APPENDIX V-m

PN-AAS-568
ISN 39956

Utilization of the Protein and Energy of the
White Potato by Human Infants

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SUBJECT:

Progress Report - February 29, 1980
Research Contract AID/ta-C-1286
Clinical Assay of High Protein Foods

ABSTRACT

The digestibility and protein quality of the white potato were studied in eleven infants, ages 8-35 months, recovering from malnutrition. Seven nine-day dietary periods comprised a study. Digestibility (nine studies) was assessed by metabolic balance during the last six days of dietary periods in which potato provided 25%, 50% or 75% of dietary energy. Casein-based control dietary periods preceded and/or followed each potato dietary period. Fecal wet and dry weights, fecal energy, computed fecal carbohydrate and fecal fat during consumption of the 25% potato did not differ from control. Analysis of variance showed that consumption of increasing amounts of potatoes produced a significant linear increase in all parameters of digestibility except fecal fat. Fecal wet weight and energy content during the 75% potato period were more than double control values. Regression analysis of data from potato dietary periods showed fecal wet weight to be an excellent predictor of fecal dry weight ($r=0.904$), energy content ($r=0.785$) and computed fecal carbohydrate ($r=0.770$). Protein quality of potato was assessed with N balance studies during the dietary periods in which potato provided all dietary protein ($\sim$5% protein Kcal). Apparent N retention during eleven studies was 78.2% of that from an isonitrogenous casein control diet. Decreased apparent N absorption was primarily responsible for the difference; the "biologic value" (% of absorbed N that was retained) was similar for both diets.

Key Words

Protein quality
Potato
Infant Nutrition

INTRODUCTION

The white potato is the fourth leading world food crop after wheat, rice and maize. In terms of calories produced per unit area of land it exceeds all the cereals and stands only behind sugar cane. Potato is also an important source of protein: yield per unit area is superior to the cereal grains and second only to soybeans. Despite this fact, potato is popularly thought of only as a source of starch in the diet. In the United States potato contributes more than two percent of total dietary protein, compared with the three percent provided by fish and six percent supplied by eggs (1).

Originally from the Andean region of South America, the potato is now grown world-wide. Paradoxically, in this area of South America, approximately fifty percent of children under five years of age have moderate to severe forms of malnutrition (2). This prevalence owes primarily to early weaning and the lack of suitable weaning foods, both of which combine to initiate the vicious cycle of diarrhea, malabsorption and malnutrition. To determine the potential of the potato as a food for weaned infants, studies were carried out to evaluate clinical tolerance, overall digestibility, and protein quality of increasing amounts of potatoes in the diet of human infants.

MATERIALS AND METHODS

Subjects. Eleven Peruvian male infants participated in the study (Table 1). Mean age (± S.D.) was 15.7±7.1 months with a range from 8 to 35 months. All had been admitted to the Instituto de Investigacion Nutricional for treatment of severe malnutrition and its acute complications. All had passed the acute phase of treatment and were remaining in hospital to consolidate recuperation and prevent relapse. At the beginning of the study the following criteria were fulfilled by

all infants: free of infection and diarrhea, no evidence of malabsorption in previous metabolic balance studies, adequate weight gain while consuming 100-125 Kcal/kg body weight/day and stable serum albumin concentration above 3.6 g/dl. Nine children participated in studies of both digestibility and protein quality. Two children (#'s 579 and 533) participated only in the studies of protein quality.

Diets. Potato has a natural variability in protein content that is dependent on several factors such as variety, soil fertility and growing conditions. It is well known that commercial varieties grown under the same environmental conditions also vary in protein content (3). In an attempt to avoid these problems of variability a single batch of oven-dried potatoes of approximately 80 kg was processed and provided by the Centro Internacional de la Papa (International Potato Center) in Lima. Oven-dried potatoes were selected after a preliminary study showed no differences in digestibility when compared to fresh or lyophilized potatoes. Mariva potatoes (Solanum Tuberosum ssp. andigena) were cooked in boiling water for 30 minutes, peeled and cut. This material was dried in an oven at 40±2°C for 20 hours, and milled in a hammer mill. Protein content (N x 6.25) of the dehydrated material was 5.75 g/100 g.

