excretion of large amounts of *p*-nitrophenol and its "conjugates" in the urine. This must involve a breakage of the carbon-oxygen bond of the ether linkage. Homogenates of rat kidney and liver but not of pancreas cause a definite though slight cleavage of these phenyl ethers. Pancreas was inactive; boiling the liver and kidney extracts destroyed their activity against phenyl ethers. This evidence indicates that the breakdown of phenyl ethers by rat tissue is enzymatic and we propose for the enzyme the name phenyletherase.

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Nitrogen Retention after Intravenous and Oral Administration of Protein Hydrolysate and Native Protein Enterally.*

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Madden,[1] and Kozoll and Mok[2] have stated that of the two routes for supplying exogenous protein, the oral route is associated with greater nitrogen retention. Elman *et al.*[3] and Shohl[4] have indicated that a given protein digest is attended with the same nitrogen retention when supplied either parenterally or enterally. The addition of more experimental evidence on nitrogen retention under different modes of administration it was hoped might help resolve the conflicting published data.

Method. Mongrel dogs were used in this study. Dogs No. 4 and 5 were animals which had been placed on a low protein diet consisting essentially of apples, potatoes, carrots and sucrose. The diet was fortified with substantial amounts of vitamin B complex, cod liver oil, choline, and minerals. Caloric intake was limited to 40 calories per kilo body weight per day, and the studies were not begun until 30% of the original body weight had been lost. Dog No. 6 was placed on the same diet and on the same caloric intake and the study started prior to any significant weight loss. Animals were kept in metabolism cages and urine collected over a 24-hour period, and specimens were analyzed quantitatively for total nitrogen by the macro Kjeldahl method.[5] The amino acid nitrogen was determined by the method of Frame.[6] Samples of the diet, and protein hydrolysate, and calcium caseinate (Casec‡) were all analyzed for total nitrogen by the macro Kjeldahl method. At the beginning of each study period, the diet was colored with congo red and feces collected for total nitrogen determinations.

Protein hydrolysate (Amigen‡) was given in amounts equivalent to 2 g of protein per kilo of body weight. This was administered in a total volume of 500 cc of fluid over a 6 hour period. After 5 days of intravenous infusion, the same amount of protein hydrolysate was given orally over a 6 hour period by means of a Wangensteen tube passed through the nose into the stomach. Two g of protein per kilo body weight as calcium caseinate was then given orally over a 6 hour period. A control period of 9 days was interposed between each

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‡ Casec (calcium caseinate) and Amigen (enzymatic digest of casein) were kindly supplied by Mead Johnson of Evansville, Ind.

TABLE I.
Nitrogen Loss After Protein Hydrolysate Intravenously and Orally and After Calcium Caseinate Orally.
Dog. No. 4.*

No. of days	G. N. intake Total	G. N. intake Avg daily	G. N. output Total	G. N. output Avg daily	Avg daily diff.	G. urine amino acid Total	G. urine amino acid Avg daily	Feces N. Total	Feces N. Avg daily
9 control	4.30	0.48	5.09	0.57	—0.09	1.05	0.12	0.74	0.082
5 intrav. Amigen†	16.57	3.31	10.82	2.16	+1.15	2.14	0.43	1.15	0.23
9 control	4.30	0.48	7.81	0.87	—0.39	1.52	0.17	0.57	0.06
5 oral Amigen	16.57	3.31	9.21	1.84	+1.47	1.71	0.34	—	—
2 control	0.96	0.48	3.93	0.97	—1.49	0.60	0.30	—	—
5 oral Casec‡	16.57	3.31	6.83	1.37	+1.95	1.16	0.23	0.91	0.18

* Original wt, 13.55 kg; wt loss at start of study, 33.6%; wt loss at end of study, 44.0%.
† Casein hydrolysate equivalent to 2 g protein per kg body wt.
‡ Calcium caseinate equivalent to 2 g protein per kg body wt.

TABLE II.
Nitrogen Loss After Protein Hydrolysate Intravenously and Orally and After Calcium Caseinate Orally.
Dog No. 5.*

No. of days	Intake N in g Total	Intake N in g Avg daily	Urine N in g Total	Urine N in g Avg daily	Avg daily diff.	Urine amino acid N in g Total	Urine amino acid N in g Avg daily	Feces N Total	Feces N Avg daily
8 control	3.82	0.48	12.18	1.52	—1.04	1.21	0.15	0.73	0.09
6 Amigen† intrav.	21.49	3.58	10.99	1.83	+1.75	2.09	0.35	1.03	0.17
8 control	3.82	0.48	4.96	0.62	—0.14	0.90	0.11	0.72	0.09
5 Amigen orally	17.91	3.58	6.69	1.34	+2.24	1.61	0.32	0.74	0.17
9 control	4.30	0.48	5.55	0.62	—0.14	0.88	0.10	1.52	0.19
5 oral Casec‡	17.91	3.58	4.81	0.96	+2.62	0.48	0.10	0.26	0.05
5 control	2.39	0.48	2.92	0.58	—0.11	0.44	0.09	0.54	0.11

* Original wt, 14.7 kg; 34% wt loss at start of study; 45% wt loss at end of study.
† Casein hydrolysate equivalent to 2 g protein per kg body wt.
‡ Calcium caseinate equivalent to 2 g protein per kg body wt.

