significant quantitative differences in the cited tests shows that the so-called "antiprothrombic" effect of heparin is not to be interpreted as an alteration of the prothrombin itself, but rather as a manifestation of antagonisms between the heparin and the thromboplastic factors. There is an experimental difference between the simple addition of cephalin and its enzymic mobilization from protein-phospholipid combinations.

The results of all clotting experiments must be evaluated with reference to (1) quantitative relationships between the various factors, (2) the question of cephalin mobilization, and (3) time factors involved in thrombin formation, the thrombin-fibrinogen interaction, and in the overcoming of the inhibitory mechanisms. It is significant that thromboplastic enzyme has demonstrable powers of overcoming the "antiprothrombic" inhibitory mechanisms. The "antithrombic" action of heparin-albumin mixtures is immediately evident and is not dependent upon the type of thromboplastic agent used in the preparation of the thrombin.

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The Sugar Tolerance of Alcoholic Patients.

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In previous publications from these laboratories[1, 2] we have reported studies on the effect of glucose on the oxidation of alcohol. We found that the oxidation of alcohol *in vitro* was accelerated when glucose was simultaneously oxidized.[1] Studies on the effect of glucose on the oxidation of alcohol in man revealed that there was a moderate increase after glucose administration, and a more marked increase after glucose and insulin.[2] It is well known that alcoholic patients eat very little while on a drinking debauch, and it was suggested that the difference between the effect of the glucose and the glucose plus insulin might be due to an impaired ability of the patients to oxidize the added glucose without insulin because of their previous low carbohydrate intake.

1 Goldfarb, W., and Bowman, K. M., PROC. SOC. EXP. BIOL. AND MED., 1938, **39**, 471.

2 Goldfarb, W., Bowman, K. M., and Parker, S., *Am. J. Physiol.* (Proc.), 1939.

It is well known that undernutrition and a lowered carbohydrate intake diminishes the ability of the organism to oxidize glucose. Chambers[3] has recently reviewed the literature on the effect of undernutrition and has shown that it results in an impaired tolerance to glucose. We have attempted to estimate this impairment of carbohydrate tolerance in alcoholic patients by observations of the sugar tolerance curves.

Patients were chosen from among those admitted between 4 P. M. and midnight to eliminate the effect of any changes in the dietary. The first tolerance test was performed the next morning before breakfast, and was repeated again one week later after the patients had been maintained on a routine hospital diet. In 9 cases the tolerance was tested with a single dose of 50 g of glucose by mouth, and in the remaining 9 cases we used the 2-dose test with 20 and 40 g of glucose described by Jolliffe.[4]

Results. The blood sugar curves obtained with the 2-dose test are presented in Table I. The average curve of the 9 patients on admission showed an increased blood sugar after the 20 g dose of 42 mg %, and the 40 g dose of glucose caused a further rise of 38 mg %. The 2½-hour specimen was higher than the fasting specimen. The average blood sugar curve obtained after one week in the hospital approached the response of normal patients. The response to the 20 g dose was 15 mg %, and the blood sugar curve following the 40 g dose was only 14 mg % higher than the ½-hour specimen. For comparison the average blood sugar curve of 10 normal subjects observed by Jolliffe is appended. In each of the individual cases there was an improved tolerance after the hospital stay.

In a similar fashion the average tolerance curve of 9 patients tested with 50 g of glucose was improved after one week in the hospital. In 7 of these cases (10, 11, 13, 14, 16, 17, 18) tolerance was improved. Patient No. 12 showed a questionable change, while patient 15 had a definitely diminished tolerance.

In 16 of the 18 patients examined there was an increase in the sugar tolerance after one week in the hospital. The improvement may be attributed to either or both of the following reasons: (1) the patient became acclimated to the surroundings and was calmer emotionally; or (2) an improved dietary regime may correct the effects of undernutrition in the patient. There have been a number of conflicting reports in the literature on the rôle of the emotional

[3] Chambers, W. H., *Phys. Rev.*, 1938, **18**, 248.

[4] Jolliffe, N., *J. Clin. Invest.*, 1930, **9**, 363.

TABLE I.

Glucose Tolerance Tests with 20 g of Glucose *per os*, followed with 40 g after ½ hr (Jolliffe).

