the vitamin.

NUTRIENT STANDARD MEALS

One solution to the problem is to adopt a nutrient standard for meals based on the RDA, as advocated by the White House Conference on Food, Nutrition and Health. Such a guideline has been adopted by HEW for its elderly feeding programs (HEW, 1972a). The need for a nutrient standard definition can best be demonstrated by specific example meals:

• Table 5 provides a nutrient profile for the following menu:

Macaroni and Cheese
Peas
Peaches in Gelatin
Enriched Roll
Butter or Margarine
Whole Milk

This meal does not meet the Type A requirement for protein, but exceeds 1/3 RDA for protein by 50%. It also meets the 1/3 RDA for calcium and vitamin A but is low in iron. Substitution of the whole milk with an instant breakfast-type preparation; higher fortification of the bread and macaroni with iron; inclusion of iron in the dessert component; and/or substitution of a nutrified dessert such as a cream-filled cake would resolve the iron problem.

• Table 6 provides the nutrient profile for the following menu:

Frankfurter
Cooked Beans
Apple
Potato Salad
Enriched Bread
Butter or Margarine
Whole Milk

This meal is lacking in vitamin A and iron. A realistic vehicle for enhancing the vitamin A would be to use a tomato sauce in the cooked beans rather than a sugar-based sauce. This could also be accomplished by a change in choice of dessert.

It should be evident that a nutrient definition does not assure acceptable organoleptic characteristics, just as the specification of particular commodities does not assure a balanced nutritive value. With the combination of both nutritive and broad menu planning specifications, however, it becomes possible to assure nutritive value and enhance organoleptic acceptance, i.e., match the preferences of the market better.

Table 5—**NUTRIENT PROFILE** *for Macaroni, Cheese meal*

Nutrient	1/3 RDA	Meal	Percentage by which meal is above or below 1/3 RDA
Calories	835 kcal	642.4 kcal	−23
Protein	17 g	25.5 g	+50
Calcium	400 mg	594.0 mg	+49
Phosphorus	400 mg	510.6 mg	+28
Iron	6 mg	2.4 mg	−60
Vitamin A	1,500 IU	1,762 IU	+17
Thiamine	0.45 mg	0.4 mg	− 5
Riboflavin	0.45 mg	0.8 mg	+73
Niacin equivalents	6 mg	6.8 mg	+14
Vitamin C	13 mg	14.6 mg	+13

Table 6—**NUTRIENT PROFILE** *for Frankfurter, Beans meal*

Nutrient	1/3 RDA	Meal	Percentage by which meal is above or below 1/3 RDA
Calories	835 kcal	697.7 kcal	−16
Protein	17 g	24.9 g	+47
Calcium	400 mg	367.4 mg	− 8
Phosphorus	400 mg	473.9 mg	+18
Iron	6 mg	4.3 mg	−28
Vitamin A	1,500 IU	585.9 IU	−61
Thiamine	0.45 mg	0.4 mg	− 7
Riboflavin	0.45 mg	0.7 mg	+49
Niacin equivalents	6 mg	8.1 mg	+34
Vitamin C	13 mg	17.2 mg	+32

FDA GUIDELINES NOT SATISFACTORY

On March 14, 1973, the Food and Drug Administration promulgated regulations called nutritional quality guidelines for frozen "heat and serve" dinners (FDA, 1973). The manufacturer is in compliance if a minimum level of certain nutrients (shown in Table 7) is provided from specified servings of protein and vegetables (a total of three), specifically excluding the nutrient contribution of appetizer, bread or roll, dessert, soup, etc.

A specific example which negates the feasibility of these guidelines can be made for niacin. In our study, the average value of niacin per se for all 156 meals was 5.2 mg. However, when niacin was calculated in mg equivalents, accounting for the conversion of tryptophan from the more than adequate amounts of protein in these meals, the average percentage was above the 1/3 RDA goal by 60%. In fact, none of the 156 meals tallied was below the 1/3 RDA of 6.0 mg equivalents of niacin.