Although nine studies had been planned, the quantity of potatoes provided proved to be sufficient to carry out only seven. Following the completion of these, a new batch of the same variety of potatoes was obtained. Analysis of the dehydrated material revealed a protein content of 9.13 g/100 g, considerably higher than the original lot used.

Studies of Digestibility

Study Diets. Three diets providing increasing amounts of potato were designed (Table 2). Twenty-five percent, 50% or 75% of total energy was provided by potato in each diet. In the 25% and 50% diets, nitrogen (N) content was adjusted to 256.0 mg per 100 Kcal (6.4% protein-energy) by the addition of casein. In the 75% diet all N was provided by potato. A blend (80:20) of soybean-cottonseed oil was added to all three diets to provide 25% of energy as fat. The remaining energy was supplied by sucrose in the 25% and 50% diets.

When the second batch of potatoes was obtained, the same percentages of dietary energy provided by potato was maintained in order to study digestibility. The percentages of energy as fat and sucrose were also unchanged. The 25% diet was adjusted as in the previous batch, to 256.0 mg N per 100 Kcal (6.4% protein-energy) by the addition of casein. Because of the higher protein content of this batch, all N in the 50% and 75% diets was provided by potato. N content of the 50% diet was 207.0 mg per 100 Kcal (5.1% protein-energy), that of the 75% diet, 285.2 mg per 100 Kcal (7.1% protein-energy).

Control Diets. Three control diets were prepared, providing 256.0, 201.3, and 285.2 mg of nitrogen from casein per 100 Kcal. The same oil blend was used to provide 25% of energy as fat. The remaining energy of the control diets was provided by sucrose and cornstarch in nearly equal amounts. Cornstarch was added to avoid excessive sweetness and to parallel more closely the carbohydrate in the potato diets.

All diets were supplemented with vitamins and minerals to meet or exceed U.S. Recommended Dietary Allowances (4). Sodium intake was

fixed at 2 mEq/kg body weight/day. Potassium intakes varied from 6 to 10 mEq/kg body weight/day according to the amount of potato in the diet. Diets were prepared in a blenderized form at a concentration of approximately 0.67 Kcal/ml. Diet analysis for N, Na and K was performed regularly throughout the studies to assure that intakes were as calculated. Total energy content of the diets was also determined regularly by bomb calorimetry (5).

Studies of Protein Quality

Accurate assessment of protein digestibility and utilization required that balance studies be carried out with diets providing only potato protein at marginal levels of intake. The two diets in which potato provided approximately 5% protein-energy were used for these comparisons. This was the 75% potato-energy diet with the first batch of potatoes (seven studies) and the 50% potato-energy diet with the second batch (four studies). N balance while consuming these two diets was compared with that while consuming the isonitrogenous casein control diets.

Study Design and Analysis

Each 63-day study consisted of seven nine-day dietary periods in one of nine possible sequences (Table 3). The use of three levels of potato intake allowed assessment of tolerance to and digestibility of increasing amounts of the carbohydrate components of potato and permitted comparison of the three potato diets with their controls and with each other. Each potato dietary period was preceded and/or followed by an appropriate control diet. Because protein quality was to be assessed during the consumption of the 75% potato diet with the first batch and during the 50% potato diet

with the second batch each of these periods was always preceded and followed by a control diet of the same N content. Two additional patients participated only in the studies of protein quality with batch 2 and received only the 50% potato diet, with preceding and following corresponding control dietary periods.

