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GROWTH AND DEVELOPMENT

With Special Reference to Domestic Animals

XXVII. Endogenous Urinary Nitrogen and Total Creatinine Excretion in Rats as Functions of Dietary Protein Level, Time on N-Free Diets, Age, Body Weight, and Basal Metabolism.

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CONTENTS

FOREWORD

The special investigation on growth and development is a cooperative enterprise in which the departments of Animal Husbandry, Dairy Husbandry, Agricultural Chemistry, and Poultry Husbandry have each contributed a substantial part. The plans for the investigation in the beginning were inaugurated by a committee including A. C. Ragsdale, E. A. Trowbridge, H. L. Kempster, A. G. Hogan, F. B. Mumford. Samuel Brody served as Chairman of this committee and has been chiefly responsible for the execution of the plans, interpretation of results and the preparation of the publications resulting from this enterprise.

The investigation has been made possible through a grant by the Herman Frasch Foundation represented by Dr. R. W. Thatcher, who has given valuable advice from the beginning of the investigation.

F. B. MUMFORD, *Director Agricultural Experiment Station.*

ACKNOWLEDGMENTS.—This research was carried out in the laboratories of Professor A. G. Hogan. It is a pleasure to express grateful appreciation for Dr. Hogan's kindly interest and helpful suggestions. This bulletin contains a part of the dissertation of Ural S. Ashworth, presented to the Graduate School of the University of Missouri, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

The charts in this bulletin were prepared by Robert C. Procter.

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XXVII. Endogenous Urinary Nitrogen and Total Creatinine Excretion in Rats as Functions of Dietary Protein Level, Time on N-Free Diets, Age, Body Weight, and Basal Metabolism.

URAL S. ASHWORTH and SAMUEL BRODY

ABSTRACT

Data are presented for the nitrogen, total creatinine, and energy metabolism of rats between the ages of 21 days and 2 years. Comparisons are made of rats paired to diets of low and high protein levels. To secure minimum urinary nitrogen excretion, the animals were kept on practically N-free diets for periods up to 100 days in length.

The average total creatinine N coefficient for all the observed rats was 15.1. This value is practically independent of age and dietary protein level.

In most cases, the minimum nitrogen coefficient is not reached until about the 15th day on the N-free diet. The average value at this time is about 140 mg. urinary N per kg. of body weight, although in several cases lows of 100 were observed.

The limiting maximum value of the ratio of total creatinine N to total endogenous nitrogen is about 15%, reached at the same time that the nitrogen coefficient becomes a minimum. However, the average value of this ratio is about 11%.

The ratio of Calories (basal metabolism) to mg. total creatinine nitrogen declines with increasing weight at approximately the same rate as the ratio of Calories to body weight. The average numerical values of this ratio range from 13 at 80 grams body weight to 6 at 300 grams body weight. The Calories per mg. of urinary endogenous nitrogen ratio approaches 1.5 as a limit for young rats with high basal metabolism. For heavier animals the limit is closer to 0.8 Calories.

A greater proportion of adipose tissue in high proteïn rats is indicated by their lower creatinine coefficients and lower endogenous nitrogen coefficients.

I INTRODUCTION

This report is concerned with the influence of age, body weight, rate of growth, dietary protein level, duration of the time on given diets, and basal metabolism on the nitrogen metabolism, especially on minimum endogenous nitrogen excretion and on total creatinine excretion.

It is generally known that Folin distinguished between the two general types of protein metabolism, constant and variable. "I would therefore call the protein metabolism which tends to be constant, tissue metabolism or *endogenous* metabolism, and the other the variable protein metabolism, I would call the *exogenous* or intermediate metabolism." The principal end product of protein disintergration is urea, and the greater the amount of nitrogenous food ingested above the needs, the larger the amount of urea excreted. The end product of nitrogen metabolism which appars to be least affected

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by protein ingestion is creatinine. Urea and creatinine thus represent extremes in the extent to which they are influenced by dietary protein. There are other end products intermediate in this respect.

Basal (energy) metabolism has the same relation to energy metabolism as endogenous (nitrogen) metabolism has to nitrogen metabolism. They both represent irreducible minima, and this paper is concerned with these two types of metabolism, and with the factors influencing them as they relate to the white rat.

II THE LITERATURE

A very voluminous literature has grown up since Folin's pioneer work in the field of endogenous metabolism. Since Mitchell and Hamilton have included a comprehensive review of it in their recent monograph (1929), we shall only list such of the pertinent papers as appeared since 1929.

Additional evidence on the independence of preformed creatinine from dietary protein has been recently published by Bollman; Booth and Evans; Garot; McClugage; Morgulis; and Terroine and associates. There is also evidence showing that preformed creatinine is affected by the diet: Beard and Barnes found that the feeding of amino acids increased the urinary creatinine of rats on the average from 14.2% for aspartic acid to 36% for glycine. These authors also note that the feeding of comparatively large amounts of proteins or amino acids at one time to normal humans produces an increase of preformed creatinine.

Terroine and associates found that during the production of an accelerated endogenous metabolism by poisons (benzoic acid, phlorhizin, phosphorus) the preformed creatinine remains constant, while creatine increases in proportion to the increase in the total urinary nitrogen excretion.

As regards creatine, Garot in a paper on the nitrogen metabolism of infants, and Terroine and associates on nitrogen metabolism in pigs, report that this may have an exogenous origin. Terroine investigated proteins from the standpoint of their biological values, and found that the less the coefficient of utilization, the greater the creatine excretion.

Morgulis found that, during fasting, creatine excretion may exceed creatinine excretion ("cross-over") without fatal results, and that apparently creatine is synthesized by the fasting dog from the degradation of tissue protein. The latter observation was also made by Terroine *et al* for pigs during specific protein inanition.

Terroine and associates have also made a species comparison of the distribution of urinary endogenous constituents.

Chanutin has investigated the composition of the body of the rat on a variety of diets, during prolonged fasting, and during growth. The work of Chanutin and associates demonstrates that the creatine content of the body (when it is calculated on the basis of dry, ash-free, and fat-free tissue) is remarkably constant under all conditions of dietary manipulation. During fasting there is an apparent increase of the creatine content of fresh tissue due to the loss of fat.

Chanutin reports that the creatine concentration of the organic tissue in the body reaches the adult level in the rat at about the age of weaning. This value then remains quite constant.

The problem of the time required to reach the endogenous level of nitrogen excretion during specific nitrogen inanition in the rat has not received much attention. As regards humans, however, we have the important contributions by Deuel, Sandiford, and Boothby. Deuel found that a minimum level was reached after 63 days on a low nitrogen diet.

Smuts reports that the ratio between the basal metabolism and the endogenous nitrogen excretion is nearly the same in the mouse, rat, guinea pig, rabbit, and pig.

We shall not attempt to review the literature on basal (energy) metabolism, as this has been done in the preceding reports of this series (Missouri Research Bulletins 166, and 176).

III METHODS

The method consisted simply in following the nitrogen excretion, total creatinine excretion, and basal metabolism of male rats from weaning up to, in some cases, 600 days of age, on the diets listed in Table 1.

The composition of the high and low protein diets were the same except that 20% starch in the low protein diet was substituted for the 20% casein in the high protein diet. It was assumed that casein and starch were isodynamic. The corn gluten and milk albumen diets were of the same composition except for the source of protein. The same percentage of nitrogen was maintained in these two diets, and they were assumed to be isodynamic. The compositions of the several diets are summarized in Table 1. All diets not containing yeast were supplemented by 0.4 cc daily of a mixture of 50 grams Armour's concentrated liver extract with 12 grams tiki tiki prepared according to the method of the Philippine Bureau of Science. This mixture contributed about 3 or 4 milligrams of nitrogen per day to the diet.

From the same litter, rats were chosen for the low and high protein diets and paired to the same quantitative food intake. These were controlled so that the animal eating least set the pace for

TABLE 1.—COMPOSITION OF THE DIETS FED TO THE SEVERAL GROUPS OF RATS, INCLUDING N-CONTENT

	Low Prot. Diet	High Prot. Diet	Casein Diet	"L.N.A." (Low Lactalbumin diet)	"N-Free"	Corn Gluten	Albumin Diet Controls for the Gluten Group
Whole Wheat	60.0	60.0	10.0	----	----	----	----
Alfalfa Meal	2.5	2.5	----	----	----	---	----
Dried Yeast	10.0	10.0	10.0	----	----	----	----
Casein	----	20.0	70.0	----	----	----	----
Starch	20.0	----	----	71.0	74.0	59.0	65.0
Salts (14A)	2.5	2.5	4.0	4.0	4.0	4.0	4.0
Butter	4.0	4.0	2.0	8.0	8.0	----	----
Cod Liver Oil	1.0	1.0	2.0	2.0	2.0	2.0	2.0
Cellulose	----	----	2.0	3.0	2.0	2.0	2.0
Sucrose	----	----	----	10.0	10.0	----	----
Lactalbumin	----	----	----	2.0	----	----	14.0
Corn Gluten	----	----	----	----	----	20.0	----
Lard	----	----	----	----	----	13.0	13.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Nitrogen Content (mg. N/gm. food mixture)	20.0	49.0	95.0	2.5	0.5	17.0	17.0

PAIRING RATS TO THE SAME QUANTITATIVE FOOD INTAKE

2000 Series					
Low Protein Rats No. Paired with	2115	2173	2206	2209	2213
High Protein Rats No.	2116	2178	2205	2210	2214
3000 Series					
Low Protein Rats No. Paired with	3287	3288	3292	----	
High Protein Rats No.	3289	3290	3294	3293	
Slow Growth Series					
Corn Gluten Rats No. and	2528	2532			
Corn Gluten Rats No. Paired with	2529	2534			
Lactalbumin Rats No.	2530	2531			

its litter mate on the other diet. The same methods were applied to the corn gluten rats and their controls, which were on the lactalbumin diet.

Urine collections were made by the method of Mitchell, modified to some extent. Round bottom cages were used with separate false bottoms; these were supported by two U-shaped glass rods over a 25 cm. filter paper in an enameled pan of the same inside diameter. Five to ten cubic centimeters of 3% benzoic acid in 50% alcohol was used as a preservative.

For most of the work included in this paper, the urine and feces were collected over 48-hour periods, and two such periods were combined for one analysis.

Sufficient H_2SO_4 was added to the feces, and the entire collection period digested together. Aliquots were distilled for N determination. Four or five extractions with boiling water, making a total volume of about 350 cc were used to wash urine from feed tunnel, glass rods, false bottom, and filter pad. Each extraction was filtered while hot. From 4-10 c.c. (depending on N content of urine) of concentrated HCl was added, the solution evaporated to less than 100 c. c., then made up to this volume in a volumetric flask. Aliquots were taken for total creatinine and nitrogen determinations. The Folin colorimetric method for creatinine was used after careful neutralization to litmus with NaOH.

Control determinations were made to find whether any loss of creatinine occurred; also to find what effect a small amount of wasted feed might have on the creatinine determination. For this purpose a measured amount of standard creatinine solution was allowed to stand in the cage bottoms for 3 to 4 days. To some of these was added 0.2 gm. of feed which was about the maximum wasted during a collection period. These samples were extracted and creatinine determinations made in the same manner as the unknowns.

No influence of the glucose of the feed on the creatinine determination could be shown when the colorimetric readings were made within an hour after the solutions were made up and at room temperature.

From 92-105% of the creatinine was recovered.

The most satisfactory method for expressing creatinine excretion is in terms of the creatinine coefficient; that is, as ratio of milligrams of creatinine excreted per kilo body weight, or milligrams of creatinine N (creatinine x 0.372) per kilo body weight. It appears that most species of animals have values of this coefficient which are within the limits found for man (6-11 mg. creatinine nitrogen per kilo body weight). Some species, however, such as the rabbit and the rat have creatinine coefficients undoubtedly higher. This is in agreement with the higher minimum endogenous nitrogen excretion reported for these species. Thus Mitchell and Hamilton found in a tabulation of the works of several investigators for different species of animals, that while most of the animals studied approximate 30 milligrams of nitrogen per kg. of body weight, the limiting value for the rat seems to be about 100 mg.

There is, however, considerable disagreement concerning the average value of the creatinine coefficient of each species. Thus Hunter (1928, p. 124, table 13) records the average found by five different groups of investigators as varying from 9.9-23.9 mg. creatinine N per kg. body weight for young rats. Perhaps differences in experimental environment or muscular development in some strains of rats may account in part for these variations. More recently Terroine and associates found that growing pigs excrete 6.5 to 12.4 mg. of preformed creatinine nitrogen per kg. body weight per 24 hours. Individual variations are apparent from these figures.

The nitrogen excretion is also most satisfactorily expressed in terms of milligrams of nitrogen per kilogram body weight and here termed nitrogen coefficient. Since the analytical method for the determination of nitrogen is more accurate than that for creatinine, a closer approximation may be secured to the true value of endogenous nitrogen metabolism by this method. The greatest advantage of this method, however, is that it gives the **total** endogenous metabolism direct. The greatest drawback to the method is the fact that the animal must be in a certain, very definite condition, which is hard to realize experimentally, especially for a growing animal.

Finally, the ratio of creatinine N divided by total N may be used as a reference. This method has the advantages that it is not influenced by lag or daily variations of the urinary output, and that it combines two independent factors. The disadvantages of each of the independent factors apply themselves to this ratio, however.

IV RESULTS

The original data secured in this research, together with pertinent derived values, are given for each animal in separate tables in the appendix at the end of this bulletin. The data of a few of these animals are also presented, in the appendix, in graphic form plotted on arithlog, or semilog, paper. The advantage of using this type of paper is that the percentage changes for all the curves at any age are directly proportional to their respective slopes and regardless of the absolute units employed. We shall refer frequently to these tables and curves, and supplement the discussion with less comprehensive charts in the text proper. The charts in the text are plotted either on coordinate or on arithlog paper depending on the relative convenience of these two methods.

A. Nitrogen Metabolism as a Function of Time on a Nitrogen-Poor Diet

As pointed out in the introduction, a major purpose of this research is to evaluate the minimum, or endogenous, nitrogen metabolism, which might correspond to the minimum, or basal, energy metabolism. In order to eliminate the influence of dietary nitrogen on nitrogen excretion, the rats were placed frequently on diets containing very little nitrogen. One of these low nitrogen diets, referred to as :N-free", contains 0.5 mg. nitrogen per gram of food mixture. Another of these diets, referred to as "L. N. A.", contains 2.5 mg. nitrogen per gram of food mixture. The extra nitrogen of L. N. A. diet is in the form of milk albumin. This section is devoted to a consideration of the course of nitrogen metabolism as a function of the time that the animals are kept on these diets.

Before proceeding to a consideration of the behavior of individual rats when placed on the practically N-free diets, it may be useful to obtain a general view of the nitrogen metabolism of the groups as a whole. Such a view is presented in Fig. 1a. In this chart, 5-day averages of all the rats in the group were plotted separately for the low- and high-protein animals, against days on the N-free (or L. N. A.) diet. The number of determinations included in each data point are indicated on the chart by small numerals.

Three sets of curves are shown in Fig. 1a: Total urinary nitro-

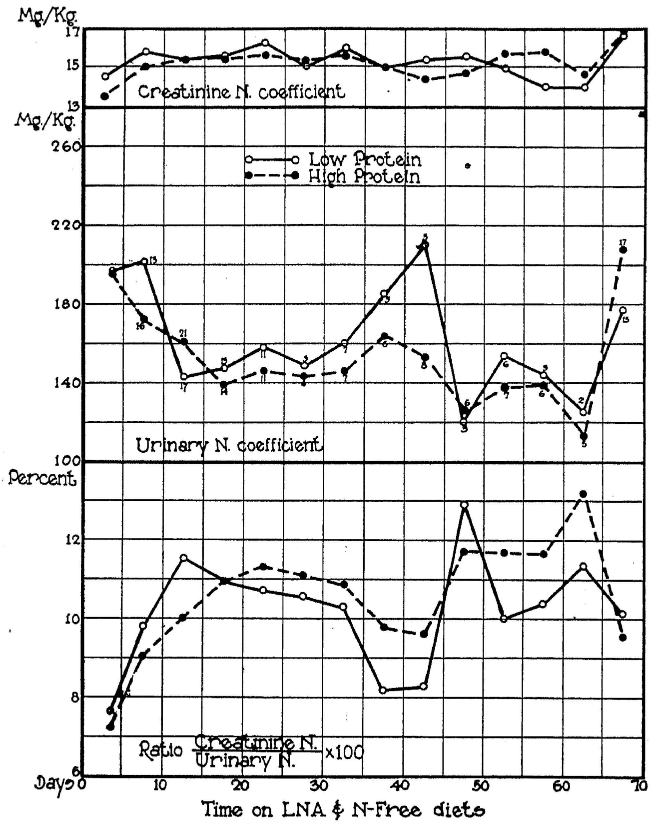


Fig. 1a.—Average values for urinary total creatinine nitrogen and total urinary nitrogen coefficients, and the ratios of these as they are influenced by the length of time on nitrogen-free diets. The numerals beside each data point indicate the number of independent determinations used for computing the average values. A comparison of these values for rats normally kept on high and low protein diets. Note that the high-protein rats tend to have lower coefficients than their paired low protein mates.

gen coefficient (mg. urinary nitrogen per kilo body weight); total creatinine nitrogen coefficient (mg. of total creatinine nitrogen per kilo body weight); and finally ratios of total creatinine nitrogen to total urinary nitrogen expressed in the form of percentages.

The average minimum nitrogen coefficient for the low-protein rats is seen to be 142, and it is reached between 10 and 15 days on the diets. The high-protein rats have a minimum coefficient of 140 reached between 15 and 20 days. However, there is wide range of these values corresponding to the particular condition of the rats.

There seems to be a rise from the first to the second 5-day period in the total creatinine coefficient when a more or less constant level is reached. From the group averages (Table 2) we see that the initial values of the coefficient are below the corresponding group averages. The low-protein group average is seen to be 15.6, while the high-protein rats is 15.0.

The maximum average value for the ratio of total creatinine nitrogen to total urinary nitrogen is reached for the high-protein group between 20 and 25 days, and for the low-protein group between 10 and 15 days. The maximum average values appear to be respectively 11.3 and 11.5 per cent.

TABLE 2.—AVERAGE VALUES OF TOTAL CREATININE NITROGEN COEFFICIENTS (Including All Available Data for Given Rats)

Diet	Rat No.	No. of Analyses	Ave. Total Creat. N. Coefficient	Diet	Rat No.	No. o Analyses	Ave. Total Creat. N. Coefficient
High Protein (Group 1)	2116	83	14.5*	Low Protein (Group 2)	2115	39	16.3***
"	2178	56	15.5	"	2173	57	15.8
"	2205	50	15.1**	"	2206	55	15.3
"	2210	44	15.2	"	2209	45	15.4
"	2214	45	14.9	"	2213	45	15.4
(Group 3)	3289	38	13.6	(Group 4)	3287	39	15.3
"	3290	38	13.7	"	3288	38	15.3
"	3294	32	14.6	"	3292	32	14.4
"	3293	32	13.7				
Corn Gluten (Group 5)	2528	31	16.3	Milk Albumin controls paired to the corn gluten rats. (Group 6)	2530	31	15.4
"	2529	31	15.9		2531	27	14.8
"	2532	27	15.6				
"	2534	27	15.3				

Weighted Average, all data ---------- 15.1
Unweighted Average, all data ---------- 15.1
Unweighted Average, Group 1 ---------- 15.0
Unweighted Average, Group 2 ---------- 15.6
Unweighted Average, Group 3 ---------- 13.9
Unweighted Average, Group 4 ---------- 15.0
Unweighted Average, Group 5 ---------- 15.8
Unweighted Average, Group 6 ---------- 15.1

*First record omitted—too high (41.3).
**Three points omitted at ages 319, 339, 337—days representing premortal rise
***First record not included—too high (39.0).
Also last two records not included—premortal rise.

We may next consider in detail the behavior of some of the individual animals on the N-free diets, and discuss the significance of the phenomena.

1. **Urinary Nitrogen Coefficient:**—Figs. 1a and 1b indicate that it takes some time for the organism to reach the minimum level of N excretion when placed on a nitrogen low diet. This fact is the main argument in favor of the existence in the body of "deposit" or "circulating" protein.

How long does it take to deplete this store of deposit protein? Probably the nearest approach to the actual minimum endogenous level of N excretion for a human was secured by Deuel and collaborators. After 54 days on a N-free diet, followed by 8 days of low protein feeding and then followed by 9 days of a N-free diet, the low level of 24.1 mg. Nitrogen per kilo body weight was secured. The subject, a man originally weighing 83.1 kg., had lost 12.8% of his weight under this regime. The low level of N excretion was attributed to a very complete exhaustion of the deposit protein supply which, according to these authors, is much larger than is generally believed, and a long time is required for its depletion.

Mitchell and Hamilton tabulated the average endogenous nitrogen per kg. for a large number of rats ranging in weight from 40 to 240 gms. They found this ratio to decline with increasing weight from 220 to 110 milligrams N per kg. body weight. However, their periods of low nitrogen feeding were of rather short duration. In Mitchell and Carman's report of their work on the biological value of foods, they state that the usual period of preliminary feeding had been of 3 days duration but that this had been increased to 4 days in order to insure a complete adjustment to the minimum level.

Two typical samples of our data on the urinary nitrogen coefficient of individual rats are presented in graphic form in Fig. 1b. The N-free, or L. N. A. feeding periods were of rather short duration for the earlier ages in order to avoid interference with normal growth.

The two pairs of rats differ in this respect: When placed on the N-free, or L. N. A. diet, the high protein rat 2116 maintained his body weight higher than the low protein rat 2115; while high protein rat 2205 fell below low-protein rat 2206 on this diet, even though high-protein rat 2205 was heavier than his low-protein mate 2206 preceding 6 months of age. This appears to be due to some individual superiority of high-protein rat 2116 over high-protein rat 2205 in his ability to maintain body weight under adverse conditions of food supply.

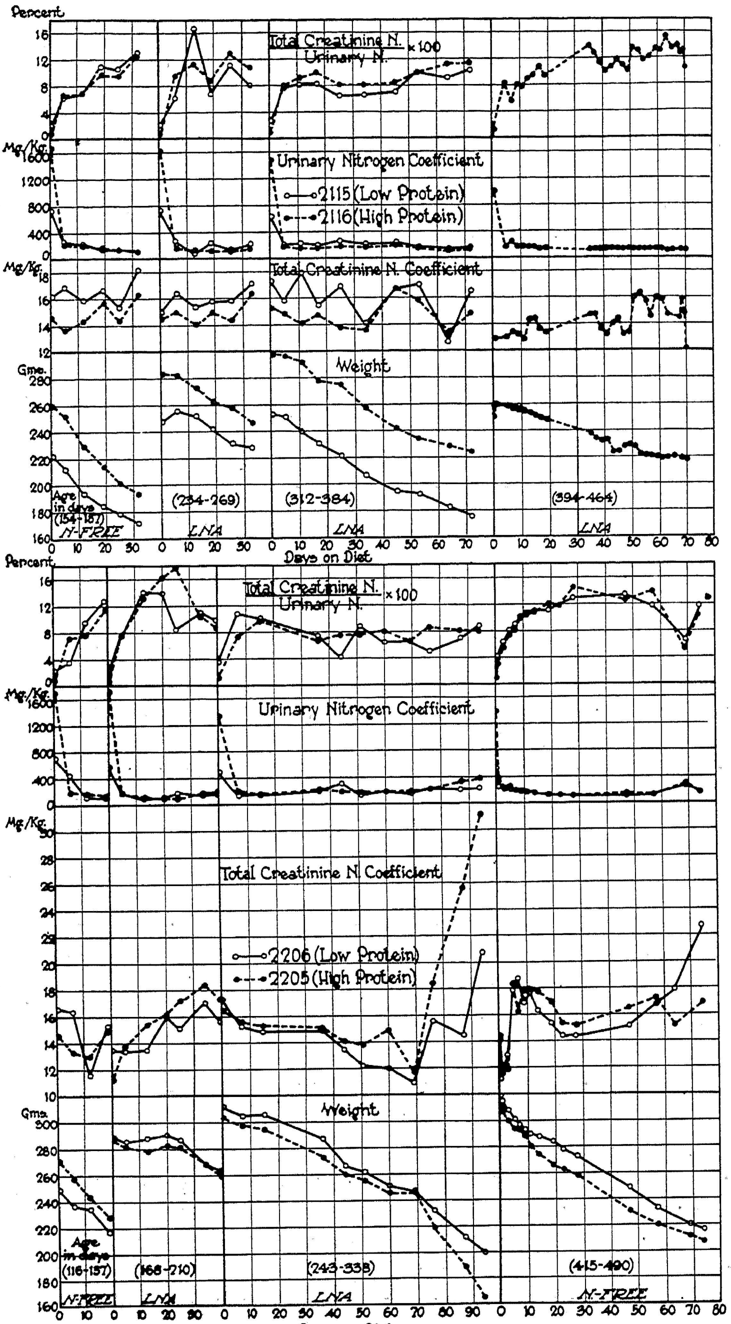


Fig. 1b.—Individual data points for two typical pairs of rats. The decline in body weight is also shown. The nitrogen coefficient scale is 1/200 as great as the creatinine nitrogen coefficient scale.