	Test on admission						Test after 1 week in hospital					
Patient	Fasting	½ hr	1 hr	1.5 hr	2 hr	2.5 hr	Fasting	½ hr	1 hr	1.5 hr	2 hr	2.5 hr
1	103	149	167	121	129	140	91	104	116	111	83	55
2	103	130	154	160	136	120	79	111	146	97	—	53
3	123	222	222	196	118	100	101	118	108	97	98	98
4	80	89	109	166	119	109	85	95	90	86	76	81
5	88	116	131	113	109	100	74	99	84	74	70	70
6	98	128	217	160	120	91	100	115	169	147	124	96
7	75	152	189	233	164	143	108	116	154	136	104	71
8	78	111	172	139	100	77	112	119	138	125	105	99
9	105	139	227	250	179	128	91	111	117	109	101	89
Avg	95	137	175	171	130	112	93	110	124	109	95	79
Age of 10 normal cases (Jolliffe)							90	102	100	95	87	80

TABLE II.

Glucose Tolerance Tests with 50 g of Glucose *per os*.

	Test on admission					Test after 1 week in hospital				
Patient	Fasting	½ hr	1 hr	2 hr	3 hr	Fasting	½ hr	1 hr	2 hr	3 hr
10	83	218	234	93	75	97	166	165	133	64
11	104	192	234	200	180	77	156	133	131	92
12	100	250	133	80	75	100	190	178	140	105
13	97	158	186	75	80	75	146	74	70	77
14	135	206	208	190	156	88	143	135	91	—
15	80	143	168	75	—	96	181	217	100	—
16	77	127	138	147	136	98	127	140	100	79
17	96	110	196	126	120	84	115	130	91	87
18	129	185	189	146	129	107	137	101	81	80
Avg	100	177	187	126	106	91	151	141	104	82

effect on the sugar tolerance curve. Schwab[5] and Jacobi and Koritter[6] studied neurotic patients in various emotional moods and found normal sugar tolerance curves. Mann,[7] Craig,[8] and Katzenelenbogen, *et al.*,[9] observed a delayed curve in a large percentage of neurotic patients. Diethelm[10] found that acute emotion caused a sharp rise of the tolerance curve, with a rapid fall, and the peak of the curve was roughly proportional to the intensity of the emotion. Henry and Mangam[11] found a diminished tolerance to glucose in psychotic patients during a depressive phase of activity, while during the excited phase of the psychosis the tolerance was increased. None of the patients we tested were depressed on admission, while the majority were tremulous and tended to be excited. The symptoms of excitement were absent when the patients were reëxamined one week later. It is difficult to evaluate the effect of the emotional effect in these patients, but it seems probable that the tolerance on admission was diminished despite the tendency to excitement.

It is generally agreed, however, that undernutrition results in a diminution of the sugar tolerance. This diminution has been observed both clinically and experimentally, and the extensive literature has been admirably reviewed by Chambers.[3] The dietary regime of alcoholic patients has frequently been described as inadequate both in quantity and quality, and it is suggested that the diminished glucose tolerance observed in these patients is largely due to the dietary deficiency. This contention is supported by the fact that adequate diet for one week resulted in a more normal sugar tolerance curve.

Summary and Conclusions. The sugar tolerance was studied in a group of 18 alcoholic patients. On admission there was a marked diminution of the sugar tolerance, which improved after one week in the hospital on a normal diet. It is suggested that the diminished tolerance was due to an undernourished state previous to admission.

5 Schwab, S. I., *Arch. Neurol. Psych.*, 1922, **8**, 401.

6 Jacobi, J., and Koritter, H., *Psychiat. Neurol. Wchnschr.*, 1923, **34**, 1.

7 Mann, S. A., *J. Mental Sc.*, 1925, **71**, 443.

8 Craig, R. N., *Lancet*, 1927, **1**, 925.

9 Katzenelenbogen, S., and Friedman-Buchman, E., *Am. J. Psych.*, 1933, **13**, 321.

10 Diethelm, O., *Arch. Neur. Psych.*, 1936, **36**, 342.

11 Henry, G. W., and Mangam, E., *Arch. Neurol. Psych.*, 1925, **13**, 743.