

of carbohydrate, a decrease in its utilization, or both. Possibly, both effects are present at different times, the overproduction phase representing a secondary reaction to the injection of insulin and manifesting itself as an increased blood sugar 24 hours after the last injection of insulin.

Summary. Normal chicks exhibit the usual

type of glucose tolerance curve, but one shorter in duration when compared with the mammalian curves. The character of the curve begins to change after 24 hours of fast and is markedly changed when taken after 72 hours of fast. Previous injections of large doses of insulin greatly decreases the glucose tolerance.

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Influence of Atmospheric Temperature upon Reaction of Rabbits to Insulin.*

J. M. JOHLIN.

From the Department of Biochemistry, Vanderbilt University School of Medicine, Nashville.

The higher mortality among white rats and white mice when kept at atmospheric temperatures considerably higher than normal, after receiving injections of insulin, and their increased inclination to convulse has frequently been reported.¹⁻⁵ Others have found, however, that the inclination of white mice to convulse is the same at 30°C as at 18°-20°C.⁶ It has also been found⁷ that rabbits acclimated at a temperature of 30°C required but one-half as much insulin to produce the same percentage of blood sugar reduction as those at 22°C.

It was observed in the present experiments

that rabbits which responded with mild convulsions, when injected with a prescribed amount of insulin at normal room temperatures, collapsed completely with the first onset of convulsions and expired forthwith after being injected with the same amount of insulin during extremely hot weather (31° to 34°), if not given immediate intravenous injections of glucose. The rabbits used were divided into 3 groups, A, B, and C. Those of group C were inclined to convulse after injections of 0.375 units of insulin per kg of body weight, those of group B with 0.5 units, while those of group A did not convulse with the larger amount. They were used but once a week and were fasted for 18 hours before each experiment. The dosage of insulin in each of these experiments was 0.375 units of crystalline zinc insulin[†] per kg of body weight.

Samples of blood were taken from each animal just before it was injected with insulin and similar samples taken each hour thereafter for 7 hours to determine the nature of the subsequent changes in the blood sugar level. Blood sugar determinations were made on individual samples according to the method of Miller and Van Slyke.⁸ Group averages of the data thus obtained are represented by the graphs of Fig. 1.

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¹ Voegtlin, C., and Dunn, E. R., *U. S. Public Health Rep.*, 1923, **38**, 1747.

² Voegtlin, C., Dunn, E. R., and Thompson, J. W., *U. S. Public Health Rep.*, 1924, **39**, 1935.

³ Hemmingsen, A. M., and Krogh, A., *Publications of the Health Organizations of the League of Nations*, C. H. 398, 40.

⁴ Trevan, J. W., and Boeck, E., *Publications of the Health Organizations of the League of Nations*, C. H. 398, 46.

⁵ Hemmingsen, A. M., *Skand. Arch. Physiol.*, 1939, **82**, 105.

⁶ Horsters, H., and Brugsch, H., *f. d. ges. exp. Med.*, 1929, **65**, 569.

⁷ Private communication, Lilly Research Laboratories.

[†] The generosity of the Eli Lilly Company who donated this insulin is gratefully acknowledged.

⁸ Miller, B. F., and Van Slyke, D. D., *J. Biol. Chem.*, 1936, **114**, 583.