As regards the nitrogen coefficient, the heavier high-protein rat 2116 has a lower coefficient than the lighter low-protein rat 2115; while the lighter high-protein rat 2205 tends to have a some-

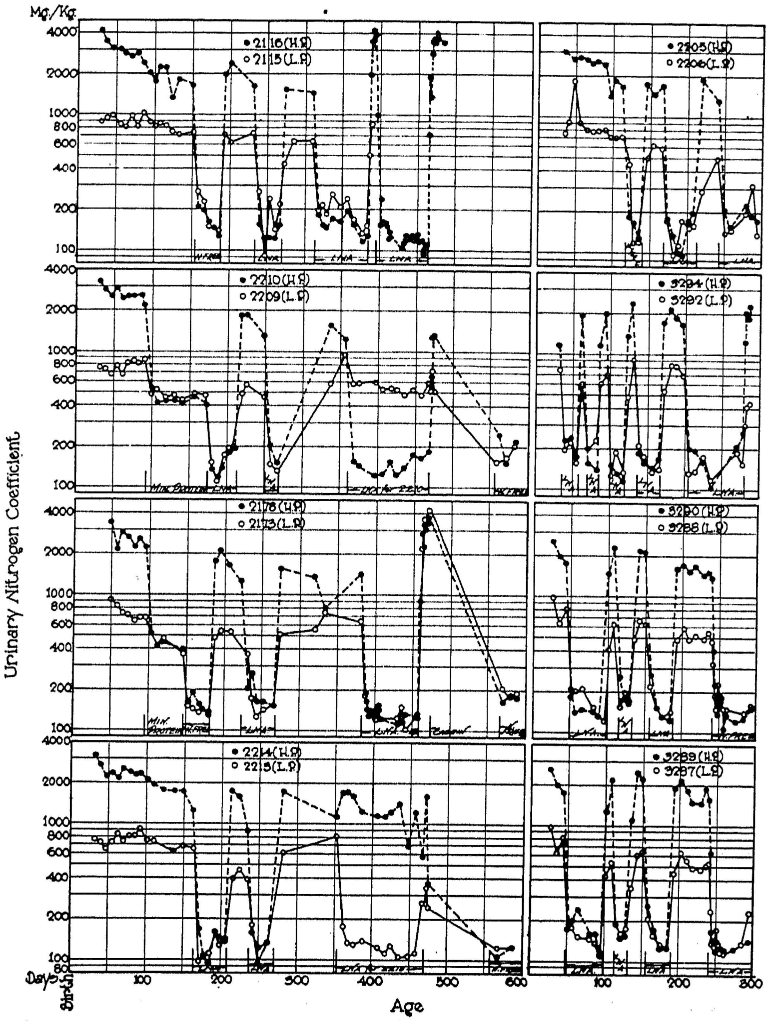


Fig. 2.—Individual age curves of the total urinary nitrogen coefficients of several pairs of rats plotted on an arithlog grid. The normal diet of each rat is indicated beside its number. Periods on the N-free and L. N. A. diets are indicated on the chart.

what higher nitrogen coefficient than the slightly heavier low-protein rat 2206 (following age 4 months). In other words, it is not so much the nature of the preceding diet, as the genetic ability of the rat to keep up the body weight under the adverse conditions of a diminished nitrogen supply that is associated with a low nitrogen coefficient. High-protein rat 2116 is evidently less wasteful with his nitrogen resources than high-protein rat 2205.

It appears that while the average minimum nitrogen coefficient is 140, as shown in Fig. 1a, the limiting, or minimum, value for the nitrogen coefficient of an individual rat may be of the order of 100 as indicated in Fig. 1b and in the tables in the appendix. The maximum value of this coefficient depends, of course, on the dietary nitrogen; Fig. 2 shows that the maximum of the nitrogen coefficient under our conditions of food supply is of the order of 4000, i. e., 40 times as great as the minimum. The decline to the minimum when placed on the N-free diet is very steep for the first 3 to 5 days. Following this initial steep decline, the change in the total nitrogen coefficient is relatively slight. The preceding level of protein intake has little influence on the nitrogen-excretion level after the first 3 to 5 days on the N-free or L. N. A. diet. Indeed, the N-coefficient of the high-protein rats tends to decline below the level of the low-protein groups.

2. Total Creatinine Nitrogen Coefficient:—Typical data for the total creatinine nitrogen coefficient as functions of the length of time on the N-free, of L. N. A., diets in individual rats are presented graphically in Fig. 1b alongside the total urinary nitrogen coefficient data. Fig. 1a presents such a curve for the groups.

The data show that the creatinine coefficients of the heavier adult rats tend to be smaller than of the lighter adult rats and regardless of the preceding normal protein level in the diet. This difference is not always true (see Tables 4, a and b, data for rats 2173 and 2178).

These curves also show that for rats on the very low-protein diets considerable variations in the creatinine coefficient may occur. This is particularly true as regards rats 2206 and 2205 (lower half of Fig. 1b). During the age interval 168 to 210 days, the coefficient for the high-protein rat rises from nearly 11 to over 18 and of the low-protein rat from 14 to 17. During the interval 243 to 338 days, there is a decline in the coefficient from about 17 down to about 11 (on the 70th day) on the L. N. A. diet. Then there is a very steep rise up to 31—presumably representing the premortal rise. The downward trend of the weight curve, and the rise in the nitrogen coefficient at this time all indicate that there was an acceleration of the endogenous metabolism with the production of considerable creatine, which would be included in the total creatinine values here given. It may be of interest to note that the ratio of the total creatinine N to total urinary nitrogen remained fairly constant during this critical period.

There is not as much systematic variation for rats 2115 and 2116 (upper half of Fig. 1b). It will be noted that rat 2116 is heavier at all times than his paired mate on the low protein diet and has a correspondingly low total creatinine coefficient. The third period of observation (age range 312-384 days) shows a less stable creatinine to body weight ratio. At the end of this period rat 2115 was in a serious condition, refusing to eat a protein-containing diet. The total creatinine coefficient immediately rose to abnormally high values and the rat died of starvation. See Table 3a.

It should also be noted that only 10 days elapsed between the 3rd and 4th periods of specific nitrogen starvation for 2116. During this interval he received a diet very rich in protein, and accompanied by unusually low total creatinine coefficients. The fourth curve shows an irregular but definite increase of the coefficient during the first 50 days of observation.

It may be noted from Table 7a that the total-creatinine nitrogen coefficient of rat 2113 declined during the 3rd period on the very low protein diet from about 17.5 at the start to a little over 13 on the 51st day; then it rose again to 17 on the 93rd day.

There may be, of course, experimental errors, especially in connection with the urine collections. The error is probably between 5 and 10 per cent. The fluctuations just discussed could not, however, be due to experimental errors alone. Body weight is certainly an influencing factor, the heavier the animal, the smaller (as a rule) is the total creatinine coefficient. Age is probably another factor in that the total creatinine coefficient tends to be less stable in immature than in mature rats. The time on the very low-protein diet seems to influence the coefficient, perhaps indirectly on account of loss of adipose tissues, or changes in water content in the body.

3. Ratio of Total Creatinine Nitrogen to Total Urinary Nitrogen:—Urea excretion is, above a certain level, directly proportional to dietary nitrogen ingestion, but creatinine excretion remains practically constant; or at least, it remains independent of the dietary nitrogen ingestion. It follows from this fact that decreasing protein ingestion will increase the percentage creatinine nitrogen in comparison to the total urinary nitrogen, and the attainment of a minimum urinary nitrogen level is associated with a maximum creatinine percentage nitrogen level.

One method, therefore, of determining the minimum urinary nitrogen level is by finding when the percentage of the creatinine nitrogen with respect to total urinary nitrogen is at a maximum. What is this maximum percentage level? Values as high as 35% are recorded in the literature. A 35% level was reported by Smith in his work on a man subjected to an unusually prolonged period of nitrogen starvation; McCollum found 17 to 19% for pigs; Mitchell, working with rats, gives an average value of 8%, but with considerable individual variation noted; Smuts, reports that the "average percentage of creatinine nitrogen in terms of total endogenous nitrogen is for mice 4.9%; for male rats, 7.3%; for female rats, 6.7% for guinea pigs, 7.2%; for rabbits, 14.3%; and for pigs, 18.2%." Smuts generalizes by saying that "the creatinine nitrogen becomes an increasing percentage of the total endogenous nitrogen as the size of the species increase." He also reports that the size of species determine the length of time necessary to reach the endogenous level. As previously mentioned in connection with Fig. 1a, we have found that the average of this ratio for male rats is between 11.0 and 11.5%, which is much higher than the value reported from Mitchell's laboratory.

The percentage ratios of total creatine nitrogen to total urinary nitrogen (total Cr. N. divided by total urinary N. x 100) for individual rats are plotted in Fig. 1b for the same two pairs of animals (2115, 2116, and 2206, 2205), and for 3000 series at earlier ages in Fig. 6a.

Just what is the effect of age on this ratio when kept on the N-free diet? Apparently young animals require as long a time to reach this maximum value of the ratio as older animals; but the young rats have not been kept as long on the N-poor diets since it was desirable that their normal growth rates be maintained. It is not possible to say what maximum would be reached by the younger rats especially when the ratio increased throughout the period of investigation.

However, when maximum points in the ratio are reached for immature rats, these values are often below the corresponding ones secured with mature animals. In this respect, the ratio shows its relation to the nitrogen coefficient data.

From the data of the mature rats 2115, 2116, 2206, and 2205 (Fig. 1b) one may see that certain periods of low-N feeding are marked by lower values of the maximum level of this ratio. Thus, from the curves for rats 2206 and 2205, it is seen that after a short period on the normal diets the weight may be entirely regained, but the effect of the previous period of L. N. A. feeding apparently remains as evidenced by the lowered values of the maxima of the ratio for the next period of L. N. A. feeding.

There are three types of trends that the ratio of creatinine N to Total N may undergo: (1) It may increase, indicating the minimum endogenous metabolism level has not been reached; (2) it may remain constant, indicating that a minimum level has been reached; and (3) it may decrease, indicating an acceleration of the endogenous metabolism providing no nitrogen has been added to the diet.

An examination of the curves indicates that there is a wide range of time required to reach the minimum level of endogenous metabolism. In most cases, maxima of 10% or more for the ratio of creatinine N to total N are reached in 8-15 days on a nitrogen-poor diet, but note the case of 2116, Fig. 1b, (age ranges 312-384 days and 394-464 days) indicating that only after some 60 days is the peak of this ratio attained; and that it is here also that the minimum excretion of urinary nitrogen per unit weight occurs.

What then can we say concerning the limits of this "constant" ratio? Since the total creatinine and endogenous nitrogen coefficients are only roughly constant, the ratios of the two can not therefore be expected to have a very narrow range of variability.

As high as 17% of the total endogenous nitrogen excretion of the rat has been traced in this work to total creatinine. This is only slightly below the values found for the pig by McCollum. But in the data here presented most of the values of this ratio fall within the limits of 10-15%, with an average between 10.5 and 11.5% as shown in Fig. 1a.

B. Nitrogen Metabolism as a Function of Age and Body Weight

Having shown what profound influence is exerted by the time of specific nitrogen starvation on nitrogen excretion—a fact that must always be kept in mind in considering the problem of nitrogen metabolism—we next consider age and body weight as factors influencing the minimum level of nitrogen excretion in the rat.

1. Urinary Nitrogen Coefficient:—It is the general opinion that there is a decline of the endogenous nitrogen coefficient with age (Mitchell and Hamilton, p. 490). Terroine and associates have confirmed this opinion and noted that while the endogenous urea, ammonia, amino acid and allantoin nitrogen decreased, the creatinine nitrogen remained constant or slightly increased with age. As previously metioned, the lowest value secured for this coefficient was 24 mg. per kg. in a man who had been in a state of specific nitrogen inanition for about 60 days.

The minimum level of nitrogen excretion is not easily attained in most animals, since it is difficult to insure a sufficient energy intake during the periods of time necessary to reduce the nitrogen excretion to a minimum. The observed high values for young animals are, perhaps, due to the fact that they reach the endogenous level of nitrogen excretion less readily than older, heavier, animals. An acceleration of the endogenous metabolism may intervene due to the utilization of tissue proteins for energy purposes, or there may be a greater proportion of "storage" protein in the young, rapidly growing animals.

As previously pointed out, during the earlier ages, our rats were kept on the L. N. A. diet for a relatively short time in order that tissue protein should not be destroyed for energy purposes. This may be the reason for the apparently higher values secured in our young rats.

In a few cases, as indicated in Fig 2 (3000 series graphs), the second period of L. N. A. feeding followed a short one of normal protein levels with an accelerated rate of growth. The effect of the preceding period of protein inanition is seen from the fact that the nitrogen excretion immediately drops to below the former minima. Is this due to a more complete depletion of the storage protein?

It appears that the minimum nitrogen values of our young rats are below the levels given by Mitchell and Hamilton. The older rats sometimes show, however, higher N coefficients even when prolonged periods on the N-free diet are maintained. This is apparently caused by an accelerated tissue catabolism due to the use of tissue protein for energy metabolism.

2. Total Creatinine Nitrogen Coefficient:—Hunter's summary of the literature shows that the **preformed** creatinine coefficient of infants is less than that of adults. Starting from less than 1 at birth, this coefficient gradually rises but does not reach the adult level until the 13th or 14th year. The **total** creatinine coefficient in children is often more nearly the same as that of the adult (Hunter, Table 25, p. 186). Hunter points out that there is also a greater irregularity in the excretion of creatine in young animals than in adults.

Garot more recently reports an average preformed creatinine nitrogen coefficient of 5.4, and a total creatinine nitrogen coefficient of 9 for infants aged 3.5 to 7 months.

The total creatinine coefficient of our rats shows considerable variations. Examination of the coefficient as plotted against age in Fig. 3, shows that fluctuations of 30 to 40% from the mean are not uncommon. In many cases, there seem to be definite trends of the coefficient. Some of these apparent discrepancies may be attributed to dietary conditions as these may influence the weight of the animal. However the variations may be explained, our data indicate that age, itself (between the limits of 25 and 600 days), does not appreciably influence the total creatinine coefficient of the rat.

In order to determine the total creatinine coefficient at earlier ages a litter of rats was weaned at 21 days and urine collected continuously until they were 62 days of age. For details see Tables 14a and 14b.

The coefficient started at an unusually high level but soon dropped to normal values. The initial high value of the coefficient may be due to the violent change in diet accompanying weaning at this early age, rather than to the age factor as such. The data for these very young rats are indicated by triangles in Fig. 3.

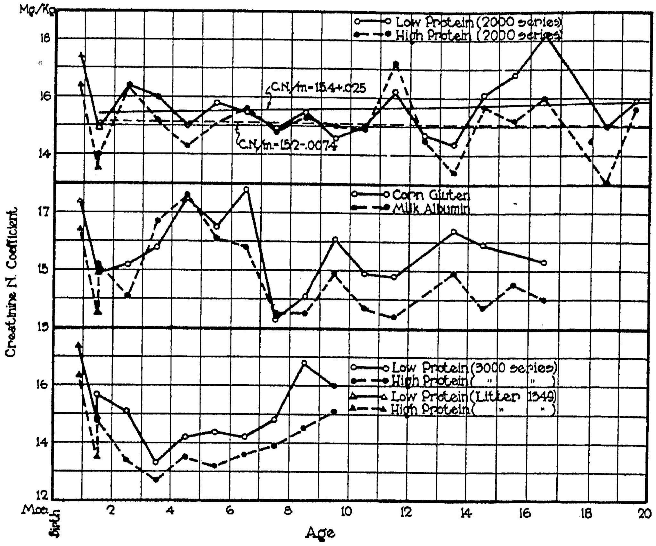


Fig. 3.—The average total creatinine coefficient as a function of age. Data from litter 1349 (triangles) are used to extend each curve to the earlier ages.

To determine the relative influence of age as such (distinct from rate of growth, and body weight) on the total creatinine coefficient, very young rats were given corn gluten as a sole source of protein. This effectively arrested their increase in body weight while, of course, they were increasing in age. The total creatinine coefficients obtained from these animals were rather irregular and high due to the emaciated condition of the animals. But no definite age trend could be detected. In Fig. 3, the average creatinine coefficient as a function of age for this group may be compared with the other group averages.

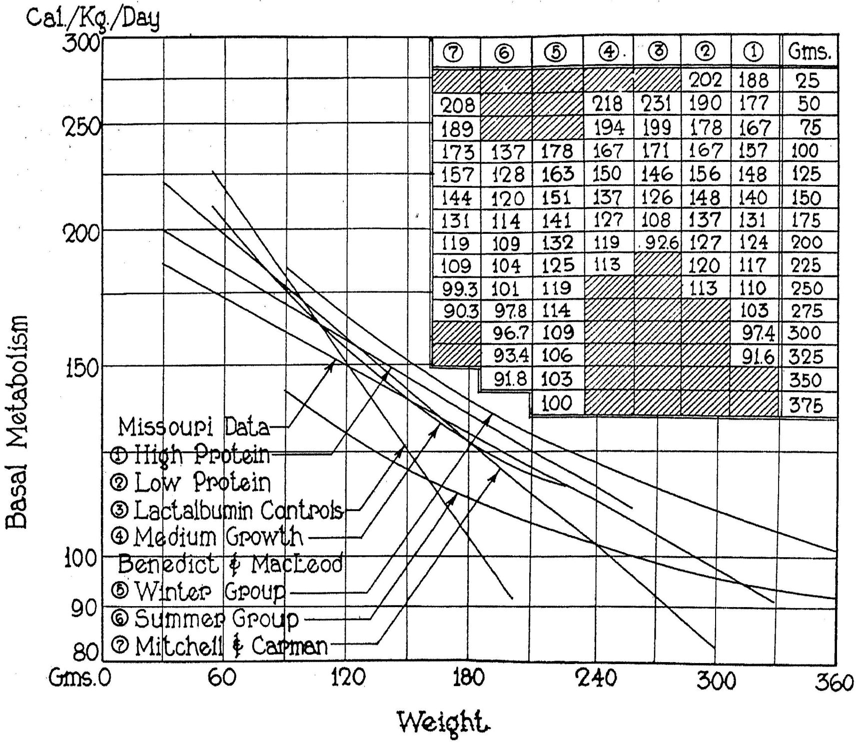
The effect of body weight on the total creatinine coefficient is much more apparent from the data here presented than that of age. The most outstanding modifications of the coefficient occurred after some 70 days or more on the N-poor rations, which led to considerable loss of weight. At this time there was often an abrupt and marked rise in the total creatinine excretion (see Figs. 1a and b). This is presumably associated with what is known as "creatine-creatinine crossing" observed particularly in fasting dogs. Morgulis has pointed out that this phenomenon is not necessarily followed by death, and our data confirm his opinion. However, there is no doubt that this sudden rise in total creatinine excretion represents the advent of a critical situation in the animal's economy. Data presented on low and high protein animals paired to the same intake show that dietary factors influence the creatinine coefficient only indirectly through their effect on the body weight of the animal.

3. Ratio of Total Creatinine Nitrogen to Urinary Nitrogen:— Since, as we have seen, that the total creatinine and total endogenous urinary nitrogen are equally affected, or unaffected, by age, therefore the ratio of creatinine N to urinary endogenous nitrogen must likewise be affected by age. These ratios for successive periods of nitrogen inanition of the several pairs of rats given in the tables may be taken as material evidence for this proposition, and nothing further need be said on this problem.

C. Basal Metabolism as a Function of Age and Body Weight

The results of basal metabolism measurements on these rats were already presented and discussed on pp. 71 to 76 Missouri Res. Bul. 166, and pp. 33 to 37, Missouri Res. Bul. 176. Figs. 4a and 4b present summaries of the results in the form of curves of each of the group of rats under consideration; they are represented in terms of Calories per kilo as functions of body weight and of age. For purposes of comparison, we have also included in this chart curves based on data by Benedict and MacLeod, and by Mitchell and Carman.

It is shown in Missouri Res. Bul. 176 that age does not, in itself, exert an appreciable influence on basal metabolism. The normal changes in the metabolic rate with increasing age are due largely to increasing body weight. As the body increases in weight, the metabolism per unit weight decreases. Now since, as we have seen, that the creatinine coefficient, and the endogenous nitrogen coefficient are not appreciably affected by age, therefore the function relating energy metabolism to endogenous nitrogen metabolism (or to creatinine metabolism) should have the same general form as the function relating metabolism to body weight. The following sections are devoted to a consideration of this problem relating the energy metabolism to nitrogen metabolism.



⑦	⑥	⑤	④	③	②	①	Gms.
					202	188	25
208			218	231	190	177	50
189			194	199	178	167	75
173	137	178	167	171	167	157	100
157	128	163	150	146	156	148	125
144	120	151	137	126	148	140	150
131	114	141	127	108	137	131	175
119	109	132	119	92.6	127	124	200
109	104	125	113		120	117	225
99.3	101	119			113	110	250
90.3	97.8	114				103	275
	96.7	109				97.4	300
	93.4	106				91.6	325
	91.8	103					350
		100					375

Fig. 4a—A comparison of the energy metabolism coefficient curves of our rats on the several diets as functions of body weight. For purpose of comparison, the average values for data by Benedict and MacLeod and of Mitchell and Carman (as computed by us) are also included. See pp. 71 to 76 Missouri Res. Bul. 166 for detailed discussion of these data.

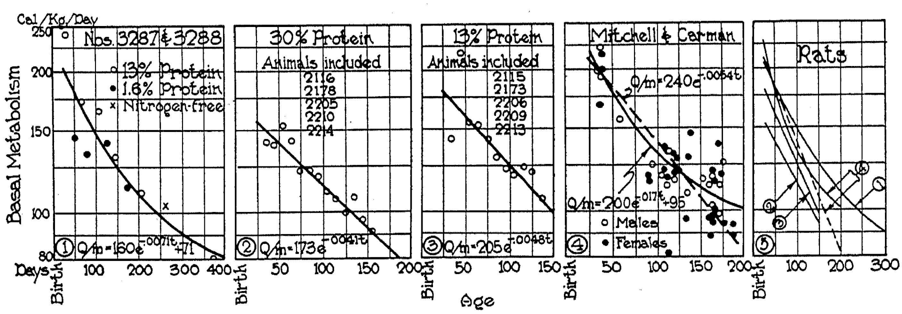


Fig. 4b.—Age curves of energy metabolism coefficients of the several groups of rats. Chart 4 represents Mitchell's and Carman's data for purposes of comparison. Chart 5 represents a comparison of all the curves. See pp. 32 to 37, Missouri Res. Bul. 176 for detailed discussion of these data.

D. Relations Between Energy and Nitrogen Metabolism

Various attempts have been made to correlate basal metabolism with creatinine excretion and the minimum endogenous nitrogen. It is generally conceded that whereas creatinine excretion for the growing animal increases in proportion to body weight, the basal metabolism increases as a fractional power of body weight. Therefore, there should be no direct proportionality between the two. For mature individuals of 5 species, varying in size from the mouse to the pig, Smuts found no strict proportionality between creatinine excretion and basal metabolism.

The trend relations between body weight, basal metabolism, per unit weight, and total creatinine nitrogen excretion per unit weight are shown in a semiquantitative form in Figs. 6a, 6b, and 6c. As the body weight increases, the metabolism per unit weight decreases; but the total creatinine nitrogen coefficient tends to remains constant. On placing the rat on an L. N. A., or N-free diet, the live weight declines, the metabolism per unit weight increases; but the creatinine coefficient still tends to remain constant.

1. Ratio of Basal Metabolism to Total Creatinine Nitrogen:—Fig. 5a presents in graphic form the relation of basal metabolism to total creatinine nitrogen excretion in the rats as function of body weight. Comparisons are also presented between the curves of individual rats, and the general averages of the animals in the high- and low-protein groups. The shapes of the curves of the ratio of energy metabolism to total creatinine excretion are the same as the shapes of the curves of the ratio of energy metabolism to body weight both represented as functions of body weight.

2. Ratio of Basal Metabolism to Urinary Nitrogen Excretion:—Fig. 5b presents the relation of basal metabolism to urinary nitrogen excretion.

The maxima on the chart correspond, of course, to the minima of nitrogen excretion. There is an apparent decrease of the ratio with age, which indicates that the basal metabolism per unit weight declines more rapidly than the minimum endogenous nitrogen per unit weight. The maximum value of the ratio seems to be between 1.2 and 1.5 Calories per mg. nitrogen. For larger, and older, rats whose basal metabolism is of the order of 70 or 80 Calories per kilo, the maximum value of the ratio is less than one. If we assume that the minimum nitrogen coefficient is 100 mg. then the ratio is easily figured.

When the dietary protein level is raised, this ratio, decreases to as low as 0.03 Calories per mg. urinary nitrogen.

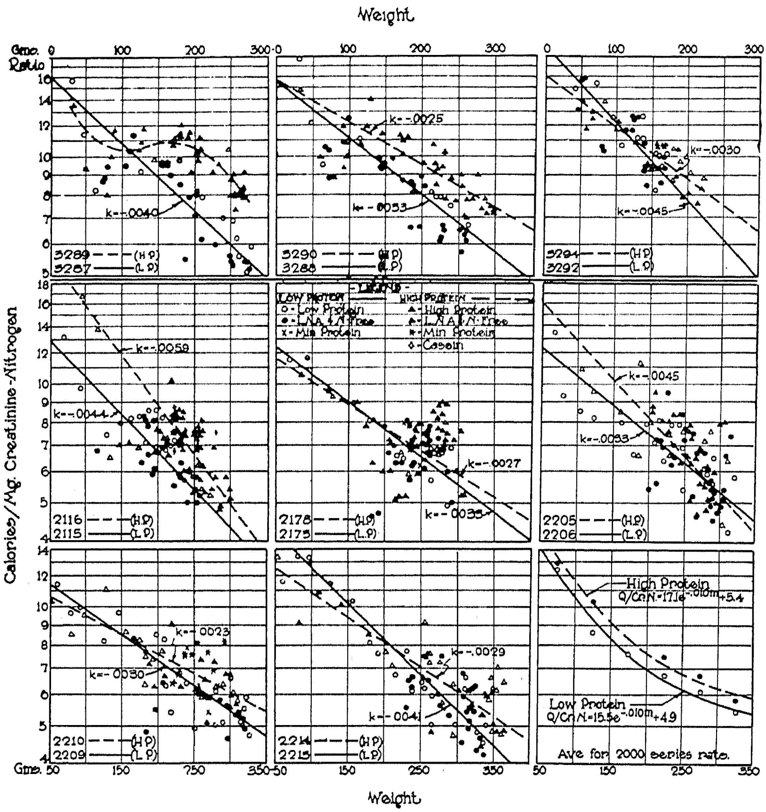


Fig. 5a.—Data points of individual determinations showing the ratio of basal energy metabolism to urinary total creatinine nitrogen excretion as a function of body weight plotted on arithlog grids. Also (lower right corner), curves representing the average values for the low and high protein animals.

