APPENDIX V-

PN-AAS-574

Digestibility and Utilization of Extrusion-Cooked

CORN-SOY BLENDS

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SUBJECT:

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INTRODUCTION

These studies were carried out for a dual purpose. The first was to evaluate the quality of the protein in a 70/30 blend of degerminated corn and dehulled soy cooked on low-cost extruders. The second was to examine the digestibility by infants of 70/30 blends of whole corn and dehulled soy (CSB#2) and whole corn-whole soy (CSB#3).

In the first part of the study the 70/30 blend of degerminated corn and dehulled soy (CSB#1) was compared with casein at a critical 6.4% protein-calories in nine convalescent malnourished male infants. In the second part of the study the same nine infants received all three blends in consecutive periods, each providing 50% of total calories in the diet and 100% of the 8.36 to 8.72% protein-calories.

MATERIALS AND DIETS

Table I lists the identification, proximate analysis, and corrected PER's of the three blends. This information was provided by Dr. G. Richard Jansen of Colorado State University, who supplied the three blends. Both the proximate analyses and the PER's of the three blends are similar, with the notable exception of fiber content, which increases from 0.8 to 1.9 to 2.3% in the three blends. The PER's were all indicative of satisfactory nutritional value.

For the CSB#1 diets in the first part of the study, an 80/20 blend of soy and cottonseed oils and cane sugar were added so that 52% of non-protein calories came from fat and 48% from carbohydrate. For the casein control diets, the same vegetable oil, cornstarch, and cane sugar were added to arrive at the same protein, fat and carbohydrate proportions. This same proportion of cane sugar to other carbohydrates was maintained. In the CSB#1 diets part of the fat came from the

product itself, representing a mixture of corn and soy oil.

Vitamin and mineral mixtures were added to the diets in both phases of the study to satisfy the recommended dietary allowances.

In the second phase of the study, in which each of the corn-soy blends supplied 50% of total diet calories, enough of the 80/20 soy-cottonseed oil blend and cane sugar were added to complete 52% of non-protein calories as fat and 48% as carbohydrate.

SUBJECTS

Table II lists the ages, heights and weights of the nine infants. The heights and weights have also been converted to height ages and weight ages by reference to the 50th percentile of the Boston reference data. All infants had recovered from the acute manifestations of malnutrition, were gaining weight steadily, had a serum albumin of at least 3.50 g/100 ml, and had no evidence of steatorrhea or overt carbohydrate malabsorption.

Because these blends are used or are to be used as weaning foods or as supplements to breast feeding and the age at which they are to be introduced is unpredictable, we included relatively young infants. Thus, two of them had weight ages of less than one month and one had a weight age of 1.7 months. Their true ages were 6.7, 8.3 and 4.7 months. Interestingly enough, the results in these three infants were as good or better than those of significantly older ones.

DIET SEQUENCES

In all cases comparison between casein and CSB#1 at 6.4% protein-calories was made first. Four infants received casein in the first

diet period and five received CSB#1 in the first diet period. These two periods were programmed to be of a minimum of nine days each, with metabolic collections on the last six days. When the preceding diet was higher in protein than these study diets, the first period was prolonged to at least 11 days, with the metabolic collections always on the last six days.

The second part of the study followed immediately after the completion of the first. The three products were given in random sequence and the duration of the diet periods was of 8, 6, and 6 days, with metabolic collections during the last six days of the first period and all six days of the other two periods.

RESULTS

Eight of the nine infants consumed their diets without any difficulty or resistance. Only one of them required some coaxing. There was no abdominal distention noted with any of the three products, there was no nausea or vomiting, and the number of stools per day was only minimally higher with products #2 and #3 than with #1. Thus we can conclude that all three products were well accepted and tolerated by these infants. This, however, must not be interpreted as a proper acceptability trial. We do consider it satisfactory evidence of good tolerance.

Table III details the results of the nitrogen balance studies of the first phase. In all nine infants the apparent absorption of nitrogen was lower than that from casein but in only three of them, #'s 525, 552, and 565 was the difference striking. These were three of the

oldest subjects. The differences were highly significant by paired "t" test.

