

Effect of Hypophyseal Growth Hormone upon the Urinary Nitrogen Excretion of Fasting Rats.*

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It was shown by Harrison and Long¹ that the administration of a saline extract of the anterior pituitary would decrease the urinary nitrogen excretion of fasting rats. It seemed of interest to determine if pure growth hormone would produce the same results.

Methods. The hormone used was prepared according to the previously published method.² All animals used were "plateued" female rats of the Long-Evans strain which weighed between 150 and 200 g and were from 5-8 months of age. There were 2 groups of 5 animals each and during the control periods each animal was fed 12 g of the stock diet[†] daily, this amount being eaten completely. The animals were kept in individual metabolism cages; urine collections were made daily; and the urine was analyzed by the micro-Kjeldahl procedure for its total nitrogen content.

Following a 5-day preinjection control period, all animals were fasted for 2 days and the animals in Group 1 were given intraperitoneally 200 γ of growth hormone per day. (The dose was divided so that the hormone was given in 100 γ doses each morning and

evening.) The animals in Group 2 served as the uninjected controls. At the end of the 2-day fasting period, hormone administration was stopped and the animals were again fed 12 g of diet per day. At the end of a second control period of 10 days the rats were again fasted and hormone administration again started. During this injection period the animals in group 2 received the same dose of hormone as above, while the previously injected animals served as the controls. The fast was continued for 5 days, 2 of the control rats dying on the 5th day. Growth hormone injections were continued for 6 days after termination of the fast. Urinary nitrogen excretion was then determined for a subsequent 9-day post-injection control period.

Results and Comment. The data of the experiment are presented graphically in Fig. 1 in which the average daily nitrogen excretions of each group are plotted. It will be seen that the average nitrogen excretion of the growth hormone-treated animals was lower than that of the controls during each fasting period. The average nitrogen excretions of the injected animals during the first and second fasting periods were 91 and 64 mg per day respectively as compared to 116 and 126 mg per day excreted by the controls during the same periods. These were compared statistically according to the methods of Fisher³ and a p value of 0.02 and of less than 0.01 were obtained for the first and second fasting periods respectively.

It is also of interest to note that following the re-institution of feeding after the second fasting period the nitrogen excretion of the animals receiving growth hormone remained

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¹ Harrison, H. C., and Long, C. N. H., *Endocrinology*, 1940, **26**, 971.

² Li, C. H., Evans, H. M., and Simpson, M. E., *J. Biol. Chem.*, 1945, **159**, 353.

[†] The diet fed consisted of ground whole wheat 67.5%, casein 15.0%, whole milk powder 10.0%, NaCl 0.75%, CaCO₃ 1.5%, hydrogenated vegetable oil (Crisco or Primex) 5.25%. To each kg of diet were added 3.5 g of Sardilene (fish oil concentrate containing 3000 USP units of vitamin A, and 400 chick units vitamin D per g).

³ Fisher, R. A., *Statistical Methods for Research Workers*, 10th Ed., Edinburgh, London, Oliver and Boyd (1946).

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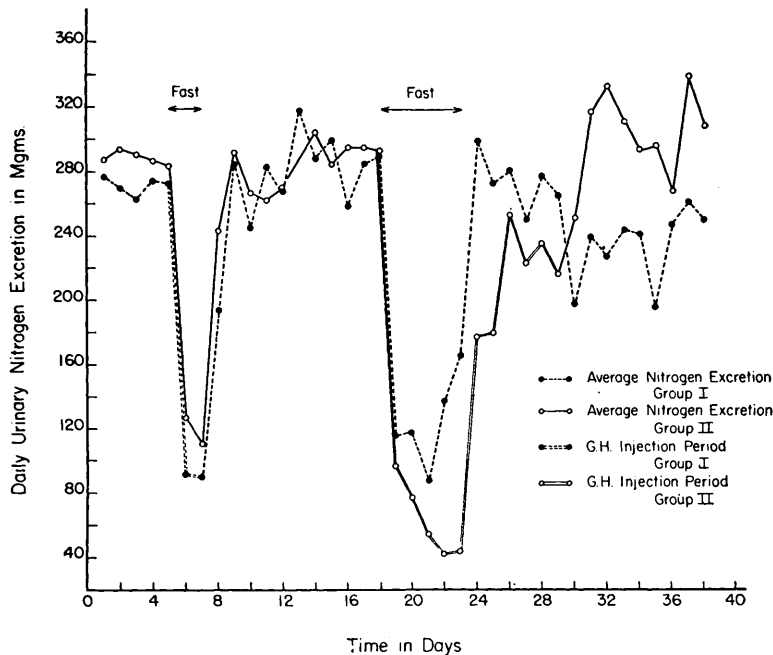


FIG. 1.

below that of the controls. Following the cessation of growth hormone administration there was an increase in nitrogen excretion comparable to that previously described.⁴ The 2 animals in the control group that died showed the typical pre-mortal rise in nitrogen excretion while none of the treated animals showed a similar rise during fasting.

That growth hormone has a protein anabolic effect in fed animals is well shown by

the fact that it produces general body growth and nitrogen retention.⁴ That it reduces urinary nitrogen excretion in fasting rats is evidence that its *net* effect is to reduce protein catabolism under these conditions. However, this type of data does not permit any critical evaluation of the mechanism of action of growth hormone on protein metabolism.

Conclusion. Growth hormone at a dose level of 200 γ per day reduces the urinary nitrogen excretion of fasting adult female rats.

⁴ Gordan, G. S., Bennett, L. L., Li, C. H., and Evans, H. M., *Endocrinology*, 1948, **42**, 153.