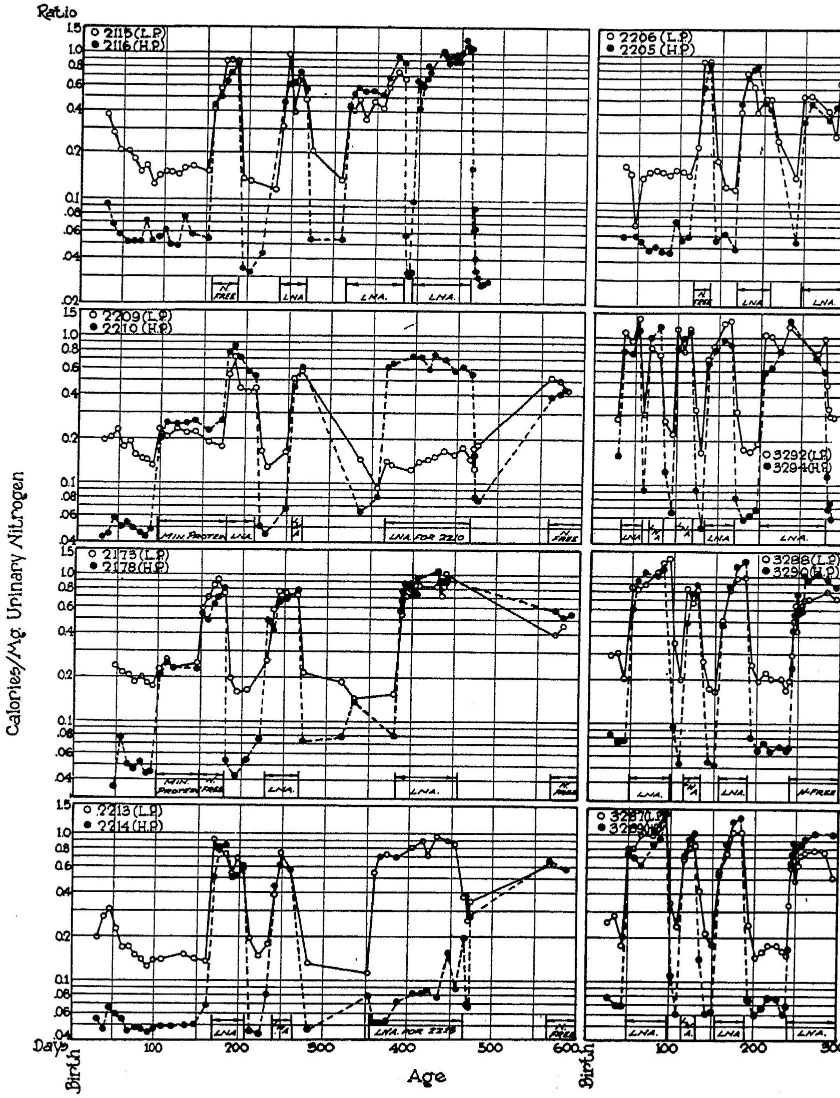


Fig. 5b.—Age curves of individual determinations of the ratio of basal energy metabolism to total urinary nitrogen excretion.

V. DISCUSSION

When rats are given a diet very low in nitrogen, the excretion of urinary nitrogen drops within a few days to a comparatively stable level which is approximately independent of the former dietary level of protein. But closer examination of the course of decline shows that considerably lower values may be secured following the first 10 or 15 days on the practically N-free diet.

It may be seen from Fig. 1a that for the low protein rat the average minimum nitrogen coefficient is reached after 10 to 15 days on the N-free diet. The high protein animals reach the average minimum value after about 15 to 20 days on the N-free diet. The rise which in each case follows the minimum is no doubt due to an acceleration of the endogenous metabolism of the average rat. In individual cases the acceleration may, of course, occur at any time. Data have been secured in a few cases up to 110 days on the L. N. A. diet. Although the data are not numerous enough to justify comparisons with the first part of the curve, there are indications of still lower minima at 60 days followed by an acceleration.

Individual variations in nitrogen coefficients are evidently quite considerable. One cannot definitely say from this that the delayed minimum of the high protein rats was due to storage protein. The curves show that with the exception of the time range of 10-15 days the high protein animals have a definitely lower average nitrogen coefficient during the first 45 days of nitrogen deprivation.

The total creatinine coefficient curve at the top of Fig. 1a does not show these marked differences between low and high protein rats. The creatinine coefficient is plotted on a scale 10 times as large as that of the nitrogen coefficient. Relatively, the creatinine coefficient seems to be much more constant than the nitrogen coefficient.

From the bottom curve of Fig. 1a, we may get some idea of the relation between the two upper curves. Here again it is evident that the 4th and 5th day on the N-free diet are represented on the steep portion of the ascending curve. It thus seems that 5 days on N-free diets is altogether too short a period for reaching the endogenous level. Fifteen days, or at least ten days, would seem to be a more reasonable time interval for rats to reach a constant low value of urinary-N excretion.

These findings are not in agreement with the opinion of Mitchell and associates. They assume that a constant level of urinary nitrogen excretion is reached in the rat after 3 or 4 days of nitrogen-poor feeding. The latest work from Mitchell's laboratory in this connection is that of Smuts. He states that: "The time required to deplete the protein reserves for different species, as judged by the constancy in daily urinary nitrogen output, was: Three days for mice; eight days for guinea pigs; 15 days for rabbits; and 20 days for pigs." Why he should have overlooked mentioning the rat here since his data includes this species is not clear; but in the above series of species, the rat should take between 3 and 8 days to reach a constant level of nitrogen excretion. The recent work using man as a subject, as previously cited, indicates that 60 days may be required to deplete the body of its "storage" protein. Data presented by us show that the rat may take fully as long to reach its apparent minimum. One may ask at this point whether the nature of the endogenous metabolism is the same regardless of how long it takes to reach the minimum level. There may be an increase of weight in the rat during the first few days of nitrogen-poor feeding, but there soon starts a steady loss which continues throughout the remainder of the period (Fig. 1b). The rats often lost 30 or 40% of their former weight when left 60 days on the N-free diet. From the urinary N coefficient curve (Fig. 1a) it may be seen that low protein rats are more subject to an acceleration of their endogenous metabolism than their high-protein mates.

Indeed, there may be no absolute minimum level of nitrogen excretion. Like the basal metabolism of fasting, the nitrogen excretion during specific nitrogen starvation may be continuously lowered as the animal tends to become adjusted to the deficient diet.

When rats are given a ration very low in nitrogen over a considerable period of time, the creatinine coefficient does not remain altogether constant. There are trends which cannot be explained as due entirely to errors in collection and analysis of the urine. But the average value secured on a nitrogen-poor diet lends no support to an exogenous origin of creatinine arising from the higher levels of protein in the diet. This especially applies to younger rats. See data for the rats of the 3000 series.

In general, our data fully confirm the theory that creatinine excretion is independent of protein intake. The total creatinine excretion of rats excreting 400 to 800 mg. of urinary nitrogen per day is seen to average only slightly more than that in rats excreting 100-200 mg. nitrogen, and per unit weight it is less.

The rats on the higher levels of protein intake invariably grew faster than their "paired" mates on the low protein diet, but consuming, according to our calculation, food having the same energy content. This raises a number of questions, one of which is, what becomes of the energy consumed by the low-protein rats which in the case of the high protein rats goes for increasing body weight? But what we are immediately concerned with is the fact that the high-protein animals (which were larger than their low-protein litter mates) had a somewhat lower total creatinine coefficient. It is interesting to note in this connection that Harding and Gaebler found the creatinine coefficient of puppies to decline slightly with an increase of the protein level in their diet.

From the above data it seems that there must be either a greater proportion of adipose tissue in the bodies of the high-protein animals, or a diminished rate of production of creatinine. Chanutin's work indicates a slightly higher percentage of fat in the bodies of rats living on a diet containing 85% beef. However, the problem of the formation of fat from protein is still under debate, in spite of the large literature on the subject (reviewed by Mitchell and Hamilton, p. 317).

In the following table the total creatinine coefficients of rats receiving corn gluten as sole source of protein are compared with those of control rats paired to an equivalent amount of diet containing lactalbumin as source of protein. In the table, averages represent 4 corn-gluten animals and 2 lactalbumin animals.

Age Range, Days	33-100		101-200		201-300		301-400	
Diet	Gluten	Albumin	Gluten	Albumin	Gluten	Albumin	Gluten	Albumin
Food Consumed, Gms	277	267	475	522	567	567	621	612
Gain in Weight, Gms.	24	72	23	29	15	−5	17	32
Ave. Total Creat. N Coefficient	15.3	14.9	16.7	16.4	15.3	14.1	14.9	13.4

The stunting of the growth of the control (lactalbumin) rats is due to an insufficient intake of food. The qualitative composition of the diet was satisfactory. Under these circumstances it is difficult to conceive that they would be fatter than their paired mates on the qualitatively deficient corn-gluten diet which had all the food that they would consume. (The amount of food given to the lactalbumin rats was quantitatively limited to the amount eaten by the corn-gluten rats.) Yet the lactalbumin animals were heavier at all ages, and had a lower creatinine coefficient than their corn gluten mates (Fig. 3). When they were placed on the L. N. A. diet, the creatinine excretion was irregular, thus making it difficult to decide, whether or not there was an exogenous production of total creatinine due to feeding of protein of low biological value, as would be indicated by the work of Terroine and Danmanville. (See Fig. 6c for a composite picture.)

When some of the stunted rats were placed on a normal (high) protein diet after age 400 days, they immediately resume normal growth, without, however, changing the total creatinine coefficient.

To further test the possibility of an exogenous production of creatine, rat 2116, after being subjected to about 75 days of L. N. A. feeding was changed to the casein ration containing about 40 times as much nitrogen. The daily output of nitrogen on the L. N. A. diet had dropped to about 29 mg. During the first 2 days on the 70% casein diet, it increased to 442 mg. per day. The total creatinine coefficient in the same time declined below the normal level as may be seen from the data (Fig. 3b). This drop continued for 6 days while the rat was rapidly regaining lost weight. Rat 2115 was also offered the casein diet at the same time. However, this rat refused to eat the diet and died a few days later from starvation. During this time the creatinine coefficient of rat 2115 rose to double the normal value. Thus, we see that when the animal is gaining weight, a high source of protein does not increase the total creatinine excretion, but that the accelerated endogenous metabolism of fasting gives rise to a marked increase of the total creatinine. Our data do not, therefore, substantiate the idea of an exogenous origin of creatine or creatinine. It may be recalled in this connection that Beard and Barnes increased the total creatinine excretion of adult rats 36% by feeding glycine.

In agreement with Chanutin, we find that the creatine metabolism of the rat is quite stable. His report that the feeding of a variety of proteins at 25% and 75% levels, as well as diets very low in protein, failed to affect the creatine content of the rat (calculated on the basis of fat and ash-free tissue) is in agreement with our conclusions that marked changes in the diet do not affect the total creatinine excretion.

There are only two conditions which we found to alter the total creatinine coefficient. The coefficient may be increased to double its normal level after a long period of N-free feeding due to the "premortal rise"; and it may be lowered to one-half its normal value by the refeeding of emaciated rats (after confinement on N-free diets). This latter observation indicates the filling of a creatine reservoir or the use of creatine in synthesizing new tissue.

From Table 2 we note that the average creatinine N coefficient for the rat is 15.1 mg./kg. The highest group average is that of the corn-gluten rats, which is 15.8. While this seems to indicate an exogenous source from the corn gluten, one must remember that these rats were very emaciated. The lowest group average was that of group 3 (high-protein rats). These rats were given a very fast growing diet, but their growth rate was slowed down by frequent periods of L. N. A. feeding. These periods of low-N feeding were of rather short duration, and probably conducive to the formation of fat. Then in the period immediately following these an accelerated growth is marked by a retention of creatine which would tend to lower the coefficient.

Further evidence of the production of adipose tissue in high-protein rats is indicated from the basal metabolism per unit weight. Thus, we see that the low protein animal has on the average a slightly higher basal metabolism per unit weight (Fig. 4a) than their high-protein litter mates paired to the same quantitative intake.

It may also be seen that rats living for one year on corn gluten as sole source of protein, and averaging 90 gms. in weight, have an average basal metabolism of about 155 Calories per kilogram while growing rats of 90 gms. body weight and consuming a low-protein diet average about 170 Calories per kilogram. Moreover, the underfed, paired controls (lactalbumin rats) although heavier in weight, averaging about 150 grams, have an average basal energy production of about 125 Calories per kilogram while the low-protein rats of the same weight average 148 Calories per kilogram. From which it appears that rats stunted in growth by either a quantitative or qualitative deficiency in diet have a somewhat lower basal metabolism per unit weight than normally growing rats on about the same level of protein.

VI. SUMMARY AND CONCLUSIONS

1. The total creatinine coefficient of the rat is not appreciably affected by age or dietary protein level between the limits of 22 and 600 days. It averages 15.1 mg. creatinine nitrogen per kg. body weight throughout the age range investigated.

2. The total urinary nitrogen coefficient is more a function of the time that the rat is kept in a state of specific nitrogen inanition than it is of age. Minimum levels of 90-100 mg. urinary nitrogen per kg. body weight were secured in several cases during the first 7 days of nitrogen-poor feeding, but in general a much longer time is necessary to secure minimum values. The nitrogen coefficient may decline during a period of nitrogen fasting in a similar manner to the course of decline of energy metabolism during absolute fasting.

3. As high as 15% of the total urinary endogenous nitrogen excretion of the rat may be in the form of total creatinine. However, the average maximum is closer to 11%. Periods of acceleration of the endogenous metabolism are indicated by a decline in

the creatinine to total nitrogen ratio during specific nitrogen starvation due to an increase in the urinary nitrogen excretion.

4. Since the total creatinine coefficient is practically constant for all weights, therefore the ratio of basal metabolism to creatinine excretion follows approximately the same course as the ratio of basal metabolism to body weight.

5. 30% to 40% variations from the normal value of the creatinine coefficient were observed, but no explanation of these could be found from any one of the factors studied which are ordinarily associated with creatinine metabolism. There are, however, two exceptions to this. Rats suffering from long periods of nitrogen deprivation may show what has been designed as the "pre-mortal rise" of creatinine when the coefficient may double in value. If these animals are given a high protein ration and they immediately start gaining weight rapidly, the creatinine nitrogen coefficient may drop to 10 or lower.

6. Rats on the high, 30%, protein level grew faster than their paired litter mates on the low, 13%, protein level. The total creatinine coefficient as well as the minimum total urinary nitrogen coefficient of the high protein animals was definitely lower than that of the low protein rats. From this, it may be inferred that, under the given conditions, the higher level of protein is more conducive to the formation of adipose tissue than the lower level.

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APPENDIX

Data in Graphic and Tabular Form

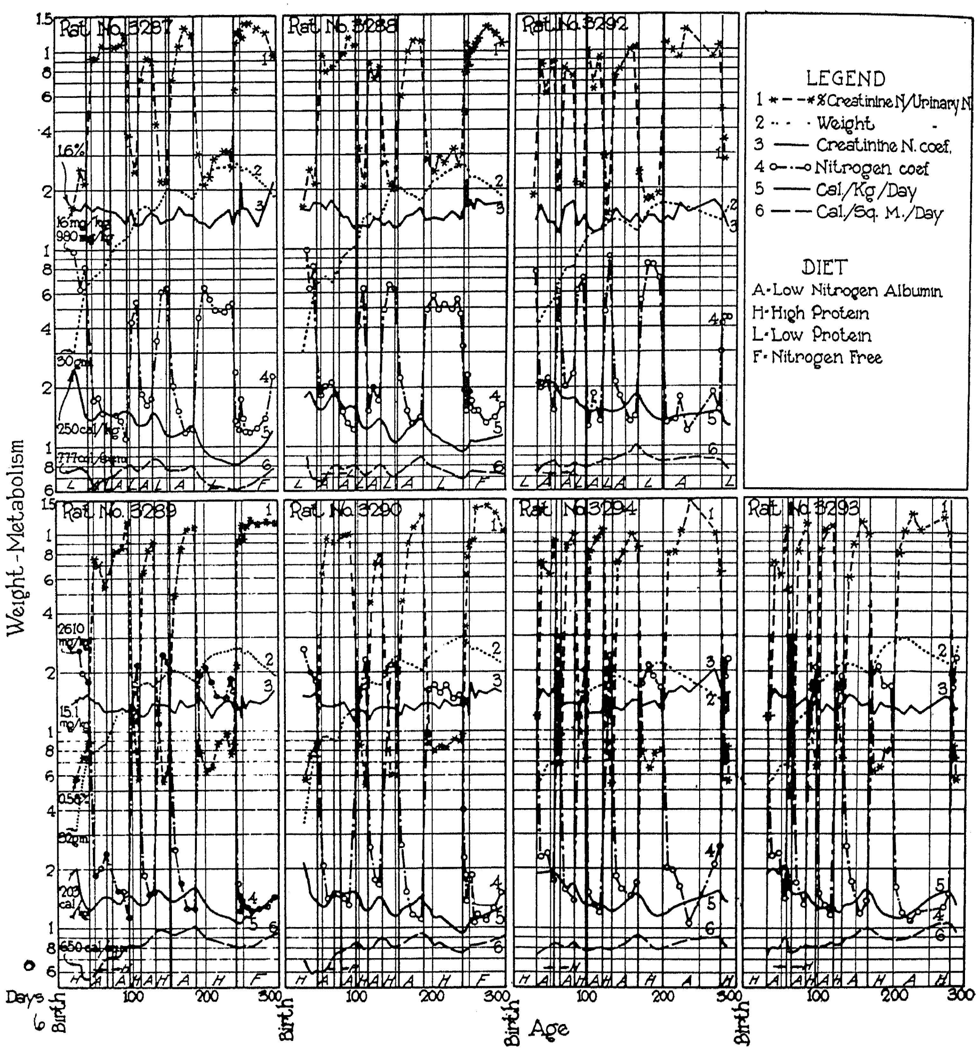

Fig. 6a.—A comparison on arithlog paper of all factors studied as a function of age for the 3000 series. See legend for interpretation and identification of the several curves. "A" represents the "L. N. A." diet; "F" is nitrogen diet, etc.

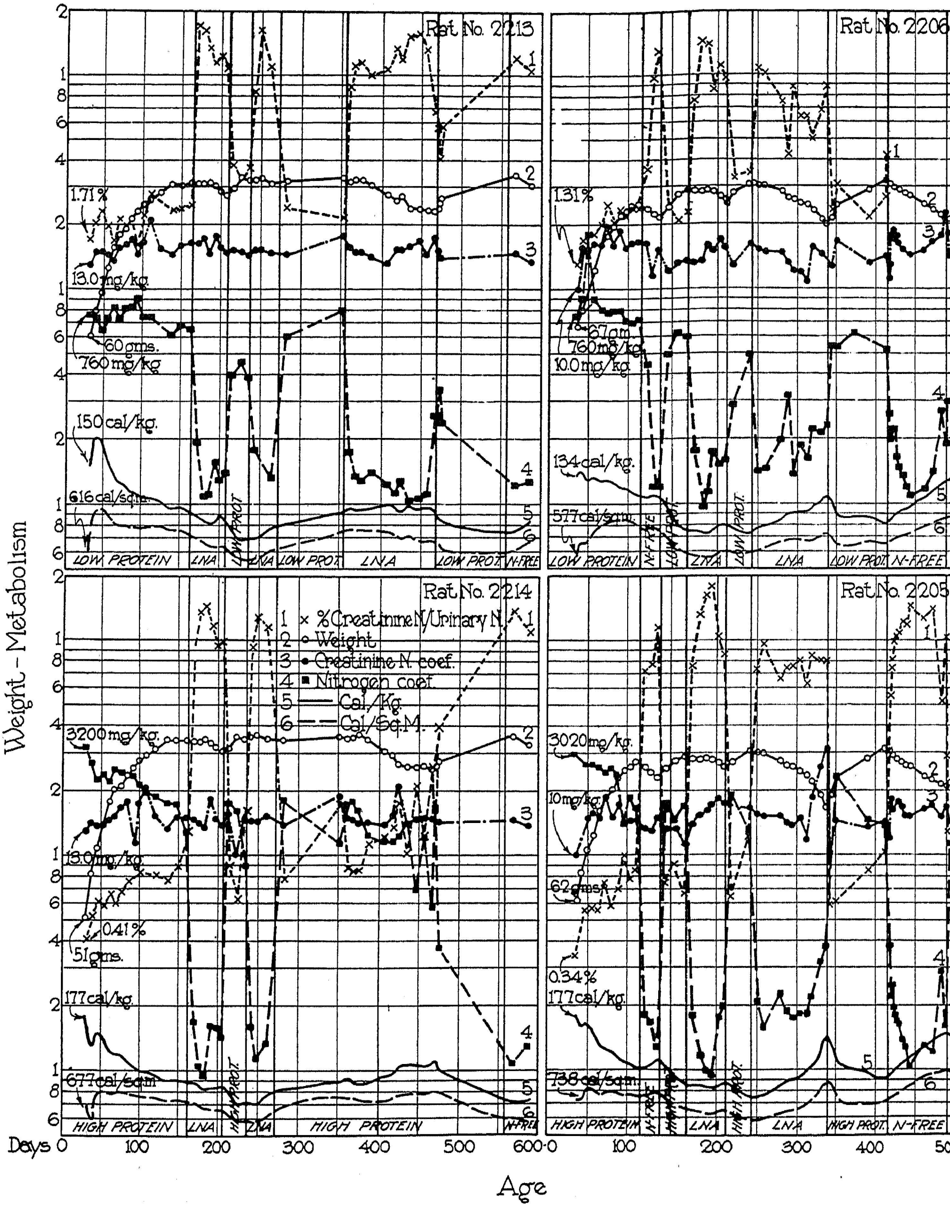

Fig. 6b.—A comparison on arithlog paper of all factors studied as a function of age for two typical pairs of the 2000 series.

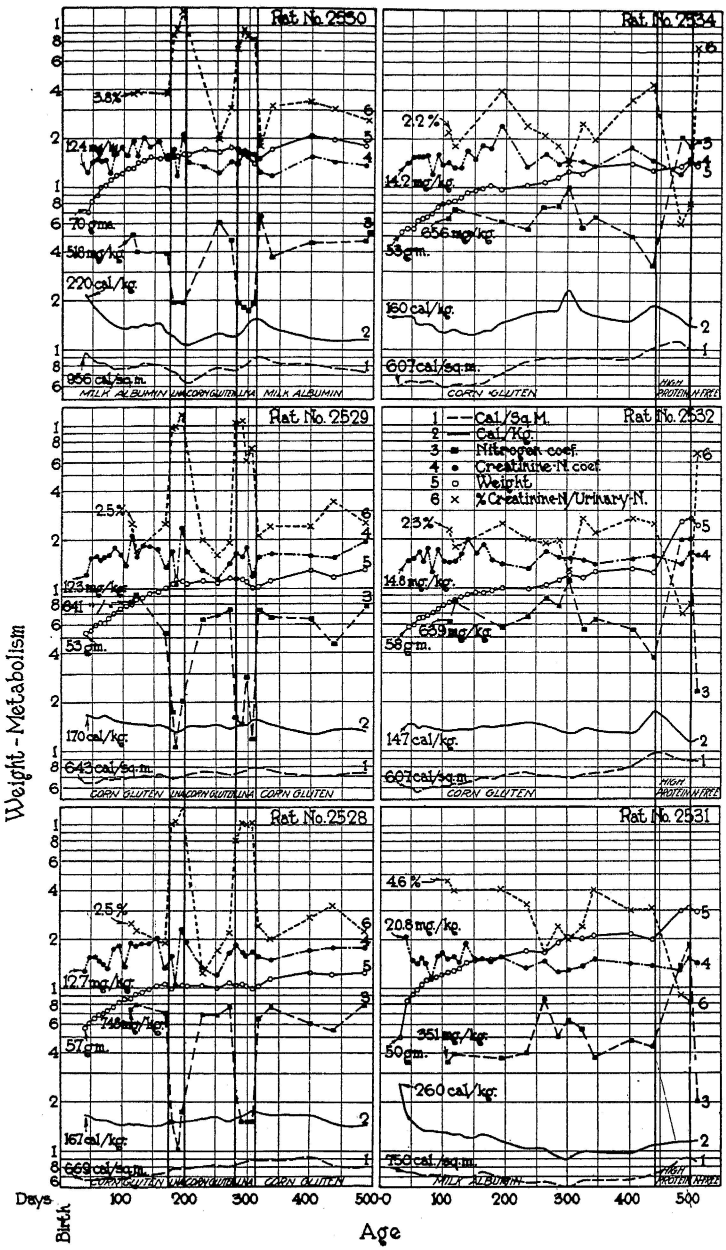

Fig. 6c.—A comparison on arithlog paper of all factors studied as a function of age for the slow growth series.