The mean apparent retentions of nitrogen, as a percentage of intake, were not significantly different. In two subjects who had very satisfactory absorptions of nitrogen, the apparent retentions from CSB#1 were actually a little higher than from casein. These results confirm the high PER's found in rats. In two subjects, #552 and #565, who had the poorest absorption, the apparent retentions were much lower than those from casein. Subject #565, who had an apparent retention of 5% of intake, was either just in balance or in negative balance if unmeasured losses of nitrogen are considered. Besides demonstrating one of the poorest nitrogen absorptions in this phase of the study, this patient had significant difficulties in the second phase and it is possible that this very low retention already indicated an adverse reaction to any corn-soy blend.

The results of changes in body weight are included in the table and there was no difference between the two products but these are of relatively little value as weight changes during such short periods of time cannot be interpreted intelligently. For instance, if the diet is relatively high in fiber the weight of the intestinal contents will be increased.

Table IV details the stool weights and stool fat of the nine infants in the first phase of the study. Both stool wet weight and stool dry weight were significantly higher during the CSB#1 diets but this is entirely to be expected on the basis of the higher fiber content. The high stool weights of patient #552 on both diets are indicative of some

degree of carbohydrate malabsorption. At the same time his apparent absorption of nitrogen from casein was the lowest in the group, as was his apparent absorption of nitrogen from CSB#1. Although this had no effect on apparent retention of nitrogen from casein, it must undoubtedly have had an effect on the apparent retention of nitrogen from CSB#1. This was probably not due to the loss of energy but more likely due to the striking loss of nitrogen in the stool.

Stool fat, in actual amounts and as a percent of intake was not different for the two diets. As a percent of dry weight it was significantly lower from the CSB#1 diet, but this is an artifact due to the higher dry weight of the stool with this diet. It must be noted here that we have some reason to believe that stool fat values, by the Van de Kamer technique, may be spuriously low with stools containing significant amounts of undigested fiber. We do not think that this affects relative values or that it represents a large error but we are soon to begin a comparative study between the Van de Kamer method and another suggested by the U.S.D.A. in Beltsville.

Table V details the apparent absorptions and retentions and nitrogen from the three CSB products in the second phase of the study. It must be kept in mind that studies with 8.36 to 8.72% of calories from protein cannot be interpreted in the same way as studies with 6.4% protein-calories. The excess of protein tends to blunt or wipe out differences in protein quality. The apparent absorption of nitrogen was significantly lower from CSB#2 and CSB#3 than from CSB#1, with no difference between #2 and #3. For this reason an analysis of variance was not carried out. It would seem that there is little difference between 1.9

and 2.3% fiber.

Apparent retention of nitrogen was significantly higher from CSB#1 than from CSB#2 and #3, again no difference between these last two products. In some subjects there may have been an order effect, with the product given first in sequence testing higher than it might have otherwise. This trend, however, was not consistent.

In subject #565 the apparent absorption of nitrogen from CSB#1, which was first in sequence, was as low as in the first phase. The apparent retention was somewhat better. The second diet, with CSB#2, was aborted after only three days because of a deteriorating apparent absorption and, most important, because of the documentation of a sharp drop in hemoglobin and hematocrit and in serum iron, and a decidely positive test for occult blood in the stool. It is entirely possible that the blood (and possible protein) loss in the stool began during the CSB#1 period. The incomplete data from this patient are not included in the statistical analysis.

Table VI details the stool weights of the infants in this second phase. Both the wet and dry weights, particularly the latter, were significantly lower during the CSB#1 periods. There was no difference between the other two products although a slight trend for increase of CSB#3 over CSB#2 is apparent.

Table VII details the stool fats of the infants in the second phase. There was no difference between the three products.

Table VIII details the energy digestibilities during the second phase of the study. Unfortunately, diet energy, determined by bomb calorimetry, was not carried out in two of the subjects while receiving

CSB#1 and one subject while receiving CSB#3. Thus, some of the statistical analyses were carried out with a smaller "n". Stool energy was significantly lower during the CSB#1 periods than during either one of the other two, again with no difference between these two. As a percentage of intake, despite the smaller "n", stool energy was still significantly lower from CSB#1.

Although not reaching significance, there was a tendency for serum albumin to fall during the study. This was to be expected from the lower nitrogen retentions during some of the periods.

There was a consistent fall in serum cholesterol of about 25 mg/100 ml during the corn-soy periods. This is quite characteristic in our unit with most high-fiber diets but cannot be attributed specifically to the fiber as it may be due to the lower protein quality. We see it when comparing casein and soy protein isolate.