TABLE III.
Nitrogen Loss After Protein Hydrolysate Intravenously and Orally and After Calcium Caseinate Orally.
Dog No. 6.*

No. of days	Intake N in g Total	Intake N in g Avg daily	Urine N in g Total	Urine N in g Avg daily	Avg daily diff.	Urine amino acid N in g Total	Urine amino acid N in g Avg daily	Feces N Total	Feces N Avg daily
6 control	2.87	0.48	17.53	2.92	—2.34	6.30	1.05	—	—
5 Amigen intrav.	18.71	3.74	13.05	2.61	+1.13	2.41	0.48	1.31	0.26
9 control	4.30	0.48	9.14	1.02	—0.54	0.97	0.11	1.47	0.21
5 Amigen orally	18.71	3.74	10.08	2.02	+1.73	1.60	0.32	0.90	0.18
9 control	4.30	0.48	7.27	0.81	—0.33	1.78	0.20	0.30	0.03
5 oral Casec‡	18.71	3.74	8.21	1.64	+2.10	2.15	0.43	2.09	0.42
5 control	2.39	0.48	3.95	0.69	—0.21	0.52	0.10	0.86	0.17

* Wt, 10.2 kg; no wt loss at start of study; 21.6% wt loss at end of study.
† Casein hydrolysate equivalent to 2 g protein per kg body wt.
‡ Calcium caseinate equivalent to 2 g protein per kg body wt.

study period except in Dog No. 4 which had only 2 days of control between the oral protein hydrolysate and oral calcium caseinate. Urine was collected during these periods and quantitative determinations made for nitrogen as during the test periods.

Results. The results are tabulated in terms of average daily nitrogen intake and average daily nitrogen excretion in the urine.

Dog No. 4, Table I, lost 2.16 g urinary nitrogen, or 65.4% of the intake after infusion of protein hydrolysate intravenously. 1.84 g urinary nitrogen or 55.6% of intake was lost when protein hydrolysate was given orally. 1.37 g urinary nitrogen, or 41.5% of intake was lost when calcium caseinate was given orally.

Dog No. 5, Table II, lost 1.83 g urinary nitrogen, or 51.2% of the intake after infusion of protein hydrolysate intravenously. 1.34 g of urinary nitrogen, or 37.3% of intake was lost when protein hydrolysate was given orally. 0.96 g urinary nitrogen, or 26.8% of the intake was lost when calcium caseinate was given orally.

Dog No. 6, Table III, lost 2.61 g urinary nitrogen, or 70% of intake when protein hydrolysate was given intravenously. 2.02 g urinary nitrogen, or 53.6% of intake was lost when protein hydrolysate was given orally. 1.64 g of urinary nitrogen, or 44% of the intake was lost when calcium caseinate was given orally.

Summary. It has been observed that with the oral ingestion of native protein (Casec), there is the greatest nitrogen retention; with the protein hydrolysate enterally there is less nitrogen retention; and with protein hydrolysate intravenously there is least nitrogen retention.

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Nitrogen Retention after Injection of Protein Hydrolysate into the Portal and Systemic Veins.*

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Numerous reports[1-3] suggest that positive nitrogen balance can be obtained by the parenteral administration of essential amino acid mixtures or protein hydrolysates. Regularly there is a sharp rise in the total urinary nitrogen following the infusion of these mixtures. Under these circumstances, theoretically, significant quantities of amino acids might be lost through renal excretory mechanisms before circulation through, and protein fabrication in, the liver could take place.

Method. Mongrel dogs were used in this study. Dogs No. 3, 4, and 5 were placed on a low protein diet consisting essentially of potatoes, apples, carrots, and sucrose. The diet was fortified with substantial quantities of vitamin B complex, cod liver oil, choline, and minerals. Caloric intake was limited to 40 calories per kg body weight daily. The animals were not studied until a weight loss of 30% had been reached. Dog No. 6 was placed on the low protein diet and the study begun prior to any significant weight loss. Caloric intake in this dog was similarly limited to 40 calories per kg of body weight.

Prior to the beginning of the study the animals were operated upon and a polythene tubing with an outside diameter of 1 millimeter and an inside diameter of 0.5 mm was threaded into a radicle of the splenic vein until it reached the entrance to the portal vein. The tube was brought to the outside through a separate stab wound. During infusion a blunt end 25 gauge needle was inserted into the tube. Four % sodium citrate solution was used to irrigate and fill the tube daily. A small glass plug was kept in the needle when not in use

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† Fellow of the United States Public Health Service.

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