Table 3a.—Metabolism Data on Rat #2115, Born 11/2/30

Diet	Age Days	Wt. Gms.	Daily Int. Food Gms.	Daily Int. N Mgs.	Daily N Excreta, Mgs. Urin.	Daily N Excreta, Mgs. Fec.	Daily N Excreta, Mgs. Total	Daily N Excreta, Mgs. Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs. Urinary	Daily N Excreta Per Kg. Body Wt. Mgs. Total Cr. N.	Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day Per Kg. Live Wt.	Basal Met. Cal/day Per Sq. M.	Basal Met. Cal/day Per Mg. Cr. N.
L. Pr.	31	36	4.5	90.0	32.0	20.0	52.0	1.41	38.2	42.4	890	39.0	4.40	333	1121	8.6
	38	50	5.7	114.0	47.0	20.0	67.0	0.60	47.6	41.8	940	11.9	1.28	270	1030	22.6
	46	68	7.9	158.0	67.0	36.0	103.0	1.12	55.0	34.8	990	16.4	1.65	216	930	13.2
	56	91	9.0	180.0	77.0	43.0	120.0	1.60	60.0	33.3	850	17.5	2.08	181	878	9.8
	63	115	10.2	204.0	94.0	43.0	137.0	2.64	66.0	32.4	820	23.0	2.81	157	833	6.8
	71	128	10.4	208.0	125.0	50.0	175.0	3.05	33.0	15.9	980	20.1	2.44	148	826	7.4
	79	148	10.0	200.0	120.0	37.0	157.0	2.57	43.0	21.5	810	17.3	2.14	138	813	8.0
	86	163	12.4	248.0	168.0	49.0	217.0	2.60	31.0	12.5	1030	16.0	1.55	130	797	8.2
	94	173	11.3	226.0	154.0	48.0	202.0	2.70	24.0	10.6	890	15.6	1.75	130	812	8.3
	101	182	11.5	230.0	150.0	46.0	196.0	3.24	35.0	15.2	820	17.8	2.16	126	807	7.1
	108	186	11.7	234.0	158.0	41.0	199.0	2.79	35.0	15.0	850	15.0	1.77	128	826	8.6
	116	197	12.7	254.0	163.0	74.0	237.0	2.86	17.0	6.7	830	14.5	1.76	124	819	8.6
	124	205	11.2	224.0	152.0	51.0	203.0	3.05	21.0	9.4	750	14.9	1.99	122	814	8.2
	133	210	10.2	204.0	150.0	26.0	176.0	3.72	28.0	13.7	710	17.7	2.48	120	810	6.8
	142	216	12.9	258.0	----	----	----	3.65	----	----	----	16.9	----	119	810	7.0
	152	222	10.5	210.0	167.0	37.0	204.0	3.61	6.0	2.9	750	16.2	2.16	116	804	7.2
N-Free	159	212	6.0	3.0	57.0	10.0	67.0	3.60	−62.9	−2097.	270	16.9	6.30	120	817	7.1
	166	194	4.5	2.8	44.0	5.0	49.0	3.09	−46.3	−1682.	230	15.9	7.00	129	811	8.1
	173	185	8.5	4.3	28.0	12.0	39.0	3.09	−35.0	−822.4	151	16.7	11.00	131	840	7.8
	179	179	7.9	4.0	26.0	13.0	39.0	2.75	−35.2	−889.9	145	15.4	10.60	129	816	8.3
	186	172	6.5	3.3	24.0	8.0	32.0	3.13	−29.2	−896.9	140	18.2	13.10	121	756	6.6
L. Pr.	194	200	14.8	296.0	143.0	58.0	201.0	2.98	----	----	720	14.9	2.08	100	665	6.7
	202	235	16.6	332.0	149.0	71.0	220.0	3.45	113.0	34.0	630	14.7	2.32	84	596	5.7
	232	248	8.4	168.0	180.0	29.0	209.0	3.72	−41.0	−24.4	730	15.0	2.06	87	627	5.8
L.N.A.	240	256	9.7	24.3	68.0	14.0	82.0	4.21	−57.8	−238.1	270	16.4	6.20	86	630	5.2
	247	252	7.6	19.0	23.0	13.0	36.0	3.87	−17.0	−89.5	91	15.4	16.80	89	650	5.8
	253	242	5.0	12.5	57.0	---	----	3.83	----	----	240	15.8	6.70	94	672	6.0
	260	231	6.7	16.8	33.0	12.0	45.0	3.65	−27.3	−162.7	143	15.8	11.10	100	701	6.3
	267	228	6.9	17.3	49.0	20.0	69.0	3.91	−51.8	−300.0	210	17.1	8.00	101	706	5.9
L. Pr.	274	244	11.5	230.0	107.0	30.0	137.0	3.87	93.0	40.4	440	15.8	3.62	94	678	6.0
	310	253	11.0	220.0	162.0	46.0	208.0	4.39	12.0	5.5	640	17.3	2.71	87	634	5.0
L.N.A.	317	251	9.9	247.5	51.0	20.0	71.0	3.94	176.5	71.3	200	15.8	7.70	86	623	5.4
	323	240	4.3	107.5	52.0	14.0	66.0	4.28	41.5	38.6	220	17.9	8.20	89	634	5.0
	329	231	7.3	182.5	43.0	15.0	58.0	3.57	125.5	68.8	186	15.5	8.30	90	634	5.8
	337	222	3.9	97.5	58.0	14.0	72.0	3.76	25.5	26.2	260	16.9	6.50	92	639	5.5
	346	207	6.4	160.0	44.0	12.0	56.0	2.90	104.0	65.0	210	14.1	6.60	98	656	6.9
	357	195	6.1	152.5	46.0	14.0	60.0	3.27	92.5	60.7	240	16.7	7.10	102	667	6.1
	365	193	7.5	187.5	33.0	12.0	45.0	3.27	142.5	76.0	171	17.0	9.90	100	651	5.9
	376	183	7.8	195.0	25.0	13.0	38.0	2.31	157.0	80.5	137	12.7	9.20	103	657	8.1
	384	176	7.0	175.0	28.0	11.0	39.0	2.90	136.0	77.7	159	16.5	10.40	105	659	6.3
Casein	387	165	2.1	200.0	84.0	----	----	4.80	----	----	510	29.1*	5.70	----	----	----
	389	152	0.2	19.0	130.0	----	----	4.87	----	----	860	32.0*	3.70	----	---	----

TABLE 3B.—METABOLISM DATA ON RAT #2116, BORN 11/2/30

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
H. Pr.	31	36	4.2	205.8	150	29	179	1.49	26.8	13.0	4170	41.3	1.00	383	1290	9.2
	38	64	7.4	362.6	223	29	252	0.67	10.6	2.9	3480	10.0	0.30	238	1000	23.8
	46	93	8.8	431.2	287	68	355	1.00	76.2	17.7	3090	10.8	0.35	180	879	16.7
	56	115	9.6	470.4	347	64	411	1.67	59.4	12.6	3020	14.5	0.48	157	833	13.7
	63	133	10.5	514.5	379	69	448	2.98	66.5	12.9	2850	22.3	0.79	147	826	6.5
	71	145	10.2	499.8	392	89	481	2.90	18.8	3.8	2700	20.1	0.74	141	827	7.0
	79	159	10.3	504.7	449	79	528	2.94	−24.7	−4.9	2820	18.5	0.66	131	795	7.1
	86	172	12.0	588.0	417	99	516	2.85	72.0	12.2	2420	18.2	0.68	125	782	6.9
	94	197	11.7	568.4	399	83	482	2.85	86.4	15.2	2020	14.5	0.71	111	732	7.7
	101	206	9.8	480.2	262	51	313	3.46	167.2	34.8	1760	16.8	1.32	109	740	7.3
	108	211	12.0	588.0	472	66	539	3.15	49.0	8.3	2240	15.0	0.67	109	740	7.3
	116	222	12.7	622.3	495	64	559	2.98	63.3	10.2	2230	13.5	0.60	106	732	8.3
	124	236	9.7	475.3	311	28	339	3.20	136.3	28.7	1320	13.6	1.03	101	718	7.5
	133	235	9.7	475.3	429	59	488	3.98	−12.7	−2.7	1830	16.9	0.93	106	723	6.0
	142	252	12.5	612.5	----	----	----	3.91	----	----	----	15.5	----	95	694	6.2
	152	260	11.1	543.9	433	51	484	3.83	59.9	11.0	1670	14.7	0.89	91	671	6.2
N-Free	159	252	5.4	2.7	53	11	64	3.44	−61.3	−2270.	210	13.7	6.50	93	676	6.8
	166	230	5.7	2.9	47	12	59	3.31	−56.2	−1970.	200	14.4	7.00	100	701	7.0
	173	214	7.9	4.0	35	13	48	3.39	−44.1	−1115.	164	15.8	9.70	105	712	6.6
	179	202	7.4	3.7	30	12	42	2.88	−38.3	−1035.	149	14.4	9.60	109	726	7.6
	186	194	8.4	4.2	25	8	33	3.16	−28.8	−686.	129	16.3	12.60	109	716	6.7
H. Pr.	194	232	14.9	730.1	593	87	----	2.86	----	----	2600	12.4	0.48	88	617	7.1
	202	259	16.6	813.4	618	85	703	3.65	110.4	13.6	2390	14.1	0.59	76	560	5.4
	232	284	8.9	436.1	462	58	----	4.13	---	----	1630	14.5	0.90	70	538	4.9
L.N.A.	240	283	8.4	21.0	44	16	----	4.24	----	----	156	15.0	9.60	72	547	4.8
	247	273	6.8	17.0	34	18	----	3.83	----	----	125	14.1	11.30	76	567	5.4
	253	263	4.6	11.5	45	----	----	3.94	----	----	124	15.0	8.80	80	592	5.3
	260	258	6.1	15.3	29	14	----	3.72	----	----	112	14.4	12.80	83	607	5.7
	267	247	6.0	15.0	38	19	----	4.06	----	----	154	16.4	10.70	87	635	5.3
H. Pr.	274	270	11.4	558.6	415	94	----	4.24	----	----	1540	15.7	1.02	82	609	5.2
	310	298	11.5	563.5	442	67	----	4.54	----	----	1480	15.3	1.03	78	606	5.1
L.N.A.	317	297	11.3	28.3	54	26	----	4.39	----	----	182	14.8	8.10	79	615	5.4
	323	292	7.0	17.5	45	20	----	4.13	----	----	154	14.1	9.20	81	627	5.8
	329	278	6.2	15.5	41	16	----	4.09	----	----	148	14.7	10.00	86	649	5.8
	337	275	4.2	10.5	47	11	----	3.79	----	----	171	13.8	8.10	94	658	6.3
	346	257	6.2	15.5	43	12	----	3.50	----	----	167	13.6	8.10	94	691	6.9
	357	242	7.7	19.3	48	7	----	4.06	----	----	198	16.7	8.50	102	728	6.1

	365	234	8.0	20.0	37	15	----	3.72	----	----	158	15.8	10.00	107	755	6.8
	376	228	7.7	19.3	27	15	----	3.05	----	----	118	13.4	11.30	111	773	8.3
	384	224	6.5	16.3	29	12	----	3.31	----	----	130	14.8	11.40	113	789	7.7
Casein	387	222	6.8	646.0	442	----	----	3.76	----	----	1990	16.9	0.85	114	791	6.8
	389	225	9.0	855.0	789	----	----	2.72	----	----	3510	14.7	0.35	113	786	7.7
	391	238	11.4	1083.	990	----	----	2.20	----	----	4160	9.1	0.22	107	760	11.7
	393	250	13.2	1254.	983	----	----	1.50	----	----	3940	6.0	0.15	102	738	16.9
L.N.A.	395	260	13.2	33.0	259	----	----	3.35	----	----	1000	12.9	1.30	98	722	7.6
	399	258	13.4	33.5	40	----	----	3.35	----	----	155	13.0	8.40	99	726	7.6
	401	256	12.4	31.0	61	----	----	3.42	----	----	240	13.4	5.60	100	731	7.4
	403	255	----	----	42	----	----	3.39	----	----	163	13.2	8.20	100	731	7.6
	405	254	----	----	42	----	----	3.24	----	----	166	12.8	7.70	100	733	7.8
	407	253	----	----	41	----	----	3.65	----	----	161	14.4	9.00	101	738	7.0
	409	251	----	----	38	----	----	3.61	----	----	152	14.4	9.50	102	742	7.1
	411	249	----	----	31	----	----	3.39	----	----	125	13.6	10.90	102	746	7.6
	413	248	----	----	35	----	----	3.31	----	----	140	13.4	9.50	103	746	7.7
	429	237	----	----	25	----	----	3.50	----	----	106	14.7	13.90	109	775	7.4
	431	234	----	----	27	----	----	3.46	----	----	115	14.7	12.80	111	782	7.5
	433	232	----	----	28	----	----	3.16	----	----	120	13.6	11.40	112	790	8.2
	435	233	----	----	31	----	----	3.09	----	----	132	13.2	10.00	112	788	8.5
	437	224	----	----	29	----	----	3.13	----	----	131	14.0	10.70	116	807	8.3
	439	224	----	----	27	----	----	3.24	----	----	122	14.4	11.80	116	807	8.1
	441	228	----	----	28	----	----	3.01	----	----	121	13.2	10.90	114	798	8.6
	443	229	----	----	30	----	----	3.05	----	----	132	13.3	10.10	114	795	8.5
	445	228	----	----	27	----	----	3.65	----	----	118	16.0	13.60	115	801	7.2
	447	222	----	----	27	----	----	3.61	----	----	123	16.3	13.20	118	813	7.2
	449	221	----	----	30	----	----	3.46	----	----	134	15.7	11.70	118	816	7.5
	451	221	----	----	26	----	----	3.20	----	----	119	14.5	12.20	118	816	8.1
	453	220	----	----	26	----	----	3.50	----	----	119	15.9	13.40	119	818	7.5
	455	219	----	----	26	----	----	3.46	----	----	120	15.8	13.20	119	821	7.5
	457	219	----	----	21	----	----	3.20	----	----	96	14.7	15.30	120	824	8.1
	459	220	----	----	24	----	----	3.16	----	----	107	14.4	13.50	119	821	8.3
	461	220	----	----	25	----	----	3.50	----	----	114	15.8	13.90	119	821	7.6
	462	219	----	----	25	----	----	3.24	----	----	116	14.8	12.80	120	824	8.1
	463	218	----	----	24	----	----	3.20	----	----	111	14.7	13.20	120	826	8.2
	464	218	----	----	25	----	----	2.57	----	----	113	11.8	10.50	120	826	10.2
Casein	465	223	----	----	162	----	----	3.39	----	----	730	15.2	2.10	118	814	7.7
	466	222	----	----	424	----	----	3.39	----	----	1910	15.3	0.80	118	816	7.7
	467	220	----	----	299	----	----	3.05	----	----	1360	13.8	1.02	120	824	8.7
	468	221	----	----	419	----	----	3.13	----	----	1900	14.1	0.75	119	822	8.5
	469	226	----	----	650	----	----	3.09	----	----	2880	13.7	0.48	116	812	8.5
	470	229	----	----	803	----	----	3.50	----	----	3500	15.3	0.44	115	804	7.5
	472	237	----	----	886	----	----	3.50	----	----	3740	14.7	0.40	111	787	7.6
	474	250	----	----	870	----	----	3.42	----	----	3480	13.7	0.39	105	765	7.7
	476	254	----	----	1020	----	----	----	----	----	4010	14.4	----	104	756	7.2
	478	260	----	----	967	----	----	----	----	----	3720	12.5	----	102	748	8.1
	484	279	----	----	963	----	----	----	----	----	3450	12.6	----	95	717	7.5

TABLE 4A.—METABOLISM DATA ON RAT #2173, BORN 11/21/30

Diet	Age Days	Wt. Gms.	Daily Int. Food Gms.	Daily Int. N Mgs.	Daily N Excreta, Mgs. Urin.	Daily N Excreta, Mgs. Fec.	Daily N Excreta, Mgs. Total	Daily N Excreta, Mgs. Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs. Urinary	Daily N Excreta Per Kg. Body Wt. Mgs. Total Cr. N.	Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day Per Kg. Live Wt.	Basal Met. Cal/day Per Sq. M.	Basal Met. Cal/day Per Mg. Cr. N.
L. Pr.	48	68	6.7	134.0	62	31	93	1.19	41.0	30.6	910	17.5	1.92	218	937	11.5
	56	93	8.5	170.0	77	27	104	1.43	65.0	35.9	830	15.3	1.86	179	842	11.6
	64	121	12.4	248.0	89	51	140	1.93	108.0	43.5	740	16.0	2.17	153	830	9.6
	72	157	12.2	244.0	111	41	152	2.31	92.0	37.7	710	14.7	2.10	132	793	9.0
	80	180	12.9	258.0	115	54	169	2.86	90.0	34.9	640	15.9	2.49	128	813	8.1
	87	199	13.9	278.0	137	60	197	3.13	81.0	29.1	690	15.8	2.28	125	827	7.9
	94	216	13.9	278.0	149	61	210	3.91	67.0	24.1	690	18.1	2.62	119	813	6.6
Min. Pr.	102	226	13.7	178.1	115	46	161	3.27	17.1	9.6	510	14.5	2.84	116	809	8.0
	110	233	13.1	170.3	100	40	140	3.72	30.3	17.8	430	16.0	3.72	112	794	7.0
	118	234	12.9	167.7	113	33	146	3.79	21.7	12.9	480	16.2	3.36	111	785	6.8
	132	249	12.0	156.0	----	----	----	4.02	----	----	----	16.1	----	----	----	----
	145	248	11.6	150.8	92	40	132	3.63	18.8	12.5	370	14.7	3.95	92	662	6.2
N-Free	152	237	10.2	5.1	37	19	56	3.52	51.9	−1017.	156	14.9	9.50	92	653	6.2
	159	224	9.0	4.5	33	13	46	3.91	−41.5	−922.	147	16.0	11.90	100	696	6.3
	166	215	7.8	3.9	29	14	43	3.94	−39.2	−1005.	135	18.4	13.60	115	784	6.3
	171	211	9.1	4.6	30	13	43	3.94	−38.0	−834.	142	18.7	13.10	130	881	7.0
	179	204	6.4	3.2	28	8	36	3.14	−32.7	−1022.	137	15.4	11.20	103	689	6.7
L. Pr.	186	225	14.8	296.0	111	59	170	3.33	126.0	42.6	490	14.8	3.00	96	669	6.5
	194	258	16.9	338.0	143	73	217	3.33	121.0	35.8	550	13.0	2.33	87	641	6.7
	207	285	14.2	284.0	154	55	209	5.10	75.0	26.4	540	17.9	3.32	87	665	4.9
	222	291	9.4	198.0	108	----	----	5.36	----	----	----	18.6	4.96	93	716	5.0
L.N.A.	230	285	9.7	24.3	43	7	50	4.76	−26.0	−107.0	370	16.7	10.80	97	740	6.0
	236	276	6.3	15.8	48	12	60	4.09	−43.8	−277.2	174	14.9	8.50	101	767	6.8
	243	280	9.7	24.3	36	----	----	4.17	----	----	129	14.9	11.60	101	764	6.8
	251	274	7.2	18.0	39	11	50	3.98	−32.1	−178.3	142	14.6	10.20	106	797	7.3
	265	257	6.4	16.0	41	15	56	4.39	−40.6	−235.0	160	15.6	10.70	115	843	7.4
L. Pr.	273	267	13.3	266.0	140	52	192	4.35	73.7	27.7	520	16.4	3.11	111	824	6.7
	307	290	10.4	208.0	----	----	----	4.24	----	----	----	14.7	----	101	779	6.9

	318	279	10.0	200.0	154	34	188	4.32	12.3	6.2	550	15.5	2.80	104	785	6.7
	332	263	7.7	154.0	196	39	235	5.02	−81.2	−52.7	750	19.1	2.56	109	808	5.7
	380	262	9.9	198.0	169	----	----	3.98	----	----	650	15.2	2.36	103	763	6.8
L.N.A.	386	262	12.3	31.3	48	----	----	3.42	----	----	183	13.1	7.10	102	754	7.8
	388	260	11.8	29.5	50	----	----	3.50	----	----	192	13.5	7.00	102	754	7.6
	390	262	11.3	28.3	37	----	----	3.68	----	----	141	14.1	10.00	101	749	7.2
	392	261	10.6	26.5	36	----	----	3.98	----	----	138	15.3	11.10	102	751	6.6
	394	260	9.7	24.3	37	----	----	3.98	----	----	142	15.3	10.80	102	751	6.7
	399	255	9.6	24.0	33	----	----	3.50	----	----	130	13.8	10.60	104	759	7.5
	401	256	9.7	24.3	36	----	----	3.76	----	----	141	14.7	10.50	103	756	7.0
	403	256	9.7	24.3	31	----	----	3.50	----	----	121	13.7	11.30	103	754	7.5
	405	254	9.7	24.3	36	----	----	4.35	----	----	142	17.1	12.10	104	756	6.1
	407	252	9.7	24.3	31	----	----	3.72	----	----	123	14.8	12.00	104	760	7.1
	430	240	9.2	23.0	30	----	----	3.98	----	----	125	16.6	13.30	105	753	6.3
	433	238	9.3	23.3	29	----	----	3.50	----	----	122	14.7	12.10	106	757	7.2
	435	234	9.1	22.8	35	----	----	4.39	----	----	150	18.8	12.60	108	761	5.7
	437	234	8.8	22.0	30	----	----	3.61	----	----	128	15.4	12.00	107	758	7.0
	440	232	8.9	22.3	24	----	----	3.09	----	----	104	13.3	12.90	108	760	8.1
	456	222	7.3	18.3	30	----	----	3.94	----	----	135	17.8	13.10	----	----	----
Casein	458	218	7.4	703.0	131	----	----	3.87	----	----	600	17.8	3.00	----	----	----
	460	213	6.5	617.5	458	----	----	3.27	----	----	2150	15.4	0.71	----	----	----
	462	212	5.2	494.0	606	----	----	3.09	----	----	2860	14.6	0.51	----	----	----
	464	210	6.2	589.0	756	----	----	3.13	----	----	3600	14.9	0.41	----	----	----
	466	204	6.6	627.0	718	----	----	2.98	----	----	3520	14.6	0.41	----	----	----
	468	205	6.1	579.5	786	----	----	4.61	----	----	3840	22.6	0.59	----	----	----
	470	212	----	----	901	----	----	1.30	----	----	4250	----	----	----	----	----
N-Free	570	190	----	----	39	----	----	----	----	----	205	17.3	8.40	82	531	4.7
	580	181	----	----	33	----	----	----	----	----	180	17.7	9.80	----	----	----
	589	167	----	----	32	----	----	----	----	----	191	16.5	8.60	----	----	----
	608	151	----	----	32	----	----	----	----	----	212	13.0	6.10	----	----	----

TABLE 4B.—METABOLISM DATA ON RAT #2178, BORN 11/21/30

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
H. Pr.	48	67	6.2	303.8	229	57	286	1.38	17.8	5.9	3420	20.5	0.60	112	481	5.5
	56	84	7.3	357.7	181	36	217	1.36	40.7	11.4	2160	16.0	0.75	167	782	10.5
	64	127	12.2	597.8	363	103	465	1.93	132.8	22.2	2850	15.3	0.53	142	786	9.3
	72	161	11.9	583.1	421	77	498	2.23	85.1	14.6	2620	13.8	0.53	124	755	9.0
	80	183	12.9	632.1	413	107	520	2.70	112.1	17.7	2260	14.7	0.65	119	759	8.1
	87	206	13.9	681.1	536	74	610	3.83	71.1	10.4	2600	18.6	0.71	111	743	6.0
	94	221	13.7	671.3	502	74	576	3.61	95.3	14.2	2270	16.3	0.72	109	750	6.7
Min. Pr.	102	233	15.2	197.6	122	44	166	3.18	31.6	16.0	520	13.7	2.61	107	758	7.8
	110	238	13.2	171.6	102	40	142	3.72	29.6	17.2	430	15.6	3.65	108	772	6.9
	118	243	12.4	161.2	110	45	155	3.72	6.2	3.8	450	15.3	3.42	106	758	6.9
	132	251	13.5	175.5	----	----	----	4.21	----	----	----	----	----	98	710	----
	145	252	11.4	148.2	102	28	130	3.53	18.2	12.3	400	14.1	3.46	90	650	6.4
N-Free	152	244	10.5	5.3	40	11	51	3.73	−45.7	−870.5	164	15.2	9.30	89	643	5.9
	159	228	9.7	4.9	44	14	58	4.15	−54.2	−1117.	193	18.2	9.40	94	660	5.2
	166	218	8.7	4.4	34	16	50	4.09	−46.3	−1063	156	18.9	12.00	99	678	5.2
	171	214	8.4	4.2	31	15	46	4.24	−41.8	−995.2	145	19.8	13.70	101	688	5.1
	179	205	7.0	3.5	27	8	35	3.00	−31.5	−900.0	132	14.7	11.10	106	712	7.2
H. Pr.	186	232	14.7	720.3	413	95	508	3.79	212.3	29.5	1780	16.4	0.92	97	684	5.9
	194	270	17.0	833.0	577	100	677	3.52	156.0	18.7	2140	13.1	0.61	89	665	6.8
	207	304	14.4	705.6	501	71	572	5.28	133.6	18.9	1650	17.4	1.05	91	713	5.2
	222	306	9.4	460.6	385	----	----	5.65	----	----	1260	18.5	1.47	96	758	5.2
L.N.A.	230	297	9.9	24.8	61	16	77	5.02	−52.2	−210.5	206	16.9	8.20	101	785	6.0
	236	283	6.0	15.0	74	9	83	4.21	−68.0	−453.3	262	14.9	5.70	108	822	7.2
	243	281	10.1	25.3	47	----	----	4.39	----	----	167	15.6	9.40	109	832	7.0
	251	274	7.8	19.5	46	−13	59	4.24	−39.5	−202.6	168	15.5	9.20	114	854	7.3
	265	257	6.4	16.0	40	13	53	4.35	−36.0	−225.0	156	17.0	10.90	123	900	7.2
H. Pr.	273	273	13.5	661.5	434	110	544	4.84	117.5	17.8	1590	17.7	1.12	116	876	6.6
	307	302	10.3	514.5	----	----	----	4.24	----	----	----	14.1	----	107	834	7.6
	318	293	9.7	475.3	406	57	463	4.47	12.3	2.6	1390	15.2	1.10	110	850	7.2
	332	285	9.3	455.7	232	107	339	4.28	116.7	25.6	810	15.0	1.85	113	866	7.5
	380	281	9.7	475.3	400	----	----	3.98	----	----	1430	14.2	1.00	114	867	8.0