Patient #525, despite satisfactory absorptions and retentions from nitrogen, also experienced a striking fall in blood hematocrit, from 32 to 25.5%. In patient #565 the fall had been from 33 to 25%. In patient #525 this fall became evident during the time he was receiving CSB#3 but it could very well have begun during either one of the two preceding periods during which hematocrit was not determined. Patient #525 also had a strongly positive test for occult blood in the stool while receiving CSB#3. Again, no determinations are available while receiving the other two products so that it cannot be attributed to this specific blend. Both patients experienced a marked reticulocytosis, indicative of red blood cell regeneration following loss, during the next dietary period after the completion of these studies and have not

had any recurrence during a variety of subsequent studies, including prolonged feeding of three different maize varieties, both as degermed and whole kernel corn. In one other subject, patient #547, there was also a fall in hematocrit from 31 to 25% but occult blood was not found in the stool. As this fall seems to have been more gradual, with an intervening value of 29%, it may not represent blood-losing enteropathy.

DISCUSSION AND CONCLUSION

The first phase of these studies confirms the high nutritional value of the degermed corn-dehulled soy blend represented by CSB#1. As a percentage of absorbed nitrogen, the apparent retentions are as high as those found with instant CSM and the best cereal-legume combinations we have evaluated. The fact that nitrogen absorption was poor enough in at least two of the nine subjects to significantly affect retention is probably to be expected in a certain percentage of young infants whose gastrointestinal function is not entirely normal. In this respect, almost all such cereal-legume blends are bound to produce similar problems. They are not the equivalent of human breast milk or even of cow milk. The latter, of course, if not boiled, can and does result in blood and protein-losing enteropathy with some frequency. It has also been reported with soy isolate formulas so that it cannot be attributed to fiber.

The results with CSB#2 and CSB#3 are very definitely inferior to those from CSB#1 and are in contrast with the equivalent nutritional value found in rats. This is undoubtedly due to the less efficient digestive function in the young human being, particularly if not entirely

healthy. The inferiority of these two blends is significant enough to call for great caution in using them to replace the product made from degermed corn and dehulled soy.

We are willing to carry out further studies with corn-soy blends but if we do, will of course be alert to the possibility that enteropathy might occur with some frequency. It is still possible, of course, that the higher incidence with these products occurred purely by chance.

Table I

Identification and proximate analysis of CSB#1, CSB#2, and CSB#3 (Data provided by G.R. Jansen, Ph.D., C.S.U.)

	CSB#1	CSB#2	CSB#3
FSN Code #	2-39-14	2-39-17	2-39-15
AERC Sample # and Description	B242 Degermed corn/ dehulled soy 70/30 32[illegible]° Brady	B243 Whole corn/ dehulled soy 70/30 325° Brady	B244 Whole corn/ whole soy 70/30 325° Brady
% Moisture	2.82	3.27	3.58
% Fat	6.75	9.22	8.63
% Nitrogen	2.72	2.97	2.84
% Protein (Nx6.25)	17.00	18.56	17.75
% Ash	4.25	5.09	5.07
% Fiber	0.8	1.9	2.3
Corrected PER[1]	2.63±0.05	2.91±0.05	2.46±0.07

[1] Corrected relative to casein = 2.50

Table II

Age, height, height age, weight, weight age and serum albumin levels of nine convalescent malnourished male infants participating in these studies

Case #	Age months	Height cm	Ht. Age months	Weight kg	Wt. Age months	Ser. Album. g/100 ml
525	20.1	71.1	9.0	7.98	6.6	4.88
545	15.3	67.3	6.7	6.96	5.2	3.52
547	4.7	58.0	2.3	4.96	1.7	3.64
548	10.5	65.7	5.6	6.28	3.9	3.68
552	15.4	66.3	6.2	6.62	4.6	4.03
553	8.3	61.0	3.3	4.07	0.7	3.70
554	8.0	67.5	6.8	5.71	3.1	3.66
558	6.7	59.5	2.8	4.08	0.7	3.57
565	15.2	73.8	11.1	6.51	4.4	3.76

Table III

Protein quality of CSB#1 in convalescent malnourished male infants. Isonitrogenous, isoenergetic comparison with a casein-based diet, both providing 6.4% of diet calories as protein

