of the deficient, nor those of the control animals showed alterations."

From the work reported or cited here it appears that corneal vascularization is a reaction which results in the rat from a deficiency of any of the indispensable amino acids or from protein deprivation.

To date, 4 of the 7 rats on the histidine-deficient diet have developed bilateral cataracts of varying size. It is to be noted that these 4 rats are all from different litters and that none of the rats on the other diets used in this study have shown any lenticular changes which could be seen with the biomicroscope.

Summary. In the rat, deficiencies of leucine, isoleucine, phenylalanine, histidine, threonine, valine, or of arginine, resulted in corneal vascularization. Four of 7 rats on a histidine-deficient diet developed lenticular opacities.

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Chemical Changes in the Developing Turtle Embryo.

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It has been found in previous experiments[1] that the embryo of the snapping turtle (*Chelydra serpentina*) consumes fat in the amount of 61 mg per individual during the last 57 days of its development. Data obtained on the loss of dry substance during the same period, in conjunction with figures for fat loss and oxygen consumption, led to the assumption that relatively large amounts of protein were probably metabolized also. In the present study determinations of protein, carbohydrate, inorganic substances, dry substance and fat were made on turtle eggs at the beginning of development and on newly hatched turtles. The eggs used were collected from the oviducts of 3 large snapping turtles on June 11, 1946 and each egg was weighed individually. Fifteen of the eggs (5 from each clutch) were opened at once and the egg contents (albumen and yolk) of all 15 were put into a single vessel and dried at 110°C to serve for the determination of the initial chemical composition. The other eggs were incubated at room temperature and when the young turtles hatched (72-77 days) each was weighed and 15 specimens (5 from each clutch, as in the initial egg batch) were placed in a vessel and dried at 110°C. Eggs of as nearly as possible the same initial weights were used. The uniformity of the material is indicated by the fact that the average weight of the 15 eggs used for analysis of the chemical composition at the beginning of development was 11.13 ± 0.11 g (eggshells included) while the initial average weight of the 15 eggs which gave rise to the hatched turtles analyzed was 11.10 ± 0.09 g.

The 2 lots of dried material were each ground to a fine powder in a grinding mill and the following fractions were determined in aliquot parts by the methods specified: nitrogen according to Kjeldhal, using the customary factor of 6.25 to convert to protein; fat according to Kumagava-Suto;[2] total carbohydrate according to Dische and Popper[3] and inorganic substances by inciner-

[1] Lynn, W. G., and von Brand, T., *Biol. Bull.*, 1945, **88**, 112.

[2] Kumagava, M., and Suto, K., *Bioch. Z.*, 1908, **8**, 212.

[3] Dische, Z., and Popper, H., *Bioch. Z.*, 1926, **175**, 371.

TABLE I.
Chemical Changes in the Developing Embryo of the Snapping Turtle.

g	Egg	Hatched turtle	Difference
Avg fresh wt	9.89	8.01	—1.88
" dry "	2.07	1.68	—0.39
" protein content	1.15	0.93	—0.22
" fat "	0.52	0.30	—0.22
" carbohydrate content	0.14	0.16	+0.02
" inorganic "	0.17	0.19	+0.02

ation.

Our results are summarized in Table I. It is obvious that the main substances consumed were fat and protein. Quantitatively, identical amounts of both groups of substances disappeared, but the greater amount of energy was obviously derived from the fat combustion. It will be noted that the sum of protein, fat, carbohydrate and inorganic substances amounts to about 95% of the dry weight in both batches. The 5% which is unaccounted for may be due to errors in the protein and carbohydrate determinations. It is questionable whether the customary conversion factor of 6.25 used in the protein determination is exactly applicable to turtle protein and it may well be that the carbohydrates present do not give exactly the same color intensity with the indole reagent as does the glucose solution used for comparison. The quantitative balance is sufficiently close, however, to prove that the developing snapper embryo derives its energy from the combustion of fat and protein. Similar observations have thus far been reported for only one other chelonian, the marine turtle *Thalassochelys corticata*.[4,5]

In our previous study[1] we found that a snapper egg consumes about 500 cc of oxygen during its development. The complete oxidation of 0.22 g of fat and 0.22 g of protein would require about 660 cc o. gen. If some carbohydrate were synthesized from protein, the figure would be slightly lower, but would still be in excess of 500 cc. The discrepancy may be explained by the fact that the eggs used this year were somewhat heavier than those employed 2 years ago (11.1 g as compared with 9.9 g) and that their development required an average of 75 days as against 72 days.

[4] Karashima, J., *J. Biochem. (Tokyo)*, 1929, **10**, 375.

[5] Nakamura, Y., *J. Biochem. (Tokyo)*, 1929, **10**, 357.

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Effect of Anemic Anoxia on Absorption of Isotonic Magnesium Sulfate from the Small Intestine.*

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It was shown by Northup and Van Liere[1] that even severe degrees of anoxic anoxia had no significant effect on absorption of magnesium sulfate from the small intestine of dogs. It had previously been shown,[2] however, that in anemic anoxia, produced by bleeding dogs 3.2% of their body weight, isotonic sodium chloride solution was absorbed from the small intestine more quickly than in control animals. The results were

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[1] Northup, D. W., and Van Liere, E. J., *Arch. Internat. Pharmaco. et de Therap.*, 1939, **62**, 175.

[2] Van Liere, E. J., Northup, D. W., and Sleeth, C. K., *Am. J. Physiol.*, 1938, **124**, 102.