L.N.A.	386	284	12.5	31.3	56	----	----	3.57	----	----	197	12.6	6.40	112	858	8.9
	388	278	12.3	30.8	47	----	----	3.53	----	----	169	12.7	7.50	115	869	9.0
	390	279	12.1	30.3	41	----	----	4.17	----	----	147	15.0	10.20	114	864	7.6
	392	278	11.1	27.8	36	----	----	3.76	----	----	130	13.5	10.40	114	866	8.4
	394	274	10.3	25.8	38	----	----	4.09	----	----	139	15.0	10.80	116	874	7.7
	399	273	9.3	23.3	36	----	----	3.57	----	----	132	13.1	9.90	116	871	8.8
	401	273	9.9	24.8	36	----	----	4.09	----	----	132	15.0	11.40	115	868	7.7
	403	271	9.8	24.5	41	----	----	3.79	----	----	151	14.1	9.20	116	870	8.2
	405	270	9.7	24.3	43	----	----	4.35	----	----	159	16.1	10.10	117	873	7.3
	407	266	9.7	24.3	33	----	----	3.68	----	----	124	13.8	11.20	118	877	8.5
	430	249	9.2	23.0	28	----	----	3.83	----	----	113	15.4	13.70	122	884	7.9
	433	246	9.4	23.5	32	----	----	3.79	----	----	134	15.4	11.50	122	880	7.9
	435	243	9.4	23.5	33	----	----	3.94	----	----	136	16.2	11.90	123	882	7.6
	437	241	9.1	22.8	28	----	----	3.87	----	----	116	16.1	13.80	124	884	7.7
	440	240	9.0	22.5	32	----	----	4.09	----	----	133	17.1	12.80	124	884	7.3
	456	229	8.0	20.0	29	----	----	3.53	----	----	125	15.5	12.40	----	----	----
Casein	458	224	7.1	674.5	204	----	----	4.35	----	----	910	19.5	2.13	----	----	----
	460	221	7.6	722.0	638	----	----	3.65	----	----	2890	16.5	0.57	----	----	----
	462	223	6.4	608.0	511	----	----	3.50	----	----	2290	15.7	0.69	----	----	----
	464	226	5.7	541.5	748	----	----	3.31	----	----	3310	14.7	0.44	----	----	----
	466	230	7.0	665.0	694	----	----	2.53	----	----	3020	11.0	0.37	----	----	----
	468	230	6.7	636.5	784	----	----	3.72	----	----	3410	16.2	0.47	----	----	----
	470	232	----	----	873	----	----	1.41	----	----	3760	----	0.16	----	----	----
N-Free	570	207	----	----	34	----	----	----	----	----	166	13.1	7.90	98	656	7.4
	580	196	----	----	36	----	----	----	----	----	186	16.4	8.80	99	648	6.0
	589	182	----	----	32	----	----	----	----	----	178	15.6	8.80	99	632	6.3
	608	174	----	----	27	----	----	----	----	----	153	12.0	7.80	94	588	7.8

TABLE 5A.—METABOLISM DATA FOR RAT #2206, BORN 11/29/30

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.			Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total				Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N
L. Pr.	35	67	7.5	150.0	51	29	80	0.67	70.0	46.7	760	10.0	1.31	134	577	13.4
	41	80	8.5	170.0	73	33	106	1.25	64.0	37.6	910	15.6	1.71	144	661	9.3
	48	103	9.9	198.0	187	18	205	1.56	−7.0	−3.5	1820	15.3	0.83	129	658	8.5
	56	123	10.7	214.0	111	53	164	2.01	50.0	23.4	900	16.4	1.81	134	733	8.2
	65	162	12.7	254.0	129	55	184	2.62	70.0	27.6	800	16.1	2.03	130	789	8.0
	73	179	12.5	250.0	140	41	181	3.51	69.0	27.6	780	19.6	2.50	130	823	6.6
	80	197	14.0	280.0	156	53	209	3.18	71.0	25.4	790	16.1	2.04	127	836	7.9
	88	221	14.9	298.0	175	66	241	4.13	57.0	19.1	790	18.7	2.36	120	831	6.4
	96	231	13.9	278.0	163	62	225	3.57	53.0	19.1	710	15.5	2.19	120	841	7.9
	104	246	14.4	288.0	171	64	235	4.03	53.0	18.4	700	16.4	2.35	113	815	6.9
	111	250	12.2	244.0	179	50	229	4.24	15.0	6.1	720	16.7	2.37	110	799	6.6
N-Free	122	237	7.2	3.6	107	----	----	3.91	----	----	450	16.4	3.66	107	757	6.5
	128	225	11.7	5.9	27	17	44	2.60	−38.4	−65.5	120	11.6	9.60	110	768	9.5
	135	217	10.0	5.0	26	14	40	3.33	−34.9	−698.	120	15.3	12.80	111	759	7.2
L. Pr.	145	242	10.7	214.0	122	53	175	2.94	39.0	18.2	500	12.2	2.41	96	689	7.9
	155	278	13.6	272.0	175	125	300	3.70	−28.0	−10.3	630	13.3	2.12	81	613	6.1
	166	289	14.9	298.0	173	62	235	3.91	63.0	21.1	600	13.5	2.26	75	580	5.6
L.N.A.	173	286	10.4	26.0	51	17	68	3.84	−41.5	−160.	178	13.4	7.60	75	576	5.6
	181	288	12.9	32.3	28	20	48	3.89	−15.7	−48.6	96	13.5	14.10	74	565	5.4
	188	291	12.6	31.5	34	15	49	4.65	−17.5	−55.5	115	16.0	13.90	72	557	4.5
	193	287	10.2	25.5	51	14	65	4.32	−39.5	155.0	176	15.1	8.50	73	561	4.9
	202	268	7.7	19.3	41	17	58	4.54	−38.7	200.5	154	17.0	11.00	79	588	4.6
	208	263	6.6	16.5	42	14	56	4.09	−39.5	−239.	160	15.6	9.70	82	603	5.2
L. Pr.	218	282	13.4	268.0	111	----	----	3.67	----	----	290	13.0	3.31	77	589	5.9
	240	312	10.7	214.0	155	54	209	5.43	5.0	2.3	500	17.4	3.50	74	585	4.2

L.N.A.	250	305	8.6	21.5	43	18	61	4.65	−39.5	−184.	142	15.3	10.80	77	608	5.1
	258	306	12.6	31.5	45	----	----	4.54	----	----	146	14.9	10.10	79	625	5.4
	279	288	7.0	17.5	57	20	77	4.28	−59.5	−315.	199	14.9	7.50	85	653	5.7
	287	267	7.8	19.5	85	23	108	3.61	−88.5	−454.	320	13.5	4.24	91	679	6.7
	294	262	6.1	15.3	37	17	53	3.20	−37.7	−246.	139	12.2	8.80	92	678	7.5
	303	251	5.4	13.5	47	11	58	3.01	−44.5	−330.	188	12.0	6.40	93	675	7.7
	312	247	4.5	11.3	41	11	52	2.68	−40.7	−360.	165	10.9	6.40	92	661	8.4
	319	232	5.1	12.8	51	4	56	3.61	−43.2	−338	222	15.6	5.10	97	684	6.2
	330	211	6.5	16.3	45	----	----	3.05	----	----	214	14.5	6.80	105	711	7.2
	337	200	6.5	16.3	46	24	71	4.06	−54.7	−336.	232	20.7*	8.80	110	731	5.4
L. Pr.	343	215	9.2	184.0	116	----	----	2.72	----	----	540	12.7	2.34	102	698	8.1
	350	248	14.7	294.0	135	----	----	4.13	----	----	540	16.7	3.06	89	644	5.4
	391	291	11.4	228.0	179	----	----	3.87	----	----	620	13.3	2.16	86	666	6.5
	413	320	11.4	228.0	165	----	----	4.50	----	----	520	14.1	2.73	81	652	5.8
N-Free	416	315	9.7	4.9	83	----	----	3.53	----	----	260	11.2	4.23	83	662	7.4
	418	308	8.0	4.0	62	----	----	3.98	----	----	200	13.0	6.40	85	672	6.6
	420	301	7.7	3.9	65	----	----	5.36	----	----	220	17.9	8.20	87	681	4.9
	422	297	8.9	4.5	61	----	----	5.58	----	----	200	18.8	9.10	87	688	4.7
	424	293	9.8	4.9	48	----	----	4.95	----	----	164	16.9	10.20	90	697	5.3
	426	290	10.3	5.2	48	----	----	5.13	----	----	166	17.7	10.70	91	702	5.1
	429	288	10.1	5.1	42	----	----	4.69	----	----	146	16.3	11.10	92	707	5.7
	434	284	9.5	4.8	39	----	----	4.32	----	----	136	15.3	11.20	93	712	6.1
	438	278	9.6	4.8	33	----	----	3.98	----	----	120	14.4	12.00	96	725	6.7
	443	273	8.9	4.5	30	----	----	3.91	----	----	110	14.4	13.00	98	736	6.8
	462	249	----	----	28	----	----	3.76	----	----	113	15.1	13.40	108	785	7.2
	472	233	----	----	33	----	----	3.87	----	----	141	16.7	11.80	116	818	7.0
	484	220	----	----	59	----	----	3.94	----	----	270	17.9	6.60	123	846	6.9
	489	213	----	----	41	----	----	4.84	----	----	193	22.7*	11.80	127	863	5.6
L. Pr.	491	208	----	----	63	----	----	3.79	----	----	300	18.2	6.00	130	877	7.1
	493	212	----	----	65	----	----	----	----	----	----	14.1	----	128	865	----

TABLE 5B.—METABOLISM DATA ON RAT #2205, BORN 11/29/30

Diet	Age Days	Wt. Gms.	Daily Int. Food Gms.	Daily Int. N Mgs.	Daily N Excreta, Mgs. Urin.	Daily N Excreta, Mgs. Fec.	Daily N Excreta, Mgs. Total	Daily N Excreta, Mgs. Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs. Urinary	Daily N Excreta Per Kg. Body Wt. Mgs. Total Cr. N.	Ratio Cr. N. to Urin. N %	Basal Met. Cal/day Per Kg. Live Wt.	Basal Met. Cal/day Per Sq. M.	Basal Met. Cal/day Per Mg. Cr. N.
H. Pr.	35	62	7.2	352.8	187.0	54.0	241.0	0.63	111.8	31.7	3020	10.0	0.34	177	738	17.7
	41	83	8.3	----	----	----	----	----	----	----	----	----	----	157	730	----
	48	106	9.8	480.2	284.0	74.0	358.0	1.58	122.2	25.4	2680	14.9	0.56	162	835	10.9
	56	124	10.6	519.4	336.0	102.	438.0	1.93	81.4	15.7	2710	15.6	0.57	149	819	9.6
	65	162	12.7	622.3	429.0	83.0	512.0	2.42	110.3	17.7	2650	14.9	0.56	127	771	8.5
	73	186	12.5	612.5	460.0	107.	567.0	3.46	45.5	7.4	2480	18.6	0.75	124	799	6.6
	80	203	14.0	686.0	526.0	92.0	618.0	3.05	68.0	9.9	2590	15.0	0.58	121	806	8.0
	88	230	14.9	730.1	565.0	114.	679.0	3.94	51.1	7.0	2460	17.2	0.70	113	793	6.6
	96	249	13.9	681.1	350.0	121.	471.0	3.50	210.1	30.8	1410	14.1	1.00	107	776	7.6
	104	260	14.4	705.6	490.0	74.0	564.0	3.79	141.6	20.1	1890	14.6	0.77	106	779	7.5
	111	272	12.2	597.8	463.0	121.	584.0	3.98	13.8	2.3	1700	14.6	0.86	101	760	6.9
N-Free	122	258	5.6	2.8	47.4	----	----	3.42	----	----	184	13.3	7.2	----	769	7.9
	128	244	11.0	5.5	41.3	24.0	65.2	3.16	−59.7	−1085.	169	13.0	7.7	105	782	8.4
	135	229	9.5	4.8	29.6	5.6	35.2	3.40	−30.5	−641.	129	14.9	11.5	114	795	7.6
H. Pr.	145	254	12.8	627.2	450.0	52.0	502.0	3.31	125.2	20.0	1770	13.1	0.74	100	733	7.7
	155	275	13.6	666.4	404.0	167.	571.0	3.66	95.4	14.3	1470	13.3	0.91	91	685	6.8
	166	288	14.9	730.1	494.0	63.0	557.0	3.24	173.1	23.7	1720	11.2	0.66	85	651	7.6
L.N.A.	173	282	10.8	27.0	51.1	18.0	70.0	3.87	−43.0	159.3	181	13.8	7.6	86	651	6.2
	181	279	12.7	31.8	32.9	21.0	54.0	4.30	−22.2	−69.8	118	15.4	13.1	85	641	5.5
	188	283	10.2	25.5	28.2	18.0	46.0	4.58	−20.5	−80.4	100	16.2	16.3	83	631	5.1
	193	281	9.1	22.8	27.0	15.0	42.0	4.84	−19.2	−84.2	96	17.2	17.9	83	629	4.8
	202	269	6.9	17.3	47.6	16.0	63.0	4.95	−45.7	−264.	177	18.4	10.4	86	639	4.7
	208	259	6.1	15.3	52.0	15.0	67.0	4.47	−51.7	−338.	200	17.3	8.6	88	651	5.1
H. Pr.	218	272	13.4	656.6	520.0	----	----	3.30	----	----	1910	----	0.64	83	622	----
	240	304	10.4	509.6	407.0	47.0	454.0	5.02	55.6	10.9	1340	16.5	1.23	74	581	4.4

L.N.A.	250	298	9.4	23.5	62.8	20.0	83.0	4.65	−59.5	−253.	210	15.6	7.4	76	587	4.8
	258	295	12.8	32.0	46.7	----	----	4.50	----	----	160	15.3	9.6	77	600	5.0
	279	273	7.5	18.8	62.8	20.0	83.0	4.13	−64.2	−342.	230	15.1	6.6	84	630	5.6
	287	260	7.7	19.3	49.1	14.0	63.0	3.65	−43.7	−226.	189	14.1	7.5	86	652	6.3
	294	255	5.8	14.5	44.9	11.0	55.0	3.42	−40.5	−279.	176	13.8	7.6	90	659	6.6
	303	245	5.4	13.5	45.0	17.0	62.0	3.65	−48.5	−359.	184	14.9	8.1	94	676	6.3
	312	236	5.5	13.8	43.7	14.0	57.0	2.75	−43.2	−313.	186	11.7	6.3	98	697	8.4
	319	219	4.6	11.5	47.5	14.0	61.0	4.06	−49.5	−430.	220	18.5	8.5	108	739	5.8
	330	189	6.3	15.8	59.5	24.0	84.0	4.84	−68.2	−432.	320	25.6*	8.1	125	814	4.9
	337	165	6.6	16.5	62.9	22.0	85.0	5.12	−68.5	−415.	380	31.1*	8.1	146	896	4.7
H. Pr.	343	189	9.2	450.8	336.0	----	----	1.97	----	----	1780	10.4	0.59	117	842	11.5
	350	228	14.6	715.4	546.0	----	----	3.31	----	----	2400	14.5	0.61	109	761	7.5
	391	279	11.3	553.7	440.0	----	----	3.76	----	----	1580	13.5	0.85	97	734	7.2
	413	311	11.9	583.1	433.0	----	----	4.47	----	----	1390	14.4	1.03	92	725	6.4
N-Free	416	307	9.7	4.9	115.0	----	----	3.53	----	----	380	11.5	3.07	93	733	8.1
	418	300	7.9	4.0	64.9	----	----	3.57	----	----	220	11.9	5.50	95	745	8.0
	420	294	8.0	4.0	71.8	----	----	5.36	----	----	250	18.4	7.4	98	755	5.4
	422	293	9.1	4.6	57.8	----	----	4.76	----	----	198	16.3	8.20	98	757	6.0
	424	288	9.9	5.0	52.0	----	----	5.13	----	----	181	17.9	9.90	100	768	5.6
	426	280	10.1	5.1	47.6	----	----	5.06	----	----	172	18.0	10.50	103	783	5.7
	429	274	10.0	5.0	45.2	----	----	4.87	----	----	164	17.8	10.80	106	797	6.0
	434	266	9.3	4.7	37.0	----	----	4.50	----	----	139	17.0	12.20	110	818	6.5
	438	261	9.5	4.8	33.9	----	----	4.02	----	----	130	15.4	11.80	113	836	7.3
	443	258	8.9	4.5	27.0	----	----	3.91	----	----	105	15.2	14.50	115	846	7.6
	462	230	----	----	29.9	----	----	3.79	----	----	131	16.5	12.60	133	930	8.1
	472	220	----	----	26.9	----	----	3.79	----	----	123	17.2	14.00	139	959	8.1
	484	211	----	----	61.0	----	----	3.20	----	----	290	15.2	5.20	146	990	9.6
	489	207	----	----	34.0	----	----	3.50	----	----	164	16.9	10.30	149	1000	8.8
	491	206	----	----	126.0	----	----	3.61	----	----	610	17.5	2.90	150	1003	8.5
H. Pr.	493	214	----	----	242.0	----	----	----	----	----	1130	14.2	1.30	144	984	----

TABLE 6A.—METABOLISM DATA FOR RAT #2209, BORN 11/29/30

Diet	Age Days	Wt. Gms.	Daily Int. Food Gms.	Daily Int. N Mgs.	Daily N Excreta, Mgs. Urin.	Daily N Excreta, Mgs. Fec.	Daily N Excreta, Mgs. Total	Daily N Excreta, Mgs. Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs. Urinary	Daily N Excreta Per Kg. Body Wt. Mgs. Total Cr. N.	Ratio Cr. N. to Urin. N %	Basal Met. Cal/day Per Kg. Live Wt.	Basal Met. Cal/day Per Sq. M.	Basal Met. Cal/day Per Mg. Cr. N.
L. Pr.	32	60	5.4	108.0	46	16	62	0.78	48.0	44.4	760	13.0	1.71	150	616	11.5
	39	79	7.3	146.0	58	30	88	1.19	58.0	39.7	740	15.3	2.04	146	665	9.7
	46	92	8.5	170.0	63	39	102	1.45	68.0	40.0	680	15.6	2.32	158	767	10.0
	54	126	11.7	234.0	98	45	143	2.14	91.0	38.9	780	17.0	2.18	139	768	8.2
	61	147	11.2	224.0	100	52	152	2.03	72.0	32.1	680	13.8	2.03	133	784	9.7
	68	167	12.9	258.0	138	56	194	2.60	64.0	24.8	830	15.6	1.89	129	796	8.3
	76	184	12.9	258.0	158	52	210	3.00	48.0	18.6	860	16.2	1.90	126	805	7.7
	83	198	13.7	274.0	162	60	222	2.81	52.0	19.0	820	14.2	1.74	120	796	8.5
	90	210	13.7	274.0	185	63	248	2.94	26.0	9.5	880	14.0	1.59	117	790	8.3
Min. Pr.	99	219	13.7	178.1	104	49	153	3.87	25.1	14.1	480	17.7	3.72	113	780	6.4
	107	229	12.9	167.7	121	30	151	3.68	26.7	15.9	530	16.1	3.04	110	771	6.9
	118	237	12.4	161.2	109	31	140	3.38	21.2	13.2	460	14.2	3.10	108	763	7.5
	130	240	13.8	179.4	115	41	156	3.22	23.4	13.0	480	13.4	2.80	106	759	7.9
	140	257	14.7	191.1	114	42	156	4.02	35.1	18.4	440	15.6	3.53	98	723	6.3
	156	269	15.4	200.2	132	20	151	4.61	49.2	24.6	490	17.1	3.50	93	695	5.4
	172	283	14.8	192.4	137	43	180	3.79	12.6	6.5	480	13.4	2.77	85	647	6.3
L.N.A.	180	285	15.2	38.0	43	22	65	4.06	−26.7	−70.3	152	14.2	9.40	83	630	5.8
	187	295	16.4	41.0	32	8	41	4.13	0.2	.05	110	14.0	12.80	79	611	5.6
	194	297	10.9	27.3	52	16	67	4.95	−40.0	−146.5	174	16.7	9.60	77	597	4.6
	204	271	6.6	16.5	53	15	68	3.76	−51.4	−311.5	196	13.8	7.10	82	613	5.9
	211	255	4.1	10.3	50	9	59	3.71	−48.9	−474.8	196	14.5	7.40	87	636	6.0
L. Pr.	219	280	14.4	288.0	138	----	----	3.68	----	----	490	13.2	2.67	80	607	6.1
	225	308	17.2	344.0	175	----	----	4.24	----	----	570	13.8	2.66	73	577	5.3
	249	316	11.4	228.0	146	28	174	4.69	54.1	23.7	460	14.9	3.21	74	588	5.0
L.N.A.	257	312	9.4	23.5	46	18	64	4.39	−40.2	−171.1	148	14.1	9.50	76	603	5.4
	266	319	14.5	36.3	42	24	66	5.02	−30.0	−82.6	133	15.7	11.80	77	617	4.9
L. Pr.	316	322	10.9	218.0	----	----	----	4.65	----	----	----	14.4	----	85	681	5.9
	337	318	11.2	224.0	187	40	227	5.13	----	----	590	16.1	2.74	84	673	5.2
	356	300	10.5	210.0	288	----	----	4.02	----	----	960	13.4	1.40	88	688	6.6
	367	312	14.3	286.0	182	----	----	4.84	----	----	580	15.5	2.66	83	656	5.3
	374	319	12.7	254.0	189	----	----	4.61	----	----	590	14.5	2.44	80	637	5.5
	396	326	11.2	224.0	197	----	----	5.17	----	----	600	15.8	2.63	75	601	4.7
	406	315	8.7	174.0	167	----	----	4.61	----	----	530	14.7	2.76	75	596	5.1
	417	290	7.0	140.0	156	----	----	4.50	----	----	540	15.6	2.88	79	612	5.1
	424	280	7.0	140.0	147	----	----	4.50	----	----	530	16.1	3.06	80	610	5.0
	435	269	6.7	134.0	128	----	----	3.72	----	----	480	13.8	2.91	81	608	5.9
	447	250	5.2	104.0	132	----	----	4.28	----	----	530	17.1	3.24	84	610	4.9
	457	240	6.5	130.0	114	----	----	3.16	----	----	480	13.2	2.77	85	604	6.4
	467	226	----	----	136	----	----	5.77	----	----	600	25.5	4.25	88	614	3.5
	470	218	----	----	113	----	----	3.68	----	----	520	16.9	3.26	91	625	5.4
	472	215	----	----	156	----	----	5.13	----	----	730	23.9	3.29	92	629	3.9
	474	212	----	----	108	----	----	3.13	----	----	510	14.7	2.90	93	631	6.3
N-Free	562	207	----	----	32	----	----	2.64	----	----	154	12.8	8.32	82	552	6.4
	572	197	----	----	33	----	----	2.98	----	----	168	15.1	8.99	84	552	5.5
	581	183	----	----	38	----	----	3.39	----	----	206	18.5	8.98	89	566	4.8