Case #	APPARENT NITROGEN BALANCES						Body Wt Gain	
	Intake mg./day		Absorption % of Intake		Retention % of Intake		g/kg body wt/day	
	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1
525	2394	2281	83.0	70.0	24.5	20.5	2.4	6.0
545[a]	2240	2432	91.5	84.5	42.0	33.5	6.8	5.8
547[a]	2035	2150	82.0	79.5	43.5	43.0	11.5	5.4
548	2080	1984	82.5	81.5	30.0	32.5	5.1	1.2
552[a]	2194	2208	79.0	59.0	42.0	21.5	2.5	3.4
553[a]	1344	1408	86.0	79.5	26.5	23.5	4.9	7.6
554	1952	1920	88.5	86.0	36.5	38.0	5.1	4.0
558	1472	1344	84.5	82.0	37.0	43.0	3.7	7.1
565	2208	2112	80.0	68.0	28.5	5.0	2.2	4.4
$\bar{X}$	1991	1982	84.1	76.7[b]	34.5	28.9	4.9	5.0
S.D.	±356	±376	±4.0	±9.0	±7.3	±12.5	±2.9	±2.0

[a] These four infants received casein first in sequence

[b] Significantly less than casein values by paired "t", $P<0.01$.

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Table IV

Stool weights, wet and dry, and stool fat of infants receiving diets based on Casein or CSB#1 as the source of protein at 6.4% diet calories

Case #	STOOL WEIGHTS				STOOL FAT					
	Wet g/day		Dry g/day		g/day		% of dry wt		% of intake	
	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1
525	46.5	98.5	14.0	18.0	4.1	2.0	29.6	11.1	8.1	4.1
545	31.0	69.0	7.2	15.1	2.5	3.2	34.1	19.8	5.2	6.2
547	54.0	89.5	9.5	16.8	3.1	2.2	31.6	13.4	7.2	4.9
548	53.5	55.0	9.9	11.7	4.2	3.3	44.2	29.3	9.7	7.8
552	174.0	270.5	14.5	25.6	4.9	5.8	33.7	22.8	10.9	12.4
553	30.5	49.0	6.8	14.5	2.7	2.0	39.3	14.2	9.4	6.9
554	23.0	39.5	7.8	10.9	3.1	2.2	40.1	20.5	7.5	5.5
558	53.0	39.5	6.7	9.1	2.2	2.6	32.3	28.9	7.0	9.2
565	58.5	94.5	15.5	19.4	5.3	3.8	33.9	19.5	11.4	8.6
$\bar{X}$	58.2	89.4[a]	10.2	15.7[b]	3.6	3.0	35.4	19.9[c]	8.5	7.3
S.D.	±45.2	±71.7	±3.5	±5.0	±1.1	±1.2	±4.7	±6.4	±2.0	±2.6

[a] Significantly higher than casein values by paired "t", $P<0.02$.

[b] Significantly higher than casein values by paired "t", $P<0.001$.

[c] Significantly lower than casein values by paired "t", $P<0.001$.

Table III

Protein quality of CSB#1 in convalescent malnourished male infants. Isonitrogenous, isoenergetic comparison with a casein-based diet, both providing 6.4% of diet calories as protein

Case #	APPARENT NITROGEN BALANCES						Body Wt Gain	
	Intake mg/day		Absorption % of Intake		Retention % of Intake		g/kg body wt/day	
	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1
525	2394	2281	83.0	70.0	24.5	20.5	2.4	6.0
545[a]	2240	2432	91.5	84.5	42.0	33.5	6.8	5.8
547[a]	2035	2150	82.0	79.5	43.5	43.0	11.5	5.4
548	2080	1984	82.5	81.5	30.0	32.5	5.1	1.2
552[a]	2194	2208	79.0	59.0	42.0	21.5	2.5	3.4
553[a]	1344	1408	86.0	79.5	26.5	23.5	4.9	7.6
554	1952	1920	88.5	86.0	36.5	38.0	5.1	4.0
558	1472	1344	84.5	82.0	37.0	43.0	3.7	7.1
565	2208	2112	80.0	68.0	28.5	5.0	2.2	4.4
$\bar{X}$	1991	1982	84.1	76.7[b]	34.5	28.9	4.9	5.0
S.D.	±356	±376	±4.0	±9.0	±7.3	±12.5	±2.9	±2.0

[a] These four infants received casein first in sequence

[b] Significantly less than casein values by paired "t", $P<0.01$.