All children consumed from 100 to 125 Kcal/kg body weight/day. This intake was constant for each child throughout the study and was recalculated at the beginning of each dietary period. Energy intake was based on that previously shown to maintain each child's rate of weight gain in an acceptable range (3 to 7 g/kg body weight/day). After a three-day period of adaptation to each diet a six-day metabolic balance was carried out using methods standard for the unit (6). Urine and stool were collected separately in three-day pooled collections. Serum total protein (Biuret) and albumin (acetate gel electrophoresis) concentrations were measured at the beginning of the study and at the end of each successive dietary period. Urinary and fecal N were determined by the micro-Kjeldahl method (7). Feces were weighed both wet and dry. Fecal fat was determined by the method of Van de Kamer et al (8). Total fecal energy content was measured by bomb calorimetry (5) and the carbohydrate content of stool was then computed using the formula:

$$\text{Fecal CHO g} = \frac{E - (N\ g \times 6.25 \times 5.65) - (\text{Fat g} \times 9.4)}{4.15}$$

where CHO = carbohydrate in grams, E = fecal energy by bomb calorimetry, N = fecal nitrogen in grams, fat = fecal fat in grams, and 5.65, 9.4 and 4.15 are the accepted energy conversion factors for protein, fat and carbohydrate, respectively (9).

Stool wet and dry weight, fecal fat and computed fecal carbohydrate were used to estimate apparent digestibility. All of these were first analyzed by a "t" test to ascertain if the value while consuming potato minus the appropriate control value (or the average of both corresponding control values where there were two) differed significantly from zero. Further analysis was then carried out by analysis of variance blocking on subjects and treatments with orthogonal contrasts among the treatment means (10). This analysis was carried out in two ways: using the absolute treatment value, or the treatment value minus the appropriate control value (or the average of the two surrounding control values). Least squares linear regression analysis was used to correlate stool wet and dry weight with fecal energy content, fecal fat and computed fecal carbohydrates. This was first carried out separately for the potato and control diets. These relationships for both diets were then further compared by analysis of covariance (11). Values of P of less than 0.05 were accepted as significant. Apparent absorptions and retentions of nitrogen were calculated for the two potato dietary periods used to assess protein quality and were compared with the preceding and following corresponding control values by a two-tailed paired "t" test.

RESULTS

Digestibility

The diets were generally well tolerated and all children consumed the total volume planned for each diet, although in some cases the time to consume the 75% potato diet was noted to increase during the last days of this metabolic period. No adverse reactions such as vomiting or diarrhea were noted.

Digestibility data and their statistical analysis are summarized in Table 4. Analysis by "t" test comparing the values of the control periods that preceded the 25% and 50% potato periods with those that followed, and comparisons of the preceding and following control periods of the 75% potato diet with each other, showed no statistical differences in any of the five parameters used to assess digestibility. Treatment values for the five parameters used to assess digestibility were further compared by "t" test to corresponding control values at 25%, 50% and 75%. During the consumption of the 25% potato diet none of the parameters was found to differ significantly from control values. All parameters, except fecal fat, were significantly elevated relative to control during the 50% and 75% potato dietary periods. Fecal fat was significantly less than control values during the 50% and 75% potato dietary periods.

Further analysis of these data by analysis of variance (Table 5) indicated that consumption of increasing amounts of potato produced a significant linear increase in all parameters except one: fecal fat. Fecal fat did not change significantly among the three levels of potato intake. Linear regression analysis of digestibility data from all three potato periods showed a highly significant correlation between fecal wet and dry weights (Table 6). Both fecal wet and dry weights were good predictors of fecal energy and computed fecal carbohydrate. These last two parameters were also highly correlated with each other. There was no correlation between stool fat and any of the other parameters. Regression analysis of data from all control diets showed similar relationships with the exception of stool fat,

which showed significant relationships with stool dry, wet and fecal energy. In those instances in which significant relationships between the same two parameters were found for both potato and control diets, analysis of covariance was carried out to determine if there was a difference in the regression lines of the two diets. No differences were demonstrated.

Protein Quality

Apparent absorption of nitrogen during the consumption of diets in which potato provided all nitrogen differed significantly from values obtained during corresponding control periods (Table 7). In the first seven studies apparent nitrogen absorption during the consumption of the 75% potato energy diet was significantly less than that during the preceding and following control periods. In the final four studies with the 50% potato-energy diet a significant difference was found only between the treatment and the following control period. No significant difference between preceding and following control periods was found in either group.