Table 6b.—Metabolism Data for Rat #2210, Born 11/29/30

Diet	Age Days	Wt. Gms.	Daily Int. Food Gms.	Daily Int. N Mgs.	Daily N Excreta, Mgs. Urin.	Daily N Excreta, Mgs. Fec.	Daily N Excreta, Mgs. Total	Daily N Excreta, Mgs. Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs. Urinary	Daily N Excreta Per Kg. Body Wt. Mgs. Total Cr. N.	Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day Per Kg. Live Wt.	Basal Met. Cal/day Per Sq. M.	Basal Met. Cal/day Per Mg. Cr. N.
H. Pr.	32	50	5.2	254.8	163	33	196	0.67	58.8	23.1	3260	13.4	0.41	140	534	10.4
	39	78	7.4	362.6	221	57	278	1.15	84.6	23.3	2840	14.9	0.52	128	585	8.6
	46	96	8.5	416.5	243	77	320	1.47	96.5	23.2	2530	15.3	0.61	146	722	9.6
	54	126	11.6	568.4	368	100	468	1.67	102.4	18.0	2920	13.3	0.45	148	816	11.1
	61	155	11.2	548.8	384	108	492	2.34	56.8	10.3	2480	15.2	0.61	132	794	8.7
	68	173	12.9	632.1	437	112	549	2.58	83.1	13.1	2530	14.9	0.59	124	779	8.3
	76	192	12.9	632.1	486	78	564	3.04	68.1	10.8	2530	15.8	0.63	117	762	7.4
	83	205	13.6	666.4	533	80	613	2.98	53.4	8.0	2600	14.5	0.56	113	758	7.8
	90	219	13.7	671.3	480	187	667	2.60	4.3	0.6	2200	11.9	0.54	108	745	9.1
Min. Pr.	99	227	13.9	180.8	123	42	165	3.65	15.7	8.7	540	16.1	2.97	109	763	6.8
	107	235	12.9	167.7	98	40	138	3.37	29.7	17.7	420	14.4	3.44	109	774	7.6
	118	245	12.7	165.1	107	38	145	3.55	20.1	12.2	440	14.5	3.29	110	794	7.6
	130	252	13.9	180.7	112	39	151	3.46	29.7	16.4	440	13.8	3.09	112	818	8.1
	140	267	14.8	192.4	113	47	160	3.87	32.4	16.8	420	14.4	3.42	111	824	7.7
	156	275	15.4	200.2	128	40	168	4.54	32.2	16.1	470	16.4	3.55	106	855	6.9
	172	290	14.8	192.4	119	37	156	3.80	36.4	18.9	410	13.2	3.20	109	838	8.2
L.N.A.	180	293	14.9	37.3	40	19	59	4.61	−21.7	−58.2	137	15.8	11.50	107	826	6.8
	187	298	16.4	41.0	36	28	64	4.43	−22.6	−53.7	120	14.9	12.50	102	791	6.8
	194	299	10.7	26.8	42	18	60	5.28	−32.2	−120.1	140	17.7	12.60	99	773	5.6
	204	276	6.8	17.0	50	15	65	3.87	−48.0	−282.4	182	14.1	7.70	103	781	7.3
	211	258	3.8	9.5	51	11	62	3.68	−51.5	−542.1	197	14.4	7.30	106	781	7.4
H. Pr.	219	285	14.2	695.8	526	----	----	2.86	----	----	1820	----	0.52	91	697	----
	225	303	16.3	798.7	562	----	----	4.09	----	----	1850	13.6	0.72	83	649	6.1
	249	309	11.2	548.8	404	68	472	4.61	76.8	14.0	1310	14.9	1.14	86	683	5.8
L.N.A.	257	300	10.1	25.3	61	22	83	4.58	−57.7	−228.1	206	15.3	7.40	92	716	6.0
	266	307	12.8	32.0	47	25	72	4.95	−39.0	−121.9	152	16.1	10.60	92	721	5.7
H. Pr.	316	289	10.7	524.3	----	----	----	4.47	----	----	----	15.5	----	99	758	6.4
	337	278	10.8	529.2	428	76	504	4.28	25.2	4.8	1540	15.4	1.00	97	736	6.3
	356	259	10.2	499.8	328	----	----	4.39	----	----	1270	17.0	1.34	100	739	5.9
L.N.A.	367	264	14.4	36.0	41	----	----	3.83	----	----	157	14.5	9.30	96	713	6.6
	374	266	12.2	30.5	38	----	----	4.09	----	----	143	15.4	10.80	93	693	5.1
	396	261	10.6	26.5	32	----	----	3.87	----	----	122	14.9	12.10	89	660	6.0
	406	251	8.3	20.8	31	----	----	3.61	----	----	125	14.4	11.50	90	652	6.2
	417	230	7.1	17.8	36	----	----	3.46	----	----	157	15.0	9.60	94	662	6.3
	424	221	7.2	18.0	28	----	----	3.24	----	----	126	14.7	11.70	96	663	6.5
	435	209	7.0	17.5	29	----	----	3.05	----	----	140	14.6	10.50	98	663	6.7
	447	194	4.8	12.0	34	----	----	3.09	----	----	175	15.9	9.10	101	659	6.3
	457	187	6.5	16.3	31	----	----	2.64	----	----	165	14.1	8.60	102	657	7.2
	467	180	----	----	33	----	----	3.72	----	----	185	20.7*	11.20	104	661	5.0
H. Pr.	470	178	----	----	120	----	----	3.53	----	----	670	19.9*	2.94	105	662	5.2
	472	180	----	----	234	----	----	2.90	----	----	1300	16.1	1.24	103	654	6.4
	474	181	----	----	244	----	----	2.53	----	----	1350	14.0	1.04	102	651	7.3
N-Free	562	165	----	----	41	----	----	1.90	----	----	247	11.5	4.66	97	552	8.4
	572	152	----	----	36	----	----	3.12	----	----	239	20.6	8.62	97	566	4.7
	579	151	----	----	33	----	----	2.64	----	----	221	17.5	7.92	97	557	5.5

TABLE 7A.—METABOLISM DATA FOR RAT #2213, BORN 11/29/30

Diet	Age Days	Wt. Gms.	Daily Int. Food Gms.	Daily Int. N Mgs.	Daily N Excreta, Mgs. Urin.	Daily N Excreta, Mgs. Fec.	Daily N Excreta, Mgs. Total	Daily N Excreta, Mgs. Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs. Urinary	Daily N Excreta Per Kg. Body Wt. Mgs. Total Cr. N.	Ratio Cr. N. to Urin. N %	Basal Met. Cal/day Per Kg. Live Wt.	Basal Met. Cal/day Per Sq. M.	Basal Met. Cal/day Per Mg. Cr. N.
L. Pr.	32	60	5.6	112.0	46	16	62	0.78	50.0	44.6	760	13.0	1.71	150	616	11.5
	39	80	7.3	146.0	58	30	88	1.19	56.0	38.4	730	14.9	2.04	200	920	13.4
	46	96	8.5	170.0	63	39	102	1.45	68.0	40.0	640	14.9	2.32	198	979	13.3
	54	126	11.6	232.0	91	46	137	1.81	95.0	40.9	730	14.4	1.98	165	912	11.4
	62	157	11.9	238.0	131	52	183	2.20	78.0	32.8	830	13.6	1.68	140	843	10.3
	69	180	13.6	272.0	133	59	192	2.80	80.0	29.4	740	15.6	2.11	126	802	8.1
	77	192	13.9	278.0	157	56	213	3.09	65.0	23.4	820	16.1	1.97	122	799	7.6
	85	215	14.9	298.0	176	64	240	3.67	58.0	19.5	820	17.0	2.09	114	778	6.7
	92	231	15.7	314.0	207	79	286	3.35	28.0	8.9	910	14.5	1.62	111	780	7.7
	100	252	14.9	298.0	188	63	251	4.17	47.0	15.8	750	16.5	2.22	105	766	6.4
	109	264	14.9	298.0	195	69	264	5.50	34.0	11.4	750	21.1	2.80	105	778	5.0
	136	311	14.4	288.0	192	61	253	4.50	35.0	12.2	620	14.4	2.34	95	753	6.6
	148	308	13.9	278.0	210	57	267	4.95	11.0	4.0	680	16.1	2.36	96	756	5.9
	161	318	14.7	294.0	211	56	267	5.25	27.0	9.2	660	16.4	2.49	90	721	5.5
L. N. A.	170	314	15.4	38.5	30	19	49	5.17	−10.2	−26.5	96	16.4	17.20	88	696	5.4
	177	313	16.9	42.3	33	20	53	5.43	−10.6	−25.1	107	17.3	16.30	85	678	4.9
	184	317	13.7	34.3	35	17	52	4.69	−17.2	−50.1	110	14.7	13.50	81	645	5.5
	192	305	5.7	14.3	48	8	56	5.47	−41.6	−290.9	156	17.9	11.50	81	637	4.5
	198	289	6.0	15.0	37	10	47	4.54	−32.0	−213.3	129	15.7	12.10	90	638	5.3
	205	277	6.9	17.3	38	13	51	4.13	−34.1	−197.1	139	14.9	10.80	84	637	5.6
L. Pr.	213	298	12.4	248.0	118	57	175	4.54	73.3	29.6	396	15.2	3.85	77	595	5.0
	223	335	15.0	300.0	153	----	----	5.03	----	----	460	14.9	3.28	68	550	4.5
	234	327	7.1	142.0	127	31	158	4.72	−16.0	−11.3	390	14.4	3.72	69	556	4.8
L.N.A.	242	326	14.1	35.3	59	----	----	4.99	----	----	180	15.3	8.50	70	562	4.5
	249	332	14.5	36.3	31	21	52	5.06	−15.9	−43.8	93	15.3	16.40	70	571	4.6
	261	317	6.7	16.8	42	12	54	4.65	−37.2	−221.4	133	14.7	11.10	76	605	5.1
L. Pr.	281	322	15.6	312.0	195	58	253	4.72	59.0	18.9	610	14.7	2.42	80	638	5.4
	352	336	10.2	204.0	273	----	----	5.92	----	----	810	17.6	2.17	91	745	4.9
L.N.A.	360	320	13.1	32.8	56	----	----	4.95	----	----	175	15.5	8.90	96	769	6.2
	367	325	15.7	39.3	44	----	----	4.84	----	----	134	14.9	11.10	94	759	6.3
	374	325	14.8	37.0	42	----	----	4.84	----	----	130	14.9	11.50	94	754	6.3
	386	308	8.9	22.3	43	----	----	4.32	----	----	139	14.1	10.10	95	751	6.8
	406	278	7.0	17.5	34	----	----	3.68	----	----	122	13.2	10.80	99	747	7.5
	417	260	7.2	18.0	29	----	----	3.94	----	----	112	15.2	13.50	98	722	6.5
	424	274	5.7	14.3	32	----	----	3.72	----	----	128	15.1	11.80	91	684	6.0
	435	238	8.8	22.0	25	----	----	3.79	----	----	104	15.9	15.30	99	707	6.2
	447	238	7.8	19.5	25	----	----	4.02	----	----	107	16.9	15.80	95	674	5.6
	457	235	6.8	17.0	26	----	----	3.46	----	----	112	14.7	13.20	95	672	6.5
	467	231	----	----	60	----	----	4.02	----	----	260	17.4	6.70	95	671	5.5
L. Pr.	470	238	----	----	63	----	----	3.61	----	----	260	15.2	5.70	97	659	6.1
	472	255	----	----	86	----	----	3.53	----	----	340	13.8	4.10	86	630	6.2
	474	266	----	----	65	----	----	3.72	----	----	240	14.0	5.70	83	615	5.9
N-Free	567	340	----	----	----	----	----	5.02	----	----	122	14.8	12.10	74	606	5.0
	586	311	----	----	----	----	----	4.20	----	----	127	13.5	10.60	84	662	6.2

TABLE 7B.—METABOLISM DATA FOR RAT #2214, BORN 11/29/30

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Urin. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg Cr. N.
H. Pr.	32	51	5.2	254.8	163	33	196	0.67	58.8	13.1	3200	13.0	0.41	177	677	13.4
	39	82	7.4	362.6	221	57	278	1.15	84.6	23.3	2700	14.1	0.52	128	597	9.1
	46	108	8.5	416.5	243	77	320	1.48	96.5	23.2	2250	13.8	0.61	148	769	10.8
	54	139	11.6	568.4	328	76	404	1.93	164.4	28.9	2360	13.9	0.59	140	806	10.1
	62	177	11.9	583.1	390	88	478	2.58	105.1	18.0	2200	14.6	0.66	123	779	8.5
	69	201	13.7	671.3	506	81	587	3.05	84.3	12.6	2520	15.2	0.60	117	778	7.7
	77	210	14.0	686.0	513	64	577	3.49	109.0	15.9	2440	16.7	0.68	118	797	7.1
	85	237	14.9	730.1	556	78	634	4.17	96.1	13.2	2350	17.6	0.75	110	778	6.2
	92	254	15.7	769.3	595	92	687	2.94	82.3	10.7	2340	11.5	----	105	767	9.1
	100	278	14.9	730.1	589	100	689	4.87	41.1	5.6	2120	17.6	0.83	99	749	5.7
	109	292	14.9	730.1	577	59	636	5.99	94.1	12.9	1980	20.5	1.04	97	751	4.7
	121	314	15.9	779.1	594	137	731	4.80	48.1	6.2	1890	15.3	0.81	93	739	6.1
	136	345	14.6	715.4	601	80	681	4.58	34.4	4.8	1740	13.3	0.76	88	725	6.6
	148	341	13.8	676.2	589	93	682	5.17	−5.8	−0.9	1730	15.1	0.88	89	728	5.8
	161	341	14.8	725.2	437	74	511	5.10	214.2	29.5	1280	15.0	1.17	87	718	5.8
L.N A.	170	339	15.3	38.3	57	18	75	4.99	−36.5	−95.0	169	14.8	8.70	86	708	5.9
	177	337	16.8	42.0	35	18	53	4.76	−10.6	−25.2	104	14.1	13.60	85	692	6.0
	184	345	12.1	30.3	33	16	49	4.65	−18.6	−60.3	95	13.5	14.10	80	663	6.0
	192	330	6.5	16.3	53	9	62	6.10	−45.5	−279.	161	18.5	11.50	82	663	4.4
	198	318	6.3	15.8	50	12	62	4.72	−45.8	−290.	157	14.8	9.40	82	658	5.6
	205	301	5.8	14.5	43	10	53	4.17	−38.9	−268.	143	13.8	9.70	85	662	6.1
H. Pr.	213	316	12.6	617.4	550	88	638	4.91	−20.6	−25.9	1740	15.6	0.89	79	631	5.1
	223	354	16.2	793.8	570	----	----	3.53	----	----	1610	10.0	0.62	70	583	7.0
	234	347	7.9	387.1	308	40	348	5.10	39.3	10.2	890	14.7	1.65	71	587	4.8
L.N.A.	242	353	14.0	35.0	56	----	----	5.13	----	----	158	14.5	9.20	70	585	4.8
	249	362	13.9	34.8	41	19	60	5.17	−24.4	−70.1	112	14.3	12.70	69	581	4.8
	261	347	7.5	18.8	46	16	62	5.25	−42.9	−228.	133	15.1	11.40	75	621	5.0
H.P.	281	346	15.6	764.4	617	79	696	4.76	68.0	8.9	1780	13.8	0.77	82	675	6.0
	352	358	10.3	504.7	403	----	----	6.73	----	----	1130	18.8	1.67	89	742	4.7
	360	350	13.1	641.9	602	----	----	5.21	----	----	1720	14.9	0.87	90	751	6.1
	367	351	15.7	769.3	617	----	----	5.17	----	----	1760	14.7	0.84	90	746	6.1
	374	363	15.4	754.6	586	----	----	4.91	----	----	1610	13.5	0.84	86	724	6.4
	386	347	9.1	445.9	427	----	----	4.87	----	----	1230	14.1	1.14	87	716	6.2
	406	306	6.7	328.3	353	----	----	4.24	----	----	1150	13.8	1.20	93	733	6.7
	417	292	7.5	367.5	335	----	----	4.47	----	----	1150	15.3	1.34	96	743	6.3
	424	266	4.7	230.3	321	----	----	5.58	----	----	1210	21.0	1.74	104	774	5.0
	435	258	8.4	411.6	362	----	----	3.61	----	----	1400	14.0	1.00	107	783	7.6
	447	257	7.2	352.8	177	----	----	3.72	----	----	690	14.4	2.10	107	786	7.4
	457	261	6.9	338.1	316	----	----	3.87	----	----	1210	14.9	1.22	106	785	7.2
	467	253	----	----	144	----	----	3.72	----	----	570	14.7	2.58	110	801	7.5
	470	252	----	----	408	----	----	4.21	----	----	1620	16.7	1.03	111	806	6.6
	472	262	----	----	423	----	----	3.68	----	----	1620	14.1	0.87	107	788	7.6
	474	275	----	----	----	----	----	3.91	----	----	370	14.2	3.80	101	767	7.2
N-Free	567	363	----	----	----	----	----	5.32	----	----	107	14.5	13.60	71	596	4.8
	586	332	----	----	----	----	----	4.58	----	----	127	13.8	10.90	73	593	5.3

TABLE 8A.—METABOLISM DATA FOR RAT #3287, BORN 6/14/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.			Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Urin. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total				Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
L. Pr.	26	30	3.8	76.0	29.3	----	----	0.48	----	----	980	16.1	1.6	250	777	15.6
	35	47	4.6	92.0	29.6	15.7	45.3	0.74	46.7	50.8	630	15.8	2.5	179	792	11.4
	43	64	6.6	132.0	51.6	23.4	75.0	1.10	57.0	43.2	810	17.1	2.1	141	750	8.2
L.N.A.	51	73	7.4	37.0	12.5	5.9	18.4	1.15	18.6	50.3	171	15.8	9.4	137	606	8.7
	57	75	5.8	29.0	13.4	8.3	21.7	1.23	7.3	25.2	179	16.4	8.9	144	647	8.8
	65	80	7.7	38.5	12.0	9.6	21.6	1.27	16.9	43.9	150	15.8	10.7	151	695	9.5
	81	105	9.2	46.0	15.3	13.9	29.2	1.60	16.8	36.5	146	15.3	10.3	145	741	9.5
	88	110	8.2	41.0	15.0	14.6	29.6	1.60	11.4	27.8	136	14.5	11.0	150	786	10.3
	95	115	6.8	34.0	12.6	7.3	19.9	1.54	14.1	41.5	110	13.4	11.8	152	810	11.4
L. Pr.	101	125	7.5	150.0	53.9	31.4	85.3	1.99	64.7	43.1	430	15.9	3.7	147	810	9.2
	108	155	12.5	250.0	83.7	53.1	136.8	2.05	113.2	45.3	540	13.2	2.4	128	764	9.7
L.N.A	116	163	12.3	61.5	30.5	19.7	50.2	2.21	11.3	18.4	187	13.5	7.5	130	797	9.6
	123	168	11.3	28.3	27.2	16.3	43.5	2.49	−15.3	−54.0	162	14.8	9.3	134	830	9.0
	129	155	9.2	23.0	27.1	13.7	40.8	2.40	−17.8	−77.4	175	15.5	8.6	148	888	9.6
L. Pr.	136	163	6.5	130.0	56.5	20.3	76.8	2.42	53.2	40.9	347	14.8	4.3	144	880	9.7
	143	178	12.5	250.0	108.0	----	----	2.40	----	----	610	13.5	2.1	131	833	9.8
	150	203	13.2	264.0	131.0	----	----	2.86	----	----	640	14.1	2.2	115	770	8.2
L.N.A.	158	202	11.5	28.8	41.1	17.3	58.4	2.90	−29.7	−103.	204	14.4	6.9	115	769	8.0
	167	200	13.9	34.8	30.6	----	----	3.27	----	----	153	16.4	10.5	115	767	7.1
	175	192	10.3	25.8	22.4	----	----	2.90	----	----	117	15.1	12.8	120	782	7.9
	185	180	6.5	16.3	22.1	----	----	2.68	----	----	123	14.9	12.2	127	806	8.5
L. Pr.	194	210	11.0	220.0	95.0	----	----	2.86	----	----	450	13.7	3.1	108	729	7.9
	202	238	16.2	324.0	152.0	----	----	3.20	----	----	640	13.5	2.0	95	674	7.0
	210	251	13.5	270.0	141.0	----	----	3.24	----	----	560	12.9	2.3	89	649	6.9
	217	257	11.0	220.0	126.0	----	----	3.61	----	----	490	14.1	2.9	87	637	6.2
	228	260	10.0	200.0	126.0	----	----	3.94	----	----	480	15.2	3.1	85	626	5.6
	235	270	13.5	270.0	139.0	----	----	4.32	----	----	510	16.0	3.1	82	610	5.1
	239	276	11.7	234.0	145.0	----	----	3.76	----	----	530	13.6	2.6	80	603	5.9
N-Free	242	275	10.5	26.3	65.4	----	----	4.21	----	----	238	15.3	6.3	80	603	5.2
	244	272	11.7	29.3	36.8	----	----	4.09	----	----	135	15.1	11.1	81	605	5.4
	246	270	13.2	33.0	35.1	----	----	4.28	----	----	130	15.8	12.3	81	607	5.1
	248	270	13.3	33.3	32.5	----	----	4.02	----	----	121	14.9	12.3	81	604	5.4
	250	256	11.2	28.0	44.9	----	----	5.58	----	----	175	21.8	12.6	85	625	3.9
	253	250	10.5	26.3	34.7	----	----	4.02	----	----	139	16.1	11.5	87	634	5.4
	257	254	9.6	24.0	29.9	----	----	4.09	----	----	118	16.1	13.5	86	626	5.3
	261	248	8.6	21.5	28.7	----	----	3.94	----	----	116	15.9	13.8	88	638	5.6
	273	227	5.7	14.3	28.1	----	----	3.68	----	----	124	13.1	12.9	97	677	6.0
	284	209	4.8	12.0	29.0	----	----	3.57	----	----	139	17.1	12.2	106	715	6.2
	294	186	2.7	6.8	43.0	----	----	4.06	----	----	231	21.8	9.5	119	771	5.5

TABLE 8B.—METABOLISM DATA FOR RAT #3289, BORN 6/14/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Urin. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
H. Pr.	26	32	3.3	161.7	83.6	----	----	0.48	----	----	2610	15.1	0.58	203	650	13.5
	35	58	4.6	225.4	115.0	15.3	130.3	0.86	95.1	42.2	1990	14.8	0.74	138	559	9.3
	43	77	5.4	264.6	138.0	28.7	166.7	1.19	97.9	37.0	1790	15.5	0.87	123	559	8.0
L.N.A.	51	79	8.0	40.0	14.7	10.9	25.6	1.12	14.4	36.0	186	14.1	7.58	133	607	9.4
	57	83	5.7	28.5	16.6	8.0	24.6	1.15	3.9	13.7	200	13.9	6.95	139	646	10.0
	65	88	7.7	38.5	21.2	12.6	33.8	1.12	4.7	12.2	240	12.7	5.29	148	707	11.6
	81	121	10.0	50.0	18.8	19.0	37.8	1.56	12.2	24.4	155	12.9	8.32	132	717	10.3
	88	125	8.5	42.5	19.3	16.4	35.7	1.66	6.8	16.0	155	13.2	8.52	144	793	10.8
	95	128	6.8	34.0	14.4	11.7	26.1	1.63	7.9	23.2	113	12.7	11.20	148	826	11.7
H. Pr.	101	142	7.6	372.4	180.0	42.7	222.7	2.03	149.7	40.2	1270	14.3	1.13	141	816	9.8
	108	168	12.5	612.5	366.0	65.0	431.0	2.08	181.5	29.6	2180	12.4	0.57	131	812	10.6
L.N.A.	116	176	12.4	62.0	33.0	20.8	53.8	2.07	8.2	13.2	188	12.0	6.38	134	842	11.3
	123	179	11.7	29.3	26.7	16.8	43.5	2.23	−14.3	−48.7	149	12.5	8.39	140	887	11.2
	129	170	9.1	22.8	25.8	15.3	41.1	2.36	−18.4	−80.7	152	13.9	9.14	155	963	11.1
H. Pr.	136	179	6.9	338.1	197.0	47.1	244.1	2.46	94.0	27.8	1100	13.7	1.25	156	993	11.4
	143	188	12.5	612.5	467.0	----	----	2.57	----	----	2480	13.7	0.55	152	983	11.1
	150	206	12.4	607.6	455.0	----	----	2.79	----	----	2210	13.5	0.61	140	945	10.4
L.N.A.	158	205	11.5	28.8	52.0	20.9	72.9	2.53	−44.2	−153.6	254	12.4	4.90	138	922	11.1
	167	202	13.3	33.3	34.3	----	----	2.90	----	----	170	14.4	8.50	146	974	10.2
	175	193	9.3	23.3	24.4	----	----	2.57	----	----	126	13.3	10.60	153	1000	11.5
	185	180	6.2	15.5	22.7	----	----	2.46	----	----	126	13.7	10.80	164	1042	12.0
H. Pr.	194	204	11.0	539.0	394.0	----	----	3.05	----	----	1930	15.0	0.78	145	967	9.7
	202	231	15.2	744.8	494.0	----	----	3.09	----	----	2140	13.4	0.63	128	899	9.5
	210	245	13.9	681.1	440.0	----	----	2.86	----	----	1800	11.7	0.65	120	868	10.3
	217	251	10.5	514.5	376.0	----	----	3.27	----	----	1500	13.1	0.87	117	849	9.0
	228	254	10.2	499.8	373.0	----	----	3.65	----	----	1470	14.4	0.98	114	833	7.9
	235	260	13.2	646.8	487.0	----	----	3.68	----	----	1870	14.2	0.76	112	822	7.9
	239	263	10.8	529.2	417.0	----	----	3.50	----	----	1590	13.3	0.84	110	811	8.2
N-Free	242	266	11.1	27.8	170.0	----	----	3.68	----	----	640	13.8	2.15	108	799	7.8
	244	265	11.8	29.5	44.6	----	----	3.42	----	----	168	12.9	7.68	108	798	8.3
	246	264	13.2	33.0	38.6	----	----	3.46	----	----	146	13.1	8.97	108	801	8.2
	248	267	14.7	36.8	32.0	----	----	3.13	----	----	120	11.7	9.75	107	796	9.1
	250	255	12.0	30.0	35.4	----	----	3.91	----	----	139	15.3	11.00	112	817	7.3
	253	249	10.3	25.8	34.9	----	----	3.27	----	----	140	13.2	9.43	115	813	8.7
	257	254	9.5	23.8	32.1	----	----	3.53	----	----	127	13.9	10.90	111	813	8.0
	261	248	8.6	21.5	30.2	----	----	3.53	----	----	122	14.2	11.60	113	814	7.9
	273	223	4.8	12.0	27.9	----	----	3.09	----	----	125	13.8	11.00	126	869	9.1
	294	194	3.6	9.0	27.8	----	----	3.09	----	----	143	15.9	11.10	144	946	9.1