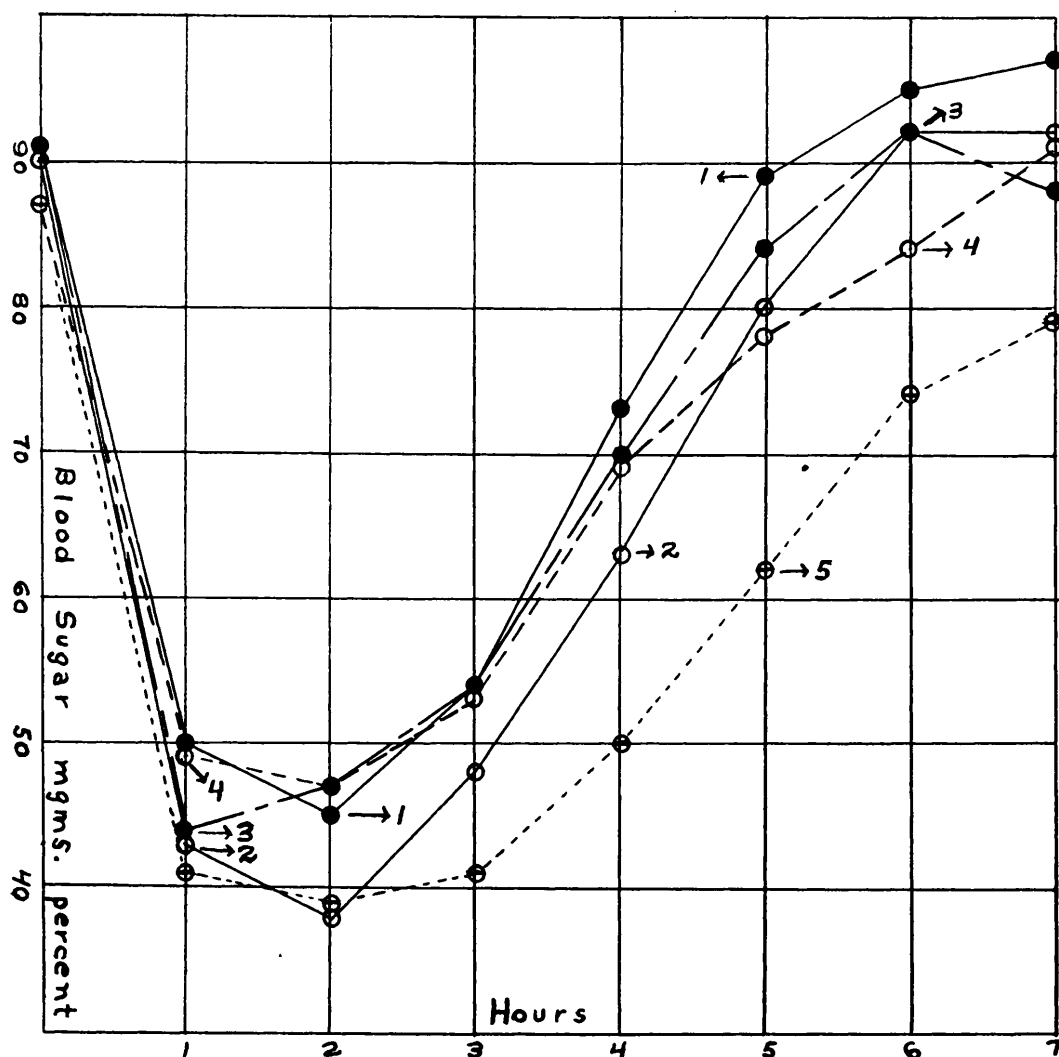


FIG. 1.

Curves 1-4 show the progressive changes in the blood sugar of rabbits not inclined to convulse after injections of insulin.

	Temp. of 18-hr fasting period	Temp. of 7-hr experimental period
Curve 1	33°C	33°C
" 2	20	20
" 3	33	20
" 4	20	33

Curve 5, obtained under similar conditions as curve 3 with rabbits less inclined to convulse under conditions pertaining to curves 1 and 2, shows a persistently lower level of blood sugar.

No animal of group A (8 rabbits) or of group B (3 rabbits) was ever inclined to convulse under any of the conditions of the present experiments. When the animals of group C (3 rabbits) were kept at 33°C or at 20°C during the 18-hour fasting period as well as during the subsequent 7-hour experimental

period all were invariably inclined to convulse. When, however, these same animals were kept at 33°C during the 18-hour fasting period and at 20°C during the 7-hour experimental period it was found in repeated experiments with each animal that none of them convulsed. The blood sugar level reached

under these circumstances was fully as low as that reached under conditions when the animals convulsed. The data obtained with group C was averaged with similar data obtained with group B (graph 5).

When the animals of group A were kept at 33°C during both the 18-hour fasting period and the 7-hour experimental period it was found that their blood sugar level was consistently higher than when they were kept at a temperature of 20°C during these periods. (Graphs 1 and 2.) This may be due to a lack of complete acclimatization to the lower temperature. Recent data indicate that 3 to 4 days are required for the full acclimatization to desert temperatures by man.⁹ Similar experiments with group B produced similar data. These data were not averaged with those obtained with group A because of occasional sporadic deviations in blood sugar values. This was also true of the data obtained with the rabbits of group C.

When the animals of group A were kept at 33°C during the 18-hour fasting period and at 20°C during the 7-hour experimental period the blood sugar level at first was inclined to follow the level maintained when these animals were kept at 20°C during both periods and then approached the level obtained when these animals were kept at 33°C during both periods. (Graph 3.) When the animals of group A were kept at 20°C during the 18-hour fasting period and at 33°C during the 7-hour

experimental period a similar reversal of the blood sugar level, but in the opposite direction, took place. (Graph 4.) Similar data were obtained with the animals of group B.

The data which were obtained with group B when kept at 33°C during the 18-hour fasting period and at 20°C during the 7-hour experimental period were averaged with those obtained under similar conditions with the rabbits of group C. (Graph 5.)

Phenomena associated with the failure of the rabbits of group C to convulse when kept at 20°C during the 7-hour experimental period after they had been kept at 33°C during the 18-hour fasting period, are suggestive of similar phenomena associated with the behavior of parathyroidectomized animals under the influence of a sudden change in the acid-base balance of the blood. Because of the base deficit caused by overventilation at 33°C the rabbits would be subject to an uncompensated acidosis at 20°C until the kidneys had restored the acid-base balance to a normal state.

Just as an increased acidity restrains the onset of tetany in parathyroidectomized animals it appears to restrain the inclination of normal animals to convulse under the influence of insulin hypoglycemia. An inhibiting effect upon the convulsive response after insulin injections due to an atmosphere with a high partial pressure of CO₂ has been reported.¹⁰

⁹ Bean, W. B., and Eichna, L. W., *Proc. Fed. Am. Soc. Exp. Biol.*, 1943, **2**, 144.

¹⁰ McQuarrie, I., Ziegler, M. R., and Stone, W. E., *Chinese M. J.*, 1940, **58**, 1.

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Androgen Assay on Three-Day-Old Male Chicks.*

A. E. RAKOFF, K. E. PASCHKIS,[†] AND A. CANTAROW.

From the Jefferson Medical College and Hospital, Philadelphia, Pa.

The capon comb growth method is recognized as the standard procedure for the biologic assay of androgens. However, when a great many assays are being performed constantly the difficulties of maintaining large

numbers of such birds diminishes the practicability of this method.

Frank and his associates have developed an assay method based on the comb growth of the immature chick. The progress in devel-