Apparent retention of nitrogen obtained with the same two diets was, as might be expected, inferior to casein. With the 75% potato-energy diet the difference from the preceding and following controls was significant. In the four patients in whom protein quality was evaluated during the consumption of the 50% potato energy diet apparent nitrogen retention was significantly less when compared to the following casein control period. In both groups the mean apparent nitrogen retention during the following control periods was higher than that during the preceding control periods but the differences were not

statistically significant. When the eleven studies in which potato provided all nitrogen were combined, apparent nitrogen retention was 78.2% of the mean of the casein control values.

DISCUSSION

Results of these studies show that potatoes can be used successfully to supply a substantial part of the daily requirements for both protein and energy in the diets of infants and small children. The consumption of large amounts of potatoes may be limited by bulk and by carbohydrate digestibility. The increases in stool weight, for example, with increasing amounts of potato are greater than we have previously reported for wheat pasta (12).

The analysis of digestibility was based on the assumption that the digestion and absorption of casein, vegetable oil and sucrose is almost complete or that it remains constant for each child throughout the study. Granting this to be valid, changes in stool parameters used to assess digestibility could be directly related to the amount of potato in the diet. Consumption of increasing amounts of potatoes was associated with a linear increase of stool wet weight, stool dry weight and losses of carbohydrates and energy in feces. Energy losses during the consumption of the 25%, 50% and 75% potato diets, expressed as a percentage of increase over control diets, were 13.1%, 50.1% and 116.1% respectively. This represents 5.8%, 7% and 10.5% of the total energy intake for each diet, respectively. These changes across the three levels of potato intake reflect a decrease in the percentage digestibility of carbohydrate. When viewed in terms of energy and osmotically induced water and electrolyte losses, these diet related

changes could be considered of nutritional significance, especially in small children consuming considerable amounts of potato in their diets. Comparing the results of this study with our previous studies carried out with wheat pasta and rice (12, 13), carbohydrate digestibility of potato was found to be inferior to both. Other investigators reached a similar conclusion when potato starch in the form of biscuits was fed to infants (14).

Fat digestibility was almost complete at all three levels of potato intake and showed no correlation with any of the other parameters used to assess digestibility. This is not surprising since virtually all fat was supplied by the addition of vegetable oil. The significant correlation found by regression analysis of stool fat on both stool dry weight and fecal energy from control dietary periods is probably due to the fact that in the control diets, because of the excellent digestibility of casein and sucrose, stool dry weight and stool energy are more determined by stool fat than they are in the potato diets. As in previous studies done with staple foods, a strong linear correlation between stool wet weight, stool dry weight and stool energy content was found (12, 13). These parameters, especially stool wet weight, can be very useful to assess the overall digestibility of diets with considerable proportions of staple foods.

Apparent N absorption during the consumption of the 75% potato diet was only 79.1% of the average of the casein control diets. This relatively poor apparent N absorption is similar to that obtained with rice (78% of that from casein), in which virtually 100% of the N is contained in poorly digestible protein bodies (14). Potato, in contrast

contains approximately half of its nitrogen in the form of water soluble compounds (16). The apparently superior digestibility found with the second batch of potatoes (92.2% of casein control) may be due to the fact that approximately half of the increased nitrogen in such potatoes is in the form of free amino acids.

Potato protein is generally considered to be well balanced in amino acid composition, although there is evidence that sulfur-containing amino acids may be first limiting for human nutrition (17). Apparent retention of N during all eleven studies in which potato provided all nitrogen (5.0 to 5.1% protein-energy) was, as might be expected, inferior to casein. The increase in apparent N retention during the control period following the study diet suggests a compensatory retention of nitrogen, although when compared to the preceding control period, the difference was not statistically significant. Apparent retention of nitrogen seemed to be limited in large part by the amount of nitrogen absorbed. When the "biologic value" of potato protein (apparent N retention as a percentage of absorbed nitrogen) was calculated, this was 49% for potato protein (mean of all casein periods, 53%). Comparing the results of these studies with those of previous studies carried out with wheat pasta and rice, potato protein quality expressed as a percentage of apparent N retention from casein (78.2%) was better than both rice (76%) and wheat pasta (51%).