The FDA regulation requires that the total of the three principle components (meat, vegetable, and potato or rice) add up to a minimum of 3.4 mg of niacin. However, the niacin value would not meet this minimum even when the following menu combinations are made:

Macaroni and Cheese and Peas (1.0 mg)
Frankfurters, Corn, and Potatoes (3.0 mg)
Corned Beef, Potatoes, and Celery (1.3 mg)
Hamburger, Red Beans, and Tomatoes (2.3 mg)
Frankfurter, Beans, and Carrots (2.1 mg)
Beef, Peas, Potatoes, and Carrots Stew (2.9 mg)

We are at a loss to understand how the FDA arrived at the minimum guideline values.

In the same regulation, the FDA argues that the addition of vitamin C, and conceivably other RDA nutrients to such meals, would be "counterproductive from the standpoint of nutrition education." We do not believe that such a practice is counterproductive because the consumer looks for vitamin C fortification. It is probably one of the most successful aspects of nutrition education because the consumer knows he needs vitamin C.

We believe that in view of the American dietary needs for particular limiting nutrients, their addition to these meals would lead the consumer to correctly "conclude that such fortification increased the dietary value of the product." It is ironic that we are allowed to sell the consumer balanced pet foods but are given guidelines for "dinners" which do not permit a balanced product for humans.

RECOMMEND NUTRIFICATION

We are evidently faced with a faulty rationale; to wit, that nutrient deficiencies in the Type A school lunch can be made up in other meals fed to the child at home. Many parents depend upon school lunch, knowing that their children are receiving at least one balanced meal a day. Even knowledgeable parents who are attempting to supply their children with balanced meals assume that the school serves a balanced meal and would not try to make up any deficiencies. We believe a similar rationale has been applied to the frozen "heat and serve" dinners, in spite of the consumers' nutrition awareness to the contrary.

Table 7—**MINIMUM LEVELS OF NUTRIENTS** *specified in FDA's guidelines for frozen "heat and serve" dinners*

Nutrient	Amount per 100 kcal of principal components[a]	Amount per total principal components[a]
Protein (g)	4.60	16.0
Vitamin A (IU)	150.00	520.0
Thiamine (mg)	0.05	0.2
Riboflavin (mg)	0.06	0.2
Niacin (mg)	0.99	3.4
Pantothenic acid (mg)	0.32	1.1
Vitamin B_6 (mg)	0.15	0.5
Vitamin B_{12} (mcg)	0.33	1.1
Iron (mg)	0.62	2.2

[a] Meat, vegetable, and potato or rice

The nutritive imbalance of frozen preplated Type A meals we have reported confirms the observations of others (Ostenso, 1972). It would appear logical to promote the nutrification of such meals, particularly since evidence exists for non-optimal intakes of a number of the RDA nutrients, and since menu planning alternates are often not feasible from the viewpoint of acceptance and/or economics. The concept of nutrification is the practice of assuring balanced nutritive value for RDA nutrients on the basis of utilizable protein content in individual products or product situations wherein the protein source is invariably complemented by the product being nutrified (Lachance, 1972a).

Industry and government should be aware that nutrification of meals is feasible and suitable. Bread and rolls are suitable vehicles for calcium, iron, and other nutrients. Vegetable and entree sauces are suitable vehicles for vitamins A and E, thiamine, vitamins B_6 and B_{12}, and niacin, pantothenic acid, and biotin. Desserts are suitable vehicles for vitamin C. An alternate approach is to serve a menu component which is inherently nutrified (e.g., cream-filled cake, peanut butter pastry, pudding) to round out the nutritive value of the meal (Lachance et al., 1972).

The untoward fear of oversupplementation and marketing horsepower races is due to lack of experience. The simplest regulatory solution is to not permit nutrification above utilizable protein level or 50% of the U.S. RDA, whichever occurs first.

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