9734 P

Effects of Intravenous Injections of Acacia on Certain Functions of the Liver.

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The investigations of Andersch and Gibson[1] as to the fate of intravenously injected acacia, showed that a large proportion of the acacia was deposited in the hepatic cells of the liver, rather than being excreted as had been previously assumed by many writers. In view of the extensive clinical use of acacia in shock, hemorrhage, nephrosis and other conditions, it seemed advisable to make a more extensive study of the effects of the deposited acacia upon various functions of the liver.

The importance of the liver in carbohydrate metabolism leads one to expect significant changes in tolerance to carbohydrates if that organ were damaged by the deposition of the gum. It is at least partially true that the extent to which a particular sugar is converted into liver and muscle glycogen probably determines the degree of hyperglycemia which results following its ingestion.[2] It was long thought that galactose was specifically metabolized by the liver.[2] However, the dog is able to metabolize considerable amounts of this sugar in the absence of the liver.[3]

Glucose and galactose tolerances were done on 5 normal dogs after they had fasted 18 hours or more. After taking blood from the marginal vein of the ear for a sugar determination,[4] 1½ gm. of the sugar per kilo of body weight were given by stomach tube. Blood for sugar determinations was taken every half hour over a 2-hour period. After the dogs had been given a number of intravenous injections of acacia (a total of 4.4-10.7 gm. per kilo) at 3-day intervals, the glucose and galactose tests were repeated.

In every case, with the 5 dogs, we found a marked diminution of tolerance to galactose, and a somewhat less marked drop in glucose tolerance after acacia injections. The reduced carbohydrate tolerance would seem to indicate impairment of the function of the liver for carbohydrate metabolism. There are many cases reported in

[1] Andersch, M., and Gibson, R. B., *J. Pharm. and Exp. Therap.*, 1934, **52**, 390.

[2] Soffer, L. J., *Medicine*, 1935, **14**, 185.

[3] Deuel, H. J., *Physiol. Rev.*, 1936, **16**, 173.

[4] Gibson, R. B., PROC. SOC. EXP. BIOL. AND MED., 1929, **27**, 480.

the literature both of humans and of experimental animals which show that extensive liver damage is associated with a reduction in the tolerance to galactose,[2] though an animal with 80% of the liver removed still utilizes glucose and galactose normally.[5]

The liver seems to be the principal if not the sole source of the blood plasma proteins,[6] consequently, "in advanced chronic hepatic lesions there is a moderate reduction in the total serum proteins, the diminution occurring chiefly in the albumin fraction . . . ".[6] The diagnostic and prognostic value of these changes in plasma proteins as indicative of liver damage have been repeatedly emphasized.[6, 7] Dick, Warweg and Andersch[8] have shown that such a change takes place in the plasma proteins of dogs after acacia injections, and that the drop is much greater than can be accounted for by the dilution effect of the acacia.

TABLE I.
Effect of Intravenous Injections of Gum Acacia Solution upon Tolerance of Dogs to Glucose and Galactose.

Dog	Acacia total gm./kg.	Glucose tolerance. Bl. sug. at half hrs. mg.% as glucose 0	.5	1	1.5	2	Galactose tolerance. Bl. sug. at half hrs. mg.% as glucose 0	.5	1	1.5	2
1	0	100	147	107		81	92	157	145	131	129
	4.4	120	157	157	140	98	98	200	236	212	162
2	0	81	118	107	82	79	81	162	165	192	173
	7.5	69	165	179	138	79	90	131	189	231	175
4	0	50	150	122	80	78	87	135	122	96	85
	9.0	80	170	147	90	95	90	142	186	157	102
5	0	92	179	173	90	74	120	167	212	150	142
	10.7	96	217	212	165	96	102	102	226	212	167
6	0						79	167	186	159	129
	8.4						86	186	226	182	138

Plasma protein determinations were done by the method of Andersch and Gibson[9] on blood drawn from 4 dogs before acacia injections were made and again several days after the last injection. In general, our results confirm the results of Dick, Warweg and Andersch.[8] The total plasma protein with 4 dogs before and after

[5] Bollman, J. L., and Mann, F. C., *Ann. Int. Med.*, 1935, **9**, 617.

[6] Snell, A. M., *Proc. Staff Meet. Mayo Clin.*, 1935, **10**, 489.

[7] Myers, W. K., and Keefer, C. S., *Arch. Int. Med.*, 1935, **55**, 349.

[8] Dick, W. M., Warweg, E., and Andersch, M. A., *J. Am. Med. Assn.*, 1935, **105**, 654.

[9] Andersch, M., and Gibson, R. B., *J. Lab. and Clin. Med.*, 1933, **18**, 816.

the series of acacia injections was as follows: dog 2, 4.98% and 4.54%; dog 4, 5.67% and 4.93%; dog 5, 4.70% and 2.86%, and dog 6, control lost and 4.20%.

It has been repeatedly demonstrated that blood fibrinogen comes from the liver.[6] The markedly delayed clotting of the blood and fragile fibrous appearance of the clot which is formed seems to indicate that the deposition of acacia in the liver markedly affects factors in the clotting mechanism which have their origin in that organ. The average fibrinogen values for the blood from 4 dogs, drawn several days after the last acacia injection was 0.16% as compared to 0.37% before injection.

The results of this investigation indicate that the deposition of acacia in the livers of dogs produces impairment of liver function in carbohydrate and plasma protein metabolism.

9735

The Tonotropic Action of Acetylcholine on the Auricle of the Terrapin, (*Pseudemys elegans*).

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Tonic oscillations of the auricular musculature in certain species of terrapins is a well established fact.[1] This tonicity apparently depends upon the presence of auricular smooth muscle[2] since tonus is not found in the auricles of species which do not contain it. Tone is increased by pituitrin, histamine, nicotine, potassium chloride and barium chloride and depressed or abolished by epinephrine and tyramine.[4, 5] Tonus is generally believed to be increased by stimulation of the vagus.[1, 6] Recently, however, it has been reported that the tonus mechanism is not innervated by parasympathetic motor nerves since it is not influenced by physostigmine or atropine.[7]

Therefore, for a more complete understanding of this mechanism, it seemed necessary to know the action of acetylcholine on tonus.

1 Fano and Fayod, *Arch. Ital. de Biol.*, 1888, **9**, 143.

2 Laurens, H., *Anat. Rec.*, 1913, **7**, 273.

3 Chu, Hung-pih, *Chinese J. Physiol.*, 1930, **4**, 263.

4 Gruber, C. M., and Markel, C., *J. Pharm. and Exp. Therap.*, 1919, **12**, 435.

5 Gruber, C. M., *J. Pharm. and Exp. Therap.*, 1921, **16**, 405; PROC. SOC. EXP. BIOL. AND MED., 1926-27, **24**, 92.

6 Botazzi, P., *Arch. Ital. de Biol.*, 1900, **24**, 17.

7 Greene, C. W., and Maneval, K. E., *J. Pharm.*, 1932, **46**, 303