One problem encountered in carrying out these studies was the large difference in N content of the two batches used. Experience with other staples has suggested that an increase in protein content is often associated with a decrease in protein quality (18). Our N

balance data do not suggest a major difference between the two batches in terms of protein quality, although the number of children studied with the second batch is insufficient to reach a final conclusion.

Although the mean age of the children who participated in these studies is above one year, their lower "biological" age and their high protein and energy requirements for catch-up growth allow some generalization to the weaning age. A diet containing 75% of energy as potato is close to the maximum intake of this staple that can be tolerated by children. Based on bulk stool output and fecal energy losses, exceeding 50% of energy as potato may be impractical. The white potato could be a useful weaning food in developing countries at this level if adequate nitrogen content of the potato is assured.

ACKNOWLEDGEMENTS

This study was supported by Research Grant AM HD 10111-03 from the National Institutes of Health, U.S.P.H.S. and by Research Contract AID/ta-C-1286 with the Agency for International Development, United States Department of State. The International Potato Center, Lima, Peru, generously provided all potatoes used in these studies.

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Table 1

Characteristics of subjects participating in the study

Pt. No.	Age mos.	Weight kg	Length cm	Serum Albumin g/dl Initial	Serum Albumin g/dl Final
527	14	7.98	72.3	3.7	4.1
533*	35	11.10	85.0	4.0	3.9
536	15	8.21	71.7	3.6	3.8
538	15	8.21	70.0	3.9	4.3
542	13	8.75	72.0	4.0	4.6
548	12	7.62	68.7	3.8	3.7
550	17	6.79	65.0	4.2	3.9
554	10	7.49	69.5	4.0	4.0
558	8	4.93	61.5	3.8	3.9
571	15	7.25	68.3	4.5	4.2
579*	19	9.95	75.3	3.8	3.9

* These patients participated only in the protein quality studies.

Table 2

Composition of study and control diets (per 100 Kcal) used for the initial seven studies[1,2]

	25% Potato	50% Potato	Control 1	75% Potato	Control 2
Potato - g	7.29	14.58	--	21.87	--
N - mg	67.10	134.20	--	201.30	--
Energy - Kcal	25.00	50.00	--	75.00	--
Ca Caseinate[3] - g	1.37	0.88	1.86	--	1.46
N - mg	188.90	121.80	256.00	--	201.30
Energy - Kcal	5.10	3.26	6.90	--	5.40
Sucrose - g	11.20	5.40	8.50	--	8.70
Energy - Kcal	44.90	21.70	34.00	--	34.80
Cornstarch - g	--	--	9.6	--	9.8
Energy - Kcal	--	--	34.1	--	34.8
Soybean-Cottonseed Oil - ml	2.8	2.8	2.8	2.8	2.8
Energy - Kcal	25.0	25.0	25.0	25.0	25.0
Totals					
N - mg	256.0	256.0	256.0	201.30	201.30
Protein-(Nx6.25) % Energy	6.4	6.4	6.4	5.03	5.03
Energy - Kcal	100.0	100.0	100.0	100.0	100.0

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1 Minerals were supplemented in all diets to provide intakes of 2 mEq Na/kg body weight/day using a mineral mixture without potassium of the following composition (W/W): NaCl, 30.701%; $MgSO_4 \cdot 7H_2O$, 22.804%; $CaHPO_4$, 41.615%; $FeC_6H_5O_7 \cdot 3H_2O$, 3.549%; $CuSO_4 \cdot 5H_2O$, 0.625%; $ZnSO_4 \cdot 7H_2O$, 0.355%; $MnSO_4 \cdot H_2O$, 0.277%; KI 0.025%; NaF 0.50%.

2 Vitamins were supplemented by a single daily dose of 0.6-1.2 ml of Poly-Vi-Sol, Mead Johnson, Evansville, Indiana. The composition (per ml) of this preparation is as follows: retinyl palmitate, 1500 IU; ergocalciferol, 400 IU; Vitamin E, 5 IU; Ascorbic acid, 35 mg; thiamin, 0.5 mg; riboflavin, 0.6 mg; niacin, 8 mg; Vitamin B_6 0.4 mg, Vitamin B_{12}, 2 µg. Patients also received a single daily dose of choline chloride 191 mg; Inositol 180 mg; folic acid 200 µg; PABA 500 mg.

