The animals were then sacrificed and 500 mgm of the excised liver tissue were suspended in 6 cc of saline phosphate pH 7.4 contained in glass-stoppered 125 cc Erlenmeyer flasks. Both the experimental flasks and control flasks containing killed tissue had identical quantities of alcohol approximating 2.5 mgm. All flasks were filled with oxygen and incubated for 3 hours at 37° C. with continuous agitation. After $ZnSO_4$ precipitation, the entire contents of the flask were subjected to steam distillation, and the alcohol in the distillate determined by Harger's method.[4]

Under the experimental conditions outlined, 19 observations on 8 cats disclosed that an average of 23.5 per cent. of the alcohol present was oxidized by normal cat liver tissue in 3 hours; individual experiments ranged from 16 to 39 per cent.

In marked contrast, 17 observations on liver tissue from 7 diabetic cats depancreatized for 72 to 96 hours revealed an average oxidation of only 3.1 per cent. with a range from −0.5 to 6.2 per cent. Since the maximal limit of error for the measurement of the alcohol under the conditions employed is 4 per cent., it seems probable that only very small amounts of alcohol were oxidized. The completeness of the diabetes was indicated by respiratory quotients slightly below 0.70 for excised kidney tissue from these animals.

Liver tissue from one cat depancreatized, but maintained on adequate insulin for 90 hours after pancreatectomy, revealed an oxidation of 36 per cent. This further indicates that insulin is the specific factor concerned.

Additional evidence was obtained in two experiments on animals that had been depancreatized 72 hours previously. A lobe of liver was removed under anesthesia, and then immediately afterward, 20 units of insulin were given to one cat and 14 units to the other. Approximately five hours later, the animals were sacrificed and another portion of liver tissue removed. The ability of the liver tissue from the same animal, with and without insulin, to oxidize alcohol was then compared. With the diabetic tissue there was practically no oxidation (+0.3 and −0.56 per cent.), but after the administration of insulin 29.4 and 27.5 per cent. of the alcohol present was oxidized.

While the oxidation of alcohol by normal cat brain is relatively small, preliminary experiments have suggested that oxidation by diabetic brain tissue is still less. We are now studying the effect of experimental diabetes on alcohol oxidation by the intact animal.

These experiments indicate that insulin is necessary for the oxidation of ethyl alcohol by cat liver tissue. It is not yet evident whether insulin acts specifically on the alcohol oxidation system or indirectly through carbohydrate metabolism. In a complete report to be published later, data concerning the mechanism of this action will be discussed.

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[4] R. N. Harger, *Jour. Lab. and Clin. Med.*, 20: 746, 1935.

VITAMIN E AND AVIAN NEUROLYMPHOMATOSIS

BUTLER and Warren[1] have reported that vitamin E, supplied by injection or feeding of cold-pressed wheat germ oil, resulted in quick recovery from a paralysis which they indicated to be *neurolymphomatosis