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Effect of insulin on the metabolism of dogs under amytal anesthesia.

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The effect of insulin on the metabolism of normal fasting dogs has been studied in the respiration calorimeter for four hour periods after its injection. Control experiments were carried out to determine the effect of amytal anesthesia on the heat production of the dog. This anesthetic has no effect on blood sugar¹ and we have found that it has no effect on the CO₂ combining power of the blood.

When sufficient amytal was injected to produce a complete anesthesia (doses from 55 to 65 mg. per kilo, depending on the individual animal), the metabolism remained constant over a six hour period at a level of less than 5 per cent below the basal. On the production of deeper anesthesia by larger doses of this hypnotic, a larger decrease in metabolism occurred (10-25 per cent), but this usually remained constant over a six hour period provided no shivering resulted.

A marked fall in body temperature occurs following the amytal anesthesia which is very rapid at first, and the body temperature usually reaches the minimum value in the second or third hour. With light anesthesia shivering usually resulted when the minimum temperature was reached, by means of which the metabolism was markedly accelerated and the body temperature brought back to normal. With larger doses of amytal, chemical regulation was entirely prevented, although a slow return to normal temperature resulted.

When insulin was injected into a fasting dog under the influence of amytal anesthesia, an increased R. Q. was sometimes obtained during the second hour, while during the third and fourth hours the R. Q. returned to the preliminary level. In other experiments on the same animals no increase in quotient

¹ Page, I. H., *J. Lab. and Clin. Med.*, 1923, ix, 194.

followed the administration of insulin, although the blood sugar fell decidedly below the convulsive level.

A progressive increase in heat production usually occurred after the administration of insulin irrespective of the R. Q. obtained. This may indicate that insulin directly increases fat metabolism.

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Disappearance of ketone bodies in presence of unoxdized sugar in completely phlorizinized dogs.

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Sugar (glucose or levulose), given in proper amounts to starving, completely phlorhizinized dogs which have ketosis and are in coma, causes the disappearance of ketone bodies from the urine and blood for a period of 9 to 24 hours with corresponding clinical improvement of the animal, in spite of the fact that the sugar given may not be oxidized as has been shown by calorimeter experiments,¹ and may be quantitatively recovered from the urine. The degree of aketosis (the state when ketosis is absent when it could be expected) is favorably influenced by the amount of sugar administered, and therefore by the curve of extra sugar excretion. The excretion of ketone bodies after administration of sugar goes hand in hand with the fall in the nitrogen elimination noted by Deuel and Chambers.² The ketone bodies do not stagnate in the body because they disappear from the blood. There is no increase of the ketosis symptoms, but in some cases an amelioration of these symptoms; and there is no compensatory after excretion of the ketone bodies. There is also no renal impairment in Allen's sense³ which could cause aketosis. There

¹ Ringer, Michael, *J. Biol. Chem.*, 1923, lviii, 483.

² Deuel, H. J., Jr., and Chambers, Wm. H., *J. Biol. Chem.*, 1925, lxiii, 22.

³ Allen, F. M., *J. Metabol. Res.*, 1923, iv, 579.