3 Casec, Mead Johnson, Evansville, Indiana 47721. 1.88 g Casec were used to provide 1.6 g casein.

Table 3

Sequence of dietary periods[1]

A.	Control 2[2]	75% P	Control 2	Control 1	50% P	Control 1	25% P
	Control 2	75% P	Control 2	Control 1	25% P	Control 1	50% P
	Control 1	50% P	Control 2	75% P	Control 2	Control 1	25% P
	Control 1	50% P	Control 1	25% P	Control 2	75% P	Control 2
	Control 1	25% P	Control 1	50% P	Control 2	75% P	Control 2
	Control 1	25% P	Control 2	75% P	Control 2	Control 1	50% P
B.	Control 1	25% P	Control 3	75% P	Control 2	50% P	Control 2
	Control 3	75% P	Control 2	50% P	Control 2	Control 1	25% P
C.	Control 2	50% P	Control 2				

A. Sequence of dietary periods followed by the first seven patients. Composition of potato and control diets are shown in Table 2.

B. Sequences followed by two patients using the second batch of potatoes. 25% P, Control 1 and Control 2 diets are the same as used with the first batch. 50% P diet is isonitrogenous (5.1% protein-energy) to the 75% P diet of the previous batch and used to assess protein quality. 75% P and Control 3 were designed to evaluate energy digestibility only.

C. Sequence followed by two patients (#'s 579 and 533) to assess protein quality with the second batch of potatoes. Diets are as in (B.).

1 Underlined periods were used to assess protein quality

2 This sequence was used two times. All others once.

Table 4

Summary of digestibility data at three levels of potato intake

	Casein Control[1] (n=9)	25% Potato-Energy (n=9)	50% Potato-Energy (n=9)	75% Potato-Energy (n=9)	Casein Control[2] (n=9)
Stool Wet Weight-g/d	85.3 ±33.8	91.5 ±32.5	148.2[a] ±40.5	238.5[a] ±65.2	108.1 ±56.8
Stool Dry Weight-g/d	12.2 ± 3.6	12.8 ± 3.8	19.0[a] ± 4.6	30.2[a] ± 6.9	12.5 ± 4.3
Stool Energy Kcal/day	48.9 ±15.8	55.3 ±19.4	73.6[b] ±15.2	108.9[a] ±35.9	50.4 ±14.8
Stool Fat % Intake	7.7 ± 2.5	5.9 ± 2.0	5.2[c] ± 4.0	4.8 ± 1.5	8.4 ± 4.8
Stool CHO g/d	4.1 ± 2.3	5.8 ± 3.8	10.3[a] ± 3.1	16.9[a] ± 7.4	5.4 ± 4.6

[1] Average value for all the corresponding control periods surrounding 25% and 50% potato

[2] Average value for all the corresponding control periods surrounding 75% potato

[a] Significantly different from corresponding control period by "t" test, $P<0.001$

[b] Significantly different from corresponding control period by "t" test, $P<0.01$

[c] Significantly different from corresponding control period by "t" test, $P<0.05$