TABLE 9A.—METABOLISM DATA FOR RAT #3288, BORN 6/14/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
L. Pr.	26	30	3.8	76.0	29.3	----	----	0.48	----	----	980	16.0	1.64	283	876	17.7
	35	47	4.6	92.0	29.6	15.7	45.3	0.74	46.7	50.8	630	15.7	2.50	191	714	12.2
	43	64	6.6	132.0	51.6	23.4	75.0	1.10	57.0	43.2	810	17.2	2.13	164	691	9.5
L.N.A.	51	72	5.7	28.5	13.0	7.6	20.6	1.23	7.9	27.7	180	17.1	9.50	153	675	8.8
	57	72	4.3	21.5	14.5	5.2	19.7	1.15	1.8	8.4	200	16.0	7.90	164	724	10.3
	66	67	3.6	18.0	14.4	4.5	18.9	1.19	−0.9	−0.5	210	17.8	8.30	187	801	10.5
	81	92	8.0	4.0	14.0	10.5	24.5	1.34	15.5	38.8	150	14.6	9.60	158	767	10.8
	88	97	6.3	31.5	12.2	9.6	21.8	1.42	9.7	30.8	130	14.6	11.60	159	790	10.8
	95	100	4.4	22.0	12.1	7.5	19.6	1.28	2.4	10.9	120	12.8	10.60	160	804	12.5
L. Pr.	101	114	8.1	162.0	46.7	35.8	82.5	1.49	79.5	49.1	410	13.1	3.20	145	767	11.1
	108	141	13.5	270.0	89.2	57.2	146.4	1.86	123.6	45.8	630	13.2	2.09	124	717	9.4
L.N.A.	116	148	7.8	39.0	22.5	12.4	34.9	1.93	4.1	10.5	150	13.0	8.60	125	737	9.6
	123	143	6.9	17.3	28.2	9.9	38.1	2.05	−20.9	−120.9	200	14.3	7.30	133	772	9.3
	129	140	6.6	16.5	24.0	10.5	34.5	1.97	−18.0	−109.1	170	14.1	8.20	139	802	9.9
L. Pr.	136	158	10.5	210.0	77.1	43.4	120.5	2.08	89.5	42.6	490	13.2	2.70	130	782	9.9
	143	187	15.7	314.0	124.0	----	----	2.60	----	----	660	13.9	2.10	112	727	8.1
	150	212	14.4	288.0	133.0	----	----	2.72	----	----	630	12.8	2.00	104	705	8.1
L.N.A.	158	203	9.3	23.3	45.6	----	----	2.68	----	----	220	13.2	5.90	111	740	8.4
	167	189	10.0	25.0	27.8	----	----	2.75	----	----	150	14.6	9.90	122	790	8.4
	175	185	7.9	19.8	24.4	----	----	2.75	----	----	130	14.9	11.30	128	823	8.6
	185	174	5.3	13.3	25.0	----	----	2.79	----	----	140	16.0	11.20	139	874	8.7
L. Pr.	194	198	10.9	218.0	97.0	----	----	2.75	----	----	490	13.9	2.84	124	819	8.9
	202	219	12.6	252.0	127.0	----	----	3.13	----	----	580	14.3	2.47	113	780	7.9
	210	225	11.3	226.0	110.0	----	----	3.16	----	----	490	14.0	2.88	111	774	7.9
	217	239	12.5	250.0	124.0	----	----	3.35	----	----	520	14.0	2.70	105	746	7.5
	228	251	11.0	220.0	122.0	----	----	3.87	----	----	490	15.4	3.18	100	725	6.5
	235	261	12.3	246.0	143.0	----	----	3.79	----	----	550	14.5	2.65	95	703	6.5
	239	263	11.8	236.0	124.0	----	----	3.67	----	----	470	14.0	2.96	93	690	6.7
N-Free	242	261	9.2	4.6	82.4	----	----	4.02	----	----	320	15.4	4.90	94	694	6.1
	244	259	7.6	3.8	49.9	----	----	3.91	----	----	190	16.0	7.80	95	696	6.3
	246	254	8.7	4.4	38.8	----	----	4.28	----	----	150	16.8	11.00	96	704	5.7
	248	249	7.7	3.9	58.3	----	----	5.51	----	----	230	22.1	9.50	98	712	4.4
	250	230	6.3	3.2	44.2	----	----	3.76	----	----	190	16.3	8.50	107	747	6.5
	253	225	6.0	3.0	39.3	----	----	3.91	----	----	170	17.4	10.00	108	752	6.2
	257	229	7.8	3.9	33.8	----	----	3.61	----	----	150	15.8	10.70	106	740	6.7
	261	224	7.0	3.5	34.4	----	----	3.91	----	----	150	17.5	11.40	107	745	6.1
	284	196	5.1	2.6	27.5	----	----	3.31	----	----	140	16.9	12.10	112	738	6.6
	294	184	4.2	2.1	29.0	----	----	3.16	----	----	160	17.2	10.90	113	721	6.6

Table 9b.—Metabolism Data on Rat #3290, Born 6/14/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Urin. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
H. Pr.	26	32	3.3	161.7	83.6	----	----	0.48	----	----	2600	15.0	0.57	219	700	14.6
	35	58	4.6	225.4	115.0	15.3	130.3	0.86	95.1	42.2	1980	14.8	0.75	147	594	9.9
	43	77	5.4	264.6	138.0	28.7	166.7	1.19	97.9	37.0	1790	15.4	0.86	136	618	8.8
L.N.A.	51	91	6.5	32.5	19.6	4.5	200.5	1.23	−168.0	−516.9	210	13.5	6.30	126	612	9.3
	57	95	5.5	27.5	13.3	7.0	20.3	1.26	7.2	26.2	140	13.3	9.50	132	648	9.9
	66	90	4.2	21.0	13.2	8.5	21.7	1.19	−0.7	−3.3	147	13.2	9.00	156	749	11.8
	81	115	7.3	36.5	16.4	15.4	31.8	1.60	4.7	12.8	143	13.9	9.80	148	787	10.6
	88	123	6.9	34.5	16.1	9.5	25.6	1.57	8.9	25.8	131	12.8	9.80	150	822	11.8
	95	128	5.7	28.5	----	7.9	----	1.41	----	----	----	11.0	----	152	848	13.8
H. Pr.	101	143	7.5	367.5	215.0	36.9	58.4	1.82	309.1	84.1	1500	12.7	0.85	143	833	11.3
	108	173	13.5	661.5	399.0	79.0	478.0	2.16	183.5	27.7	2310	12.5	0.54	124	779	10.0
L.N.A.	116	180	8.0	40.0	46.1	12.7	58.8	2.05	−18.8	−47.0	256	11.4	4.50	126	802	11.1
	123	174	7.4	18.8	30.8	12.1	42.9	2.20	−24.2	−128.8	177	12.6	7.15	137	859	10.8
	129	169	6.9	17.3	28.1	10.3	38.4	2.20	−21.2	−122.6	166	13.0	7.80	146	908	11.2
H. Pr.	136	187	10.2	499.8	----	----	----	----	----	----	----	----	----	136	882	----
	143	220	15.7	769.3	480.0	----	----	2.86	----	----	2180	13.0	0.60	119	821	9.2
	150	239	15.0	735.0	512.0	----	----	3.09	----	----	2140	12.9	0.60	113	806	8.7
L.N.A.	158	230	10.5	26.3	61.0	17.5	78.5	2.72	−52.3	−199.0	265	11.8	4.50	120	838	10.1
	167	217	10.4	26.0	33.0	----	----	2.94	----	----	152	13.5	8.90	129	886	9.5
	175	214	8.4	21.0	24.9	----	----	2.68	----	----	116	12.5	10.80	133	908	10.6
	185	202	5.8	14.5	22.4	----	----	2.75	----	----	111	13.6	12.30	144	957	10.5
H. Pr.	194	226	11.0	539.0	364.0	----	----	3.13	----	----	1610	13.8	0.86	128	895	8.3
	202	254	13.2	646.8	435.0	----	----	3.46	----	----	1710	13.6	0.80	113	828	8.9
	210	251	10.7	524.3	388.0	----	----	3.24	----	----	1550	12.9	0.84	115	835	8.9
	217	267	12.5	612.5	453.0	----	----	3.76	----	----	1700	14.1	0.83	110	804	7.7
	228	285	13.0	637.0	415.0	----	----	3.76	----	----	1450	13.2	0.91	101	772	7.7
	235	292	12.7	622.3	440.0	----	----	3.91	----	----	1510	13.4	0.89	99	762	7.4
	239	297	11.7	573.3	415.0	----	----	3.98	----	----	1400	13.4	0.96	97	754	7.2
N-Free	242	296	10.0	25.0	118.0	----	----	4.06	----	----	400	13.7	3.40	97	756	7.1
	244	287	8.2	20.5	65.4	----	----	4.06	----	----	228	14.1	6.20	100	770	7.1
	246	280	8.7	21.8	51.9	----	----	3.94	----	----	186	14.1	7.60	103	780	7.3
	248	275	8.0	20.0	38.0	----	----	3.24	----	----	138	11.8	8.50	105	789	8.9
	250	260	6.5	16.3	46.5	----	----	4.17	----	----	179	16.0	9.00	111	816	6.9
	253	253	5.3	13.3	47.6	----	----	4.43	----	----	188	17.5	9.30	114	830	6.5
	257	260	8.5	21.3	27.9	----	----	3.76	----	----	107	14.5	13.50	111	816	7.7
	261	257	7.4	18.5	30.1	----	----	4.09	----	----	117	15.9	13.60	112	823	7.0
	273	244	6.0	15.0	27.1	----	----	3.76	----	----	111	15.4	13.90	117	841	7.6
	284	231	5.2	13.0	29.6	----	----	3.72	----	----	128	16.1	12.60	123	869	7.7
	294	217	3.7	9.3	33.0	----	----	3.39	----	----	152	15.6	10.30	131	902	8.4

TABLE 10A.—METABOLISM DATA FOR RAT #3293, BORN 6/14/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Urin. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
L. Pr.	31	40	4.6	92.0	30.5	----	----	0.57	----	----	760	14.1	1.86	212	739	14.9
L.N.A.	38	45	5.3	26.5	8.8	6.0	14.8	0.74	+11.7	44.2	196	16.6	8.47	216	789	13.1
	47	51	2.8	14.0	11.1	7.6	18.7	0.69	−4.7	−33.6	220	13.5	6.14	212	812	15.6
	55	55	4.5	22.5	8.4	5.5	13.9	0.74	8.6	38.2	153	13.5	8.82	213	842	15.8
L. Pr.	62	69	7.0	140.0	41.3	28.0	69.3	0.82	70.7	50.5	600	11.9	1.98	183	792	15.4
L.N.A.	70	78	10.1	50.5	15.6	14.1	29.7	1.27	20.8	41.2	200	16.2	8.10	173	789	10.6
	81	82	4.0	20.0	18.5	5.9	24.4	1.41	−4.4	−22.0	230	17.2	7.48	177	824	10.3
L. Pr.	87	93	6.7	134.0	56.6	26.4	83.0	1.21	51.0	38.1	610	13.0	2.13	165	805	12.6
	95	105	8.3	166.0	73.1	38.4	111.5	1.54	54.5	32.8	700	14.7	2.10	157	805	10.7
L.N.A.	101	115	11.1	55.5	14.5	15.3	29.8	1.45	25.7	46.3	126	12.6	10.00	148	787	11.7
	109	120	9.7	48.5	22.7	14.2	36.9	1.45	11.6	23.9	189	12.1	6.40	152	820	12.6
	117	123	6.7	33.5	16.4	8.4	24.8	1.52	8.7	26.0	133	12.4	9.32	154	844	12.4
L. Pr.	124	127	7.3	146.0	61.6	28.9	90.0	1.79	56.0	38.4	480	14.1	2.94	156	865	11.1
	130	135	12.1	242.0	122.0	49.6	171.6	1.82	70.4	29.1	900	13.5	1.50	150	853	11.1
L.N.A.	138	140	10.6	26.5	29.2	14.7	43.9	2.20	−14.7	−55.5	210	15.7	7.48	150	864	9.5
	145	137	8.2	20.5	24.3	----	----	1.97	----	----	177	14.4	8.14	155	888	10.8
	157	129	6.7	16.8	17.1	----	----	1.75	----	----	133	13.5	10.20	171	952	12.6
	165	121	6.3	15.8	16.9	----	----	1.77	----	----	140	14.6	10.40	186	1009	12.7
L. Pr.	172	134	9.0	180.0	72.7	----	----	1.77	----	----	540	13.2	2.44	168	949	1267
	181	154	12.0	240.0	128.0	----	----	2.23	----	----	830	14.5	1.75	147	880	10.2
	188	163	10.9	218.0	133.0	----	----	2.38	----	----	820	14.6	1.78	139	853	9.5
	197	168	9.4	188.0	118.0	----	----	2.23	----	----	700	13.3	1.90	135	838	10.2
L.N.A.	206	167	10.2	25.5	21.9	----	----	2.42	----	----	131	14.5	11.10	137	844	9.4
	214	165	8.0	20.0	22.4	----	----	2.27	----	----	136	13.8	10.10	138	851	10.0
	224	162	9.3	23.3	28.7	----	----	2.68	----	----	177	16.6	9.38	142	865	8.6
	235	158	8.2	20.5	18.8	----	----	2.42	----	----	119	15.3	12.90	144	870	9.4
	269	141	5.3	13.3	26.3	----	----	2.46	----	----	187	17.4	9.30	149	861	8.5
	277	137	5.2	13.0	20.8	----	----	2.23	----	----	152	16.3	10.70	150	854	9.2
L. Pr.	280	141	5.7	114.0	41.8	----	----	2.16	----	----	300	15.3	5.10	145	836	9.4
	282	148	7.4	148.0	61.0	----	----	2.12	----	----	410	14.3	3.49	136	805	9.5
	284	153	9.2	184.0	67.0	----	----	2.42	----	----	440	15.8	3.59	131	778	8.3
	286	156	9.1	182.0	68.5	----	----	1.97	----	----	440	12.6	2.86	128	769	10.1

TABLE 10B.—METABOLISM DATA FOR RAT #3294, BORN 6/14/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Urin. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
H. Pr.	31	53	4.9	240.1	62.7	----	----	0.73	----	----	1180	13.8	1.17	189	735	13.7
L.N.A.	38	58	5.4	27.0	13.6	7.0	20.6	0.95	+6.4	+23.7	230	16.4	7.13	190	769	11.6
	47	67	4.1	20.5	16.2	10.0	26.2	0.99	−5.7	−27.8	240	14.8	6.17	190	814	12.8
	55	68	4.9	24.5	11.9	5.8	17.7	1.10	+12.5	+51.0	175	16.2	9.26	199	854	12.3
H. Pr.	62	83	6.0	294.0	159.0	41.0	200.0	1.08	+94.0	+32.0	1910	13.0	0.68	177	826	13.6
L.N.A.	70	100	10.7	53.5	15.9	16.5	32.4	1.38	+21.1	+39.4	159	13.8	8.68	160	804	11.6
	81	105	5.9	29.5	14.6	8.5	23.1	1.45	+6.4	+21.7	139	13.8	9.93	168	859	12.1
H. Pr.	87	126	6.2	303.8	149.0	31.0	180.0	1.72	+123.8	+40.8	1180	13.7	1.16	146	807	10.7
	95	150	10.2	499.8	300.0	52.0	352.0	2.12	+147.0	+29.6	2000	14.1	0.71	130	768	9.2
L.N.A.	101	158	11.9	59.5	23.9	15.6	39.5	1.93	+20.0	+33.6	151	12.2	8.08	128	775	10.5
	109	164	9.6	48.0	21.4	13.3	34.7	2.01	+13.3	+27.7	131	12.3	9.39	130	798	10.6
	117	169	7.0	35.0	19.9	8.0	27.9	2.08	+7.1	+20.3	118	12.3	10.42	130	809	10.6
H. Pr.	124	177	6.9	338.1	242.0	29.0	271.0	2.60	+67.1	+19.8	1370	14.7	1.07	127	800	8.6
	130	188	12.7	622.3	447.0	65.8	512.8	2.38	+109.5	+17.6	2380	12.7	0.53	121	786	9.6
L.N.A.	138	189	11.2	28.0	34.6	17.5	52.1	2.46	−24.1	−86.1	183	13.0	7.10	124	808	9.6
	145	185	8.0	20.0	29.3	----	----	2.34	----	----	158	12.6	7.97	130	833	10.3
	157	173	6.7	16.8	25.0	----	----	2.46	----	----	145	14.2	9.79	142	888	10.0
	165	166	6.7	16.8	28.1	----	----	2.38	----	----	169	14.3	8.46	151	929	10.5
H. Pr.	172	180	9.0	441.0	308.0	----	----	2.42	----	----	1710	13.4	0.78	140	890	10.4
	181	203	12.5	612.5	435.0	----	----	2.79	----	----	2140	13.7	0.64	124	829	9.0
	188	219	11.5	563.5	408.0	----	----	3.09	----	----	1860	14.1	0.76	115	792	8.2
	197	221	10.0	490.0	364.0	----	----	2.90	----	----	1650	13.1	0.79	114	788	8.7
L.N.A.	206	213	10.0	25.0	43.2	----	----	3.35	----	----	200	15.7	7.85	118	805	7.5
	214	200	6.3	15.8	39.5	----	----	3.16	----	----	198	15.8	7.98	126	837	8.0
	224	191	9.6	24.0	30.6	----	----	3.20	----	----	162	16.8	10.37	131	857	7.8
	235	183	8.3	20.8	19.1	----	----	2.83	----	----	104	15.5	14.90	137	874	8.8
	269	150	4.5	11.3	31.5	----	----	3.09	----	----	210	20.6	9.81	153	906	7.4
	277	145	5.2	13.0	38.0	----	----	2.38	----	----	260	16.4	6.31	155	907	9.5
H. Pr.	280	149	5.3	259.7	184.0	----	----	3.35	----	----	1240	22.5	1.81	146	862	6.5
	282	153	7.8	382.2	313.0	----	----	2.16	----	----	2050	14.1	0.69	141	840	10.0
	284	153	9.0	41.0	282.0	----	----	2.31	----	----	1850	15.1	0.82	139	829	9.2
	286	156	8.7	426.3	357.0	----	----	1.97	----	----	2290	12.6	0.55	135	808	10.7

TABLE 11.—METABOLISM DATA FOR RAT #3293, BORN 6/14/31

Diet	Age Days	Wt. Gms.	Daily Int. Food Gms.	Daily Int. N Mgs.	Daily N Excreta, Mgs. Urin.	Daily N Excreta, Mgs. Fec.	Daily N Excreta, Mgs. Total	Daily N Excreta, Mgs. Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs. Urinary	Daily N Excreta Per Kg. Body Wt. Mgs. Total Cr. N.	Ratio Cr. N. to Urin. N %	Basal Met. Cal/day Per Kg. Live Wt.	Basal Met. Cal/day Per Sq. M.	Basal Met. Cal/day Per Mg. Cr. N.
	31	53	4.9	98.0	62.7	----	----	0.73	----	----	1180	13.8	1.17	189	735	13.7
L.N.A.	38	58	5.4	27.0	13.6	7.0	20.6	0.94	6.4	23.7	230	16.2	7.04	198	804	12.2
	47	67	4.1	20.5	16.2	10.0	26.2	0.99	−5.7	−27.8	240	14.8	6.17	187	801	12.6
	55	67	3.4	17.0	9.6	5.5	15.1	1.00	1.9	11.2	140	14.9	10.64	209	897	14.0
H. Pr.	62	100	11.1	543.9	271.0	60.0	331.0	1.27	212.9	39.1	2710	12.7	0.47	152	764	12.0
L.N.A.	70	114	13.4	67.0	19.3	19.6	38.9	1.56	28.1	41.9	170	13.7	8.06	146	777	10.7
	81	123	8.8	44.0	16.4	15.2	31.6	1.79	12.4	28.2	130	14.6	11.23	151	827	10.4
H. Pr.	87	139	6.0	294.0	160.0	35.7	195.7	1.79	98.3	33.4	1270	12.9	1.02	144	826	11.2
	94	160	10.5	514.5	332.0	65.0	397.0	2.24	117.5	22.8	2080	14.0	0.67	133	803	9.5
L.N.A.	101	178	16.1	80.5	26.8	7.9	34.7	2.20	45.7	56.8	150	12.4	8.27	126	801	10.2
	109	193	13.6	68.0	25.7	19.6	45.3	2.60	22.7	33.4	130	13.5	10.38	124	814	9.2
	117	196	9.2	46.0	22.7	13.9	36.6	2.46	9.4	20.4	116	12.6	10.86	129	846	10.2
H. Pr.	124	212	9.4	460.6	280.0	61.0	341.0	2.90	119.6	26.0	1320	13.7	1.04	123	833	9.0
	130	225	12.5	612.5	421.0	70.0	491.0	3.09	121.5	19.8	1870	13.7	0.73	120	836	8.7
L.N.A.	138	219	14.7	36.7	56.8	21.0	77.8	3.35	−41.1	−112.0	260	15.3	5.88	128	881	8.4
	145	217	14.6	36.5	36.8	----	----	3.24	----	----	171	14.9	8.71	132	908	8.9
	157	206	8.9	22.2	24.4	----	----	2.75	----	----	117	13.3	11.37	146	977	10.9
	165	196	9.8	24.5	27.3	----	----	2.68	----	----	138	13.7	9.93	156	1023	11.4
H. Pr.	172	222	13.5	661.5	435.0	----	----	2.68	----	----	1960	12.1	0.62	141	972	11.6
	181	256	16.6	813.4	547.0	----	----	3.57	----	----	2140	13.9	0.65	125	917	9.0
	188	277	14.1	690.9	465.0	----	----	3.68	----	----	1680	13.3	0.79	117	888	8.8
	197	286	13.5	661.5	476.0	----	----	3.79	----	----	1670	13.3	0.80	115	879	8.7
L.N.A.	206	292	17.6	44.0	46.6	----	----	3.72	----	----	161	12.7	7.89	113	873	8.9
	214	295	12.3	30.7	34.8	----	----	3.57	----	----	119	12.1	10.17	114	882	9.4
	224	285	9.8	24.5	31.3	----	----	3.83	----	----	109	13.4	12.29	118	898	9.4
	235	264	9.5	23.7	32.0	----	----	3.27	----	----	121	12.4	10.25	127	944	10.3
	269	224	7.3	18.2	27.5	----	----	3.35	----	----	125	15.0	12.00	153	1059	10.2
	277	219	5.7	14.2	32.5	----	----	3.27	----	----	149	14.9	10.00	157	1082	10.5
H. Pr.	280	224	7.0	343.0	167.0	----	----	3.20	----	----	750	14.3	1.91	154	1071	10.8
	282	235	10.0	490.0	380.0	----	----	3.13	----	----	1620	13.3	0.82	147	1039	11.0
	284	248	14.0	686.0	441.0	----	----	3.20	----	----	1780	12.9	0.72	139	1006	10.8
	286	265	16.4	803.6	616.0	----	----	3.46	----	----	2330	13.0	0.56	130	966	10.0

TABLE 12A.—METABOLISM DATA ON RAT #2528, BORN 1/28/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
Corn Gluten	40	57	6.0	102.0	----	----	----	0.72	----	----	----	12.7	----	167	669	13.2
	48	61	4.7	79.9	----	----	----	0.94	----	----	----	15.5	----	164	676	10.6
	56	66	4.7	79.9	----	----	----	1.02	----	----	----	15.5	----	158	671	10.2
	63	69	3.8	64.6	----	----	----	1.02	----	----	----	14.7	----	157	674	10.6
	70	70	3.9	66.3	----	----	----	0.98	----	----	----	14.0	----	157	683	11.2
	77	73	3.8	64.6	----	----	----	0.97	----	----	----	13.3	----	156	691	11.8
	86	77	4.5	76.5	----	----	----	1.36	----	----	----	17.6	----	151	682	8.5
	96	82	5.4	91.8	----	----	----	1.50	----	----	----	18.3	----	146	682	8.0
	105	86	5.3	90.1	----	----	----	1.18	----	----	----	13.7	----	145	687	10.6
	114	87	5.0	85.0	65	10	76	1.66	9.5	11.2	748	18.7	2.5	152	721	8.0
	122	92	5.6	95.2	74	14	88	1.67	7.5	7.9	799	18.2	2.3	147	714	8.1
	132	95	5.9	100.3	----	----	----	1.80	----	----	----	18.7	----	147	725	7.8
	142	99	5.7	96.9	----	----	----	1.90	----	----	----	18.8	----	143	717	7.5
	156	103	4.3	73.1	----	----	----	2.10	----	----	----	20.2	----	142	723	7.0
	169	106	5.7	96.9	75	----	----	1.40	----	----	710	13.3	1.9	146	752	11.1
L.N.A.	179	99	6.6	33.0	15	9.2	24	1.50	8.9	27.0	151	15.6	10.1	158	788	10.4
	185	103	6.2	31.0	11	5	16	1.10	15.1	48.7	102	10.5	10.5	153	782	14.4
	196	105	6.2	31.0	19	12	30	2.40	0.7	2.3	177	23.1	12.9	152	780	6.7
Corn Gluten	204	103	5.4	91.8	----	----	----	2.00	----	----	----	19.4	----	155	792	8.0
	228	103	5.5	93.5	72	11	83	1.40	10.4	11.1	697	13.4	12.4	160	817	11.8
	252	100	5.1	86.7	69	12	81	1.20	5.5	6.3	688	12.0	1.7	165	829	13.8
	271	108	5.8	98.6	84	12	95	1.80	3.6	3.7	773	16.5	2.2	154	798	9.2
L.N.A.	281	105	6.8	17.0	24	11	34	1.90	−17.2	−101.2	225	18.5	8.1	162	829	8.9
	292	106	6.9	17.3	16	11	27	1.70	−10.1	−58.3	153	16.5	10.5	165	850	10.3
	298	103	6.0	15.0	16	----	----	1.60	----	----	153	15.9	10.1	170	866	10.9
	308	99	6.4	16.0	15	----	----	1.60	----	----	154	16.5	10.5	180	899	11.1
Corn Gluten	318	103	5.0	85.0	68	----	----	1.70	----	----	657	15.6	2.4	175	891	11.3
	337	114	6.3	107.1	87	----	----	1.70	----	----	764	15.0	2.0	167	884	11.2
	400	125	5.6	95.2	77	----	----	2.10	----	----	613	17.0	2.7	168	925	10.0
	437	122	4.8	81.6	68	----	----	2.20	----	----	557	17.7	3.2	148	804	8.2
	487	124	7.0	119.0	98	----	----	2.20	----	----	790	17.7	2.2	145	796	8.4