Table IV

Stool weights, wet and dry, and stool fat of infants receiving diets based on Casein or CSB#1 as the source of protein at 6.4% diet calories

Case #	STOOL WEIGHTS				STOOL FAT					
	Wet g/day		Dry g/day		g/day		% of dry wt		% of intake	
	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1	Casein	CSB#1
525	46.5	98.5	14.0	18.0	4.1	2.0	29.6	11.1	8.1	4.1
545	31.0	69.0	7.2	15.1	2.5	3.2	34.1	19.8	5.2	6.2
547	54.0	89.5	9.5	16.8	3.1	2.2	31.6	13.4	7.2	4.9
548	53.5	55.0	9.9	11.7	4.2	3.3	44.2	29.3	9.7	7.8
552	174.0	270.5	14.5	25.6	4.9	5.8	33.7	22.8	10.9	12.4
553	30.5	49.0	6.8	14.5	2.7	2.0	39.3	14.2	9.4	6.9
554	23.0	39.5	7.8	10.9	3.1	2.2	40.1	20.5	7.5	5.5
558	53.0	39.5	6.7	9.1	2.2	2.6	32.3	28.9	7.0	9.2
565	58.5	94.5	15.5	19.4	5.3	3.8	33.9	19.5	11.4	8.6
$\bar{X}$	58.2	89.4[a]	10.2	15.7[b]	3.6	3.0	35.4	19.9[c]	8.5	7.3
S.D.	±45.2	±71.7	±3.5	±5.0	±1.1	±1.2	±4.7	±6.4	±2.0	±2.6

[a] Significantly higher than casein values by paired "t", $P<0.02$.

[b] Significantly higher than casein values by paired "t", $P<0.001$.

[c] Significantly lower than casein values by paired "t", $P<0.001$.

Table V

Apparent absorption and retention of nitrogen in convalescent malnourished male infants consuming CSB#1 (0.8% fiber), CSB#2 (1.9% fiber) or CSB#3 (2.3% fiber) when each provided 50% of calories in the diet. Diets yielded 8.36 to 8.72% of calories from protein, levels high enough to significantly blunt differences in protein quality

Case #	Apparent N Absorption % of Intake			Apparent N Retention % of Intake		
	CSB#1	CSB#2	CSB#3	CSB#1	CSB#2	CSB#3
525	79.5[1]	76.5[2]	73.0[3]	22.0[1]	22.5[2]	17.5[3]
545	81.0[1]	76.5[3]	76.5[2]	36.5[1]	24.5[3]	29.0[2]
547	87.0[2]	63.0[3]	82.0[1]	43.5[2]	16.5[3]	31.5[1]
548	81.0[1]	76.5[2]	75.0[3]	37.5[1]	23.0[2]	25.5[3]
552	72.5[3]	63.5[1]	61.5[2]	39.5[3]	28.5[1]	28.0[2]
553	81.0[3]	74.5[2]	80.5[1]	35.5[3]	19.5[2]	32.0[1]
554	85.0[2]	84.0[3]	82.5[1]	29.5[2]	26.0[3]	28.5[1]
558	87.0[2]	83.0[1]	85.5[3]	38.0[2]	42.0[1]	31.5[3]
565[a]	(67.0)[1]	(55.0)[2]	--	(17.0)	(13.0)	--
$\bar{X}$	81.8	74.7[b]	77.1[c]	35.3	25.3[b]	27.9[c]
S.D.	±4.8	±7.8	±7.6	±6.6	±7.7	±4.8

[1,2,3] Superscripts for each subject indicate diet sequences

[a] Results not included in means or statistical analysis, study aborted after first 3-day collection with CSB#2

[b] Significantly lower than CSB#1, paired "t", $P<0.05$

[c] Significantly lower than CSB#1, paired "t", $P<0.01$

Table VI

Stool weights, wet and dry, of infants consuming CSB#1 (0.8% fiber), CSB#2 (1.9% fiber), or CSB#3 (2.3% fiber) when each provided 50% of diet energy