Table 5

Analysis of variance of digestibility data*

	df	SSQRS†	MS**	F	P
			Stool Wet Weight		
Treatment	2	67330.81250	33665.40625	47.44	<0.001
linear	1	66619.87500	66619.87500	93.87	<0.001
quadratic	1	710.95654	710.95654	1.00	N.S.
Subjects	9	20753.10547	2594.13818	3.66	0.015
Error	15	10645.73828	709.71587		
			Stool Dry Weight		
	df	SSQRS	MS	F	P
Treatment	2	1240.92236	620.46118	64.88	<0.001
linear	1	1188.43091	1188.43091	124.28	<0.001
quadratic	1	52.49182	52.49182	5.49	<0.050
Subjects	9	125.65572	15.70696	1.64	N.S.
Error	15	143.44150	9.56277		
			Fecal Energy		
	df	SSQRS	MS	F	P
Treatment	2	11344.76563	5672.38281	15.77	<0.005
linear	1	10948.57031	10948.57031	30.44	<0.001
quadratic	1	396.19678	396.19678	1.10	N.S.
Subjects	9	4821.93750	602.74219	1.68	N.S.
Error	15	5395.71484	359.71432		
			Stool Fat % Intake		
	df	SSQRS	MS	F	P
Treatment	2	8.62135	4.31068	0.47	N.S.
linear	1	7.03899	7.03899	0.77	N.S.
quadratic	1	1.58237	1.58237	0.17	N.S.
Subjects	9	125.54002	15.69250	1.71	N.S.
Error	15	137.89565	9.19304		
			Computed Fecal Carbohydrate		
	df	SSQRS	MS	F	P
Treatment	2	8665.06641	4332.53125	17.59	<0.0010
linear	1	8608.73828	8608.73828	34.95	<0.0005
quadratic	1	56.33130	56.33130	0.23	N.S.
Subjects	9	4282.48047	535.31006	2.17	N.S.
Error	15	3694.48413	246.29894		

* Analyses presented are those for the treatment value minus the appropriate control period value (or the average when these were two) at 25%, 50% and 75% potatoes.

† Sum of squares

** Mean square

Table 6

Linear regression analysis and analysis of covariance of parameters of digestibility of the potato and casein control diets

	Regression Equation	r	P
Stool Wet Weight (Y)			
Stool dry weight (x)			
Potato	Y = 7.86x - 2.48	0.904	<0.0001
Casein	Y = 8.26x - 6.34	0.719	<0.0001
Potato vs. Casein			N.S.
Fecal Energy (x)			
Potato	Y = 1.82x + 15.98	0.785	<0.0001
Casein	Y = 1.77x + 11.02	0.608	<0.0001
Potato vs. Casein			N.S.
Fecal Fat (x)			
Potato	--	0.034	N.S.
Casein	--	0.217	N.S.
Potato vs. Casein			--
Fecal CHO (x)			
Potato	Y = 2.10x + 64.5	0.770	<0.001
Casein	Y = 2.10x + 58.32	0.501	<0.0002
Potato vs. Casein			N.S.
Stool Dry Weight (Y)			
Fecal Energy (x)			
Potato	Y = 0.24x + 1.86	0.892	<0.0001
Casein	Y = 0.22x + 1.40	0.904	<0.0001
Potato vs. Casein			N.S.
Fecal Fat (x)			
Potato	--	0.010	N.S.
Casein	Y = 1.77x + 8.68	0.342	<0.02
Potato vs. Casein			
Fecal CHO (x)			
Potato	Y = 0.267 + 8.54	0.851	<0.001
Casein	Y = 0.28x + 7.45	0.756	<0.0001

Table 6 (Cont'd)

	Regression Equation	r	P
Fecal Energy (Y)			
Fecal Fat (x)			
Potato		0.153	N.S.
Casein	Y = 11.24x + 25.05	0.534	<0.0001
Potato vs. Casein			—
Fecal CHO (x)			
Potato	Y = 1.14x + 27.31	0.967	<0.001
Casein	Y = 1.17x + 28.53	0.786	<0.0001
Potato vs. Casein			N.S.

Table 7

Summary of nitrogen balance studies

	5.03% Protein-Energy (n=7)			5.10% Protein-Energy (n=4)		
	Control 2	75% Potato	Control 2	Control 3	50% Potato	Control 3
Apparent N Absorption % of Intake	82.9 ±3.2	65.9[a] ±3.7	83.8 ±4.5	80.5 ±9.2	75.6[b] ±6.7	83.5 ±6.9
Apparent N Retention % of Intake	41.9 ±5.5	33.9[a] ±5.6	46.1 ±4.8	39.4 ±8.5	34.3 ±8.8	46.8 ±4.3

[a] Differs from preceding and following control periods, $P<0.02$

[b] Differs from following control period, $P<0.02$

[c] Differs from following control period, $P<0.05$