TABLE 12B.—METABOLISM DATA FOR RAT #2529, BORN 1/28/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N
Corn Gluten	40	53	5.5	88.0	----	----	----	0.64	----	----	----	12.3	----	170	643	14.1
	48	55	4.2	67.2	----	----	----	0.84	----	----	----	15.3	----	167	657	11.0
	56	60	4.2	67.2	----	----	----	0.93	----	----	----	15.6	----	160	640	10.3
	63	62	3.9	62.4	----	----	----	0.93	----	----	----	15.0	----	161	667	10.8
	70	62	3.7	59.2	----	----	----	0.96	----	----	----	15.5	----	169	700	10.9
	77	66	3.8	60.8	----	----	----	1.06	----	----	----	16.1	----	161	663	10.0
	86	70	4.1	65.6	----	----	----	1.23	----	----	----	17.9	----	157	688	8.9
	96	75	4.7	75.2	----	----	----	1.21	----	----	----	16.2	----	153	676	9.5
	105	78	4.4	70.4	----	----	----	1.08	----	----	----	13.8	----	151	694	10.9
	114	80	5.2	83.2	67	11	78	1.69	5.3	6.4	841	21.2	2.5	150	706	7.9
	122	85	6.3	100.8	79	10	89	1.33	11.9	11.8	924	15.6	1.7	147	694	9.4
	132	88	6.1	97.6	----	----	----	1.62	----	----	----	18.4	----	148	722	8.0
	142	93	6.2	99.2	----	----	----	1.69	----	----	----	18.2	----	143	700	7.9
	156	95	4.3	68.8	----	----	----	1.66	----	----	----	17.4	----	147	737	8.4
	169	100	4.0	64.0	53	----	----	1.35	----	----	533	13.5	2.5	140	700	10.4
L.N.A.	179	107	7.6	38.0	19	11	29	1.80	8.6	22.6	176	16.9	9.6	136	690	8.1
	185	113	6.1	30.5	12	5	17	1.19	13.3	43.6	107	10.6	9.8	129	695	12.3
	196	111	6.7	33.5	23	11	34	2.64	−0.5	−1.5	209	23.8	11.4	135	714	5.7
Corn Gluten	204	108	4.9	83.3	----	----	----	1.82	----	----	----	16.9	----	144	738	8.5
	228	112	5.7	96.9	73	10	83	1.45	14.0	14.4	650	13.0	2.0	143	762	11.0
	252	108	5.0	85.0	75	11	86	1.23	−1.1	−1.3	694	11.4	1.6	148	762	13.0
	271	116	6.3	107.1	87	14	101	1.67	6.5	6.1	746	14.4	1.9	138	727	9.6
L.N.A.	281	115	7.8	19.5	19	10	29	1.90	−9.2	−47.2	161	16.5	10.3	142	741	8.6
	292	115	7.3	18.3	17	8	25	1.79	−6.9	−37.5	148	15.6	10.5	143	745	9.2
	298	111	6.5	16.3	32	----	----	1.97	----	----	290	17.8	6.1	144	762	8·1
	308	100	6.1	15.3	16	----	----	1.19	----	----	119	12.0	7.3	160	800	13.4
Corn Gluten	318	103	5.7	96.9	77	----	----	1.60	----	----	744	15.6	2.1	155	800	10.0
	337	111	6.2	105.4	75	----	----	1.82	----	----	674	16.4	2.4	147	776	9.0
	400	129	6.4	108.8	85	----	----	2.05	----	----	656	15.8	2.4	126	709	8.0
	437	116	3.2	54.4	53	----	----	1.79	----	----	457	15.4	3.4	138	727	8.9
	487	130	6.7	113.9	101	----	----	2.49	----	----	777	19.2	2.5	131	739	6.8

Table 12c.—Metabolism Data for Rat #2530, Born 1/28/31

Diet	Age Days	Wt. Gms.	Daily Int. Food Gms.	Daily Int. N Mgs.	Daily N Excreta, Mgs. Urin.	Daily N Excreta, Mgs. Fec.	Daily N Excreta, Mgs. Total	Daily N Excreta, Mgs. Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs. Urinary	Daily N Excreta Per Kg. Body Wt. Mgs. Total Cr. N.	Ratio Cr. N. to Urin. N %	Basal Met. Cal/day Per Kg. Live Wt.	Basal Met. Cal/day Per Sq. M.	Basal Met. Cal/day Per Mg. Cr. N.
Milk Al-	40	70	7.6	129.2	----	----	----	1.09	----	----	----	12.4	----	220	956	14.0
bumin	48	83	4.3	73.1	----	----	----	1.39	----	----	----	14.1	----	193	889	11.5
	56	90	4.7	79.9	----	----	----	1.34	----	----	----	14.9	----	178	842	11.9
	63	100	4.0	68.0	----	----	----	1.45	----	----	----	14.5	----	165	825	11.4
	70	104	4.0	68.0	----	----	----	1.53	----	----	----	14.7	----	159	825	10.8
	77	111	4.0	68.0	----	----	----	1.35	----	----	----	12.2	----	149	786	12.2
	86	119	4.7	79.9	----	----	----	1.92	----	----	----	16.1	----	141	764	8.8
	96	122	4.7	79.9	----	----	----	2.16	----	----	----	17.7	----	139	773	7.9
	105	131	5.0	85.0	----	----	----	2.05	----	----	----	15.7	----	134	761	9.0
	114	132	4.3	73.1	68	10	78	2.57	−5.0	−6.8	518	19.5	3.8	140	804	7.2
	122	143	5.3	90.1	57	21	78	2.25	11.7	13.0	401	15.8	3.9	135	772	8.6
	132	146	6.0	102.0	----	----	----	2.99	----	----	----	20.5	----	144	840	7.0
	142	154	6.7	113.9	----	----	----	2.79	----	----	----	18.0	----	139	823	7.7
	156	152	4.3	73.1	----	----	----	2.94	----	----	----	19.3	----	138	808	7.1
	169	158	5.3	90.1	62	----	----	2.36	----	----	395	15.0	3.8	127	769	8.5
L.N.A.	179	155	7.3	36.5	31	15	45	2.68	−8.8	−24.1	197	17.3	8.8	123	731	7.1
	185	158	6.7	33.5	18	10	28	1.60	5.4	16.1	113	11.8	9.5	118	719	11.7
	196	161	5.7	28.5	32	16	47	3.42	−18.5	−64.9	196	21.3	10.9	108	644	5.1
Corn Gluten	204	161	5.0	85.0	----	----	----	2.33	----	----	----	14.4	----	106	630	7.3
	228	172	6.0	102.0	----	11	----	2.34	----	----	----	13.6	----	116	714	8.5
	252	166	3.3	56.1	101	17	118	2.05	−61.8	−110.2	608	12.4	2.0	127	778	10.2
	271	177	5.7	96.9	84	20	104	2.60	−6.9	−7.1	476	14.6	3.1	119	750	8.1
L.N.A.	281	173	8.0	20.0	34	15	49	2.42	−28.6	−143.0	194	14.0	7.2	121	750	8.7
	292	163	5.7	14.3	30	16	46	2.79	−31.3	−219.3	181	17.1	9.5	131	789	7.6
	298	156	6.9	17.3	27	----	----	2.57	----	----	174	16.4	8.7	138	827	8.4
	308	141	4.9	12.3	27	----	----	2.27	----	----	194	16.1	8.3	156	917	9.7
Milk Al-	318	150	5.1	86.7	101	----	----	1.86	----	----	673	12.4	1.8	152	912	12.3
bumin	337	174	6.2	105.4	65	----	----	2.05	----	----	374	11.8	3.2	136	843	11.5
	400	211	6.5	110.5	97	----	----	3.27	----	----	458	15.6	3.4	118	806	7.6
	437	200	3.8	64.6	94	----	----	2.90	----	----	470	14.5	3.1	115	767	7.9
	487	183	6.7	113.9	97	----	----	2.53	----	----	530	13.8	2.6	115	724	8.3

TABLE 13A.—METABOLISM DATA FOR RAT #2532, BORN 1/28/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
Corn Gluten	44	58	4.2	71.4	----	----	----	0.86	----	----	----	14.8	----	147	607	9.9
	52	60	3.8	64.6	----	----	----	0.92	----	----	----	15.3	----	148	593	9.7
	60	66	3.8	64.6	----	----	----	1.11	----	----	----	16.8	----	136	562	8.1
	67	66	3.5	59.5	----	----	----	0.98	----	----	----	14.8	----	142	588	9.6
	74	68	3.3	56.1	----	----	----	1.20	----	----	----	17.7	----	140	594	7.9
	82	71	4.4	74.8	----	----	----	0.89	----	----	----	12.6	----	139	619	11.1
	91	75	4.0	68.0	----	----	----	1.29	----	----	----	17.3	----	137	606	8.0
	100	79	4.7	79.9	----	----	----	1.16	----	----	----	14.7	----	134	624	9.1
	109	82	4.2	71.4	52	10	63	1.18	8.9	12.5	639	14.4	2.3	134	611	9.3
	119	85	5.5	93.5	71	11	82	1.25	11.8	12.6	835	14.7	1.8	135	639	9.2
	128	89	5.7	96.9	----	----	----	1.45	----	----	----	16.3	----	135	632	8.3
	138	92	3.8	64.6	----	----	----	1.86	----	----	----	20.2	----	135	653	6.7
	151	95	4.4	74.8	----	----	----	1.56	----	----	----	16.4	----	137	684	8.3
	163	94	5.5	93.5	----	----	----	1.73	----	----	----	18.5	----	143	705	7.7
	176	97	4.8	81.6	----	----	----	1.44	----	----	----	14.8	----	140	680	9.4
	193	101	5.1	86.7	58	----	----	1.43	----	----	573	14.1	2.5	144	725	10.1
	235	100	4.2	71.4	68	9	76	1.32	−4.9	−6.9	675	13.2	2.0	150	750	11.4
	263	105	6.4	108.8	92	12	104	1.77	4.9	4.5	875	16.8	1.9	143	714	8.5
	285	113	6.3	107.1	88	----	----	1.75	----	----	782	15.5	2.0	133	714	8.6
	301	120	6.5	110.5	135	----	----	1.82	----	----	1125	15.2	1.3	128	695	8.4
	323	117	6.6	112.2	65	----	----	1.71	----	----	551	14.7	2.7	137	727	9.4
	344	127	6.2	105.4	82	----	----	1.79	----	----	642	14.1	2.2	134	739	9.5
	403	133	5.3	90.1	75	----	----	2.01	----	----	562	15.1	2.7	147	817	9.8
	438	125	5.3	90.1	47	----	----	1.97	----	----	376	15.8	4.2	180	978	11.4
H. Pr.	484	257	14.4	705.6	509	----	----	3.61	----	----	1981	14.1	0.7	121	886	8.6
	499	271	15.9	779.1	550	----	----	4.46	----	----	2030	16.5	0.8	114	861	7.0
N-Free	511	247	9.4	4.7	58	----	----	3.98	----	----	233	16.1	6.9	119	868	7.4

TABLE 13B.—METABOLISM DATA FOR RAT #2534, BORN 1/28/31

Diet	Age Days	Wt. Gms.	Daily Int. Food Gms.	Daily Int. N Mgs.	Daily N Excreta, Mgs. Urin.	Daily N Excreta, Mgs. Fec.	Daily N Excreta, Mgs. Total	Daily N Excreta, Mgs. Total Cr. N.	N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs. Urinary	Daily N Excreta Per Kg. Body Wt. Mgs. Total Cr. N.	Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day Per Kg. Live Wt.	Basal Met. Cal/day Per Sq. M.	Basal Met. Cal/day Per Mg. Cr. N.
Corn Gluten	44	56	4.0	68.0	----	----	----	0.79	----	----	----	14.2	----	161	643	11.4
	52	56	3.6	61.2	----	----	----	0.86	----	----	----	15.4	----	161	643	10.5
	60	63	4.0	68.0	----	----	----	0.98	----	----	----	15.6	----	143	643	9.2
	67	65	3.4	57.8	----	----	----	1.00	----	----	----	15.5	----	143	620	9.3
	74	66	3.7	62.9	----	----	----	1.05	----	----	----	15.9	----	144	633	9.0
	82	69	3.8	64.6	----	----	----	0.84	----	----	----	12.2	----	142	653	11.7
	91	76	4.4	74.8	----	----	----	1.22	----	----	----	16.0	----	132	625	8.2
	100	79	5.2	88.4	----	----	----	1.09	----	----	----	13.8	----	127	588	9.2
	109	81	4.3	73.1	53	10	64	1.17	9.6	13.1	656	14.4	2.2	130	583	9.0
	119	82	4.6	78.2	61	10	70	1.10	7.9	10.1	739	13.4	1.8	134	611	10.0
	128	87	5.4	91.8	----	----	----	1.15	----	----	----	13.3	----	129	622	9.7
	138	93	5.2	88.4	----	----	----	1.57	----	----	----	16.9	----	124	605	7.3
	151	96	4.1	69.7	----	----	----	1.45	----	----	----	15.1	----	123	621	8.1
	163	98	5.5	93.5	----	----	----	1.80	----	----	----	18.5	----	127	620	6.9
	176	103	4.5	76.5	----	----	----	1.80	----	----	----	17.5	----	129	665	7.4
	193	98	4.2	71.4	61	----	----	2.36	----	----	622	24.1	3.9	145	710	6.0
	235	103	4.6	78.2	57	18	75	1.38	2.8	3.6	657	13.5	2.4	165	850	12.3
	263	109	6.1	103.7	83	13	96	1.77	7.5	7.2	762	16.2	2.1	172	890	10.6
	285	116	6.7	113.9	89	----	----	1.65	----	----	771	14.1	1.8	171	900	12.1
	301	126	6.9	117.3	129	----	----	1.86	----	----	1024	14.8	1.4	236	891	11.0
	323	123	5.2	88.4	70	----	----	1.79	----	----	571	14.5	2.5	171	914	11.7
	344	133	7.0	119.0	88	----	----	1.79	----	----	664	13.5	2.0	162	896	12.0
	403	141	5.2	88.4	71	----	----	2.49	----	----	501	17.7	3.5	149	875	8.4
	438	128	3.1	52.7	43	----	----	1.90	----	----	336	14.8	4.4	188	1043	12.8
H. Pr.	484	237	13.2	646.8	487	----	----	2.86	----	----	2055	12.2	0.6	160	1152	13.3
	499	251	12.3	602.7	460	----	----	3.61	----	----	1833	14.4	0.8	141	1014	9.8
N-Free	511	239	9.2	4.8	47	----	----	3.46	----	----	196	14.4	7.4	138	1000	9.5

TABLE 13c.—METABOLISM DATA FOR RAT #2531, BORN 1/28/31

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N. to Ur-in. N %	Basal Met. Cal/day		
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.		Per Kg. Live Wt.	Per Sq. M.	Per Mg. Cr. N.
Milk Albumin	44	84	8.7	147.9	----	----	----	1.75	----	----	----	20.8	----	161	754	7.7
	52	91	4.0	68.0	----	----	----	1.35	----	----	----	14.8	----	152	750	10.2
	60	99	4.3	73.1	----	----	----	1.39	----	----	----	14.1	----	141	726	10.1
	67	106	4.0	68.0	----	----	----	1.62	----	----	----	15.3	----	137	725	9.0
	74	112	4.0	68.0	----	----	----	1.59	----	----	----	14.2	----	132	705	9.3
	82	113	4.0	68.0	----	----	----	1.30	----	----	----	11.5	----	135	724	11.7
	91	118	4.0	68.0	----	----	----	1.85	----	----	----	15.7	----	131	705	8.4
	100	121	5.0	85.0	----	----	----	2.00	----	----	----	16.6	----	132	727	8.0
	109	125	4.0	68.0	44	15	59	2.03	9.4	13.8	351	16.2	4.6	131	713	8.1
	119	129	5.0	85.0	51	6	57	2.05	27.4	32.5	397	15.8	4.0	128	717	8.0
	128	133	5.0	85.0	----	----	----	1.93	----	----	----	14.6	----	128	708	8.8
	138	144	5.3	90.1	----	----	----	2.62	----	----	----	19.0	----	122	700	7.0
	151	147	4.7	79.9	----	----	----	2.23	----	----	----	15.2	----	121	712	8.0
	163	150	5.0	85.0	----	----	----	2.26	----	----	----	15.1	----	127	760	8.4
	176	152	4.7	79.9	----	----	----	2.21	----	----	----	14.6	----	125	731	8.6
	193	156	5.0	85.0	59	----	----	2.41	----	----	376	15.5	4.1	117	704	7.6
	235	168	4.1	69.7	68	18	86	2.24	−15.8	−22.7	403	13.4	3.3	104	644	7.8
	263	166	6.3	107.1	144	16	160	2.41	−53.0	−49.5	865	14.5	1.7	105	648	7.3
	285	191	6.5	110.5	97	----	----	2.38	----	----	509	12.5	2.4	94	621	7.6
	301	205	6.6	112.2	132	----	----	2.60	----	----	644	12.7	2.0	90	597	7.1
	323	201	5.1	86.7	113	----	----	2.75	----	----	562	13.7	2.4	100	667	7.3
	344	211	6.8	115.6	80	----	----	3.16	----	----	379	15.0	4.0	100	677	6.6
	403	214	5.4	91.8	103	----	----	3.01	----	----	481	14.1	3.0	97	671	6.9
	438	198	4.5	76.5	87	----	----	2.72	----	----	439	13.7	3.1	109	720	7.9
H. Pr.	484	297	14.6	715.4	404	----	----	3.79	----	----	1360	12.8	0.9	114	895	9.0
	499	310	14.6	715.4	570	----	----	4.69	----	----	1839	15.1	0.8	115	910	7.6
N-Free	511	292	8.7	4.4	59	----	----	4.09	----	----	203	14.1	6.9	115	884	8.2

TABLE 14A.—METABOLISM DATA (AVERAGE VALUES PER RAT) FOR RAT LITTER #1349, BORN 9/2/32

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N to Urin. N %
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.	
High Prot. Average of 5 Rats	22	25	----	98	35	14	49	0.68	49.0	50.0	1400	27.2	1.94
	23	29	0.2	90	57	18	75	0.63	15.3	17.0	1966	22.0	1.11
	24	32	2.8	136	79	16	95	0.52	41.2	30.3	2469	16.3	0.66
	25	32	4.0	196	79	21	100	0.44	96.3	49.1	2469	13.5	0.56
	26	36	4.0	196	99	22	121	0.55	75.4	38.5	2739	15.6	0.56
	27	39	4.0	196	97	24	121	0.45	75.0	38.3	2482	11.6	0.46
	28	46	6.0	292	36	31	68	0.46	224.4	76.8	----	10.0	----
	29	49	4.0	196	130	31	161	0.85	35.0	17.9	2661	17.3	0.65
	30	53	8.0	392	162	47	208	0.76	183.7	46.9	3049	14.0	0.47
	31	59	6.0	294	168	49	217	0.78	77.0	26.2	2847	13.3	0.46
	32	60	6.0	293	152	31	184	0.74	109.3	37.3	2540	12.4	0.49
	33	66	9.0	439	196	55	251	0.71	188.4	42.9	2967	10.6	0.36
	34	71	8.9	436	101	59	160	0.89	276.0	63.3	1423	12.5	0.88
	35	72	5.0	245	162	33	195	0.83	50.1	20.4	2244	11.5	0.51
	36	79	9.0	440	199	45	244	0.80	196.4	44.6	2513	10.2	0.40
	37	79	6.0	294	165	30	196	0.96	98.2	33.4	2094	12.2	0.58
	38	85	11.0	539	214	49	263	1.09	275.6	51.1	2518	12.8	0.51
	39	91	9.9	486	243	83	326	1.05	160.5	33.0	2670	11.5	0.43
	40	96	9.0	442	225	57	282	1.14	160.0	36.2	2346	11.9	0.51
	41	101	10.9	536	258	60	318	1.42	217.9	40.7	2555	14.0	0.55
	42	111	9.6	469	231	56	287	1.38	182.3	38.9	2077	12.4	0.60
	43	111	8.0	392	231	56	287	1.38	105.3	26.9	2077	12.4	0.60
	44	116	8.6	422	203	54	258	1.40	164.5	39.0	1752	12.1	0.69
	45	116	8.0	392	203	54	258	1.40	134.5	34.3	1752	12.1	0.69
	46	123	12.0	588	184	71	254	1.60	333.7	56.8	1494	13.1	0.87
	47	123	10.0	490	184	71	254	1.60	235.7	−8.1	1494	13.1	0.87
Average of 2 Rats	48	136	14.0	686	340	50	390	2.08	296	43.1	2496	15.3	0.61
	49	136	14.3	701	340	50	390	2.08	311	44.4	2496	15.3	0.61
	50	146	11.5	564	313	51	364	2.23	200	35.5	2140	15.3	0.71
	51	146	10.6	519	313	51	364	2.23	155	29.9	2140	15.3	0.71
	52	153	11.1	544	353	64	416	2.38	128	23.5	2304	15.5	0.68
	53	153	13.0	637	353	64	416	2.38	221	34.7	2304	15.5	0.68
	54	162	12.8	627	1123	65	1187	2.47	−560	−89.3	6929	15.3	0.22
	55	162	12.6	617	1123	65	1187	2.47	−570	−92.4	6929	15.3	0.22
	56	168	10.0	490	400	58	458	2.53	32	6.5	2381	15.0	0.63
	57	168	15.2	745	400	58	458	2.53	287	38.5	2381	15.0	0.63
	58	177	13.4	657	244	65	309	2.56	348	53.0	1379	14.4	1.05
	59	177	12.5	613	244	65	309	2.56	304	49.6	1379	14.4	1.05
	60	188	12.1	593	394	70	464	2.62	129	21.8	2096	14.0	0.66
	61	188	13.4	657	394	70	464	2.62	193	29.4	2096	14.0	0.66
	62	190	12.9	632	689	76	765	2.73	−133	−21.0	3626	14.4	0.40
	63	190	10.0	490	689	76	765	2.73	−275	−56.1	3626	14.4	0.40

TABLE 14B.—METABOLISM DATA (AVERAGE VALUES PER RAT) FOR RAT LITTER #1349, BORN 9/2/32

Diet	Age Days	Wt. Gms.	Daily Int.		Daily N Excreta, Mgs.				N Deposit Mgs.	Ratio N Dep. to N Cons. %	Daily N Excreta Per Kg. Body Wt. Mgs.		Ratio Cr. N to Urin. N %
			Food Gms.	N Mgs.	Urin.	Fec.	Total	Total Cr. N.			Urinary	Total Cr. N.	
Low Prot.	22	30	----	49	31	11	42	0.74	7.0	14.3	1033	25.1	2.39
Average of	23	32	2.5	49	24	16	40	0.50	9.1	18.6	750	15.6	2.08
4 Rats	24	35	5.0	99	30	15	85	0.61	14.4	14.5	851	17.8	2.05
	25	33	3.8	75	31	17	47	0.51	27.8	37.1	924	15.2	1.67
	26	37	5.0	100	----	19	----	0.71	----	----	----	19.3	----
	27	41	5.0	100	36	22	58	0.65	42.0	42.0	878	15.8	1.81
	28	43	7.4	148	142	22	164	0.65	−15.9	−10.7	----	15.3	----
	29	46	3.8	75	47	30	77	0.81	−2.3	−3.1	1028	17.5	1.71
	30	49	8.8	175	44	30	74	0.72	101.1	57.8	898	14.8	1.64
	31	58	7.5	150	50	----	----	0.83	----	----	867	14.4	1.65
	32	56	7.5	149	50	41	92	0.82	57.5	38.6	898	14.7	1.63
	33	61	10.0	199	61	46	106	0.84	92.7	46.6	992	13.9	1.39
	34	65	11.2	223	70	55	125	0.93	97.8	43.9	1082	14.2	1.32
	35	66	7.5	150	61	42	102	0.96	47.9	31.9	917	14.5	1.59
	36	71	11.2	224	61	49	110	0.94	113.7	50.8	863	13.1	1.53
	37	69	7.5	150	52	31	83	1.02	67.5	45.0	754	14.9	1.96
	38	75	12.5	250	68	41	109	1.13	141.0	56.4	904	15.0	1.67
	39	82	12.4	248	73	76	149	1.21	99.5	40.1	884	14.7	1.67
	40	88	11.3	225	63	48	110	1.34	114.8	51.0	710	15.2	2.15
	41	92	12.5	249	----	77	----	----	----	----	----	----	----
	42	100	12.5	250	65	55	120	1.44	130.3	52.1	647	14.4	2.23
	43	100	10.0	200	65	55	120	1.44	80.3	40.2	647	14.4	2.23
	44	105	16.3	325	75	62	137	1.50	187.7	57.8	714	14.3	2.00
	45	105	10.0	200	75	62	137	1.50	62.7	31.4	714	14.3	2.00
	46	117	13.8	275	85	66	151	1.69	123.6	44.9	726	14.4	1.99
	47	117	13.8	275	85	66	151	1.69	123.6	44.9	726	14.4	1.99
Average of	48	129	15.0	300	92	60	151	1.99	148	49.3	709	15.5	2.17
2 Rats	49	129	17.5	350	92	60	151	1.99	198	56.6	709	15.5	2.17
	50	133	14.3	286	80	46	126	2.05	160	55.9	602	15.4	2.56
	51	133	10.5	210	80	46	126	2.05	84	40.0	602	15.4	2.56
	52	147	12.6	252	110	54	164	2.27	88	34.9	748	15.5	2.06
	53	147	15.6	312	110	54	164	2.27	148	47.4	748	15.5	2.06
	54	154	15.0	300	117	67	184	2.44	116	38.7	760	15.9	2.09
	55	154	17.5	350	117	67	184	2.44	166	47.4	760	15.9	2.09
	56	161	10.0	200	113	60	173	2.57	27	13.5	702	16.0	2.27
	57	161	15.0	300	113	60	173	2.57	127	42.3	702	16.0	2.27
	58	176	18.2	364	251	57	308	2.56	56	15.4	1426	14.5	1.02
	59	176	15.0	300	251	57	308	2.56	−8	−2.7	1426	14.5	1.02
	60	185	17.5	350	120	78	198	2.70	152	43.4	649	14.6	2.25
	61	185	17.5	350	120	78	198	2.70	152	43.4	649	14.6	2.25
	62	188	18.9	378	125	97	222	2.75	156	41.3	665	14.7	2.20
	63	188	10.0	200	125	97	222	2.75	−22	11.0	665	14.7	2.20