Case #	STOOL WET WEIGHT g/day			STOOL DRY WEIGHT g/day		
	CSB#1	CSB#2	CSB#3	CSB#1	CSB#2	CSB#3
525	95.5[1]	129.0[2]	152.5[3]	21.04	23.38	30.79
545	69.0[1]	122.5[3]	115.5[2]	18.87	25.26	24.19
547	61.5[2]	77.5[3]	85.5[1]	16.81	22.54	18.94
548	110.5[1]	79.0[2]	138.0[3]	18.77	24.76	29.58
552	181.0[3]	188.5[1]	219.0[2]	25.65	33.64	32.88
553	86.5[3]	98.5[2]	74.0[1]	15.62	18.02	17.77
554	51.5[2]	58.0[3]	60.0[1]	16.19	18.95	20.63
558	38.5[2]	58.5[1]	63.0[3]	9.94	12.72	14.42
565[a]	(167.5)[1]	(290.0)[2]	--	(25.50)	(38.25)	--
$\bar{X}$	86.8	101.4[b]	113.4[b]	17.86	22.40[c]	23.65[c]
S.D.	±44.8	±44.1	±54.8	±4.53	±6.16	±6.78

[1,2,3] Diet sequence for each subject

[a] Results not included in means or statistical analysis: study aborted.

[b] Significantly higher than CSB#1, paired "t", $P<0.05$

[c] Significantly higher than CSB#1, paired "t", $P<0.001$

Table VII

Stool fat of infants consuming CSB#1, CSB#2, or CSB#3, when each provided 50% of diet energy

Case #	STOOL FAT								
	g/day			% of dry weight			% of intake		
	CSB#1	CSB#2	CSB#3	CSB#1	CSB#2	CSB#3	CSB#1	CSB#2	CSB#3
525	1.48	1.71	2.27	6.7	7.4	7.4	2.9	3.2	4.2
545	4.00	2.33	2.04	20.2	9.2	8.6	8.6	4.7	4.2
547	1.37	2.10	1.84	8.4	9.3	9.8	3.3	4.9	4.6
548	4.09	2.22	2.28	21.3	8.9	7.6	9.2	4.9	4.7
552	3.19	6.31	3.75	12.5	18.0	11.5	6.5	13.2	7.7
553	1.28	1.53	1.33	8.0	8.7	7.5	3.9	4.9	4.4
554	1.65	1.51	1.87	10.3	8.2	9.1	3.8	3.3	4.4
558	1.40	1.19	1.24	13.8	8.9	8.6	4.4	3.9	3.8
565[a]	(4.41)	(2.71)	--	(17.4)	(7.1)	--	(9.5)	(5.5)	--
$\bar{X}$	2.3	2.4	2.1	12.7	9.8	8.8	5.3	5.4	4.8
S.D.	±1.2	±1.6	±0.8	±5.5	±3.4	±1.4	±2.5	±3.2	±1.2

[a] Results not included in means: study aborted.

Table VIII

Energy digestibility in infants consuming CSB#1, CSB#2, or CSB#3, when each provided 50% of diet energy

Case #	ENERGY INTAKE Kcal/day			STOOL ENERGY Kcal/day			STOOL ENERGY % of intake		
	CSB#1	CSB#2	CSB#3	CSB#1	CSB#2	CSB#3	CSB#1	CSB#2	CSB#3
525	998.1	1126.9	1054.3	79.2	95.7	120.4	7.9	8.5	11.4
545	955.0	1086.4	N.A.	79.9	99.5	90.0	8.4	9.2	--
547	843.0	925.4	776.6	59.8	81.4	78.6	7.1	8.8	10.1
548	N.A.	943.6	1029.1	73.3	97.3	120.1	--	10.3	11.7
552	996.1	968.6	999.2	109.2	153.1	147.0	11.0	15.8	14.7
553	N.A.	674.1	629.4	57.8	70.3	65.4	--	10.4	10.4
554	889.2	925.2	901.1	64.1	73.7	79.1	7.2	8.0	8.8
558	678.2	603.9	701.4	39.3	47.3	51.2	5.8	7.8	7.3
$\bar{X}$	902.1	906.8	870.2	70.3	89.8[a]	94.0[a]	7.9	9.9[b]	10.6[c]
S.D.	±113.6	±182.2	±169.3	±20.6	±31.0	±32.3	±1.8	±2.6	±2.3

[a] Significantly higher than CSB#1, paired "t", $P<0.01$

[b] Significantly higher than CSB#1, paired "t", $n=6$, $P<0.05$

[c] Significantly higher than CSB#1, paired "t", $n=5$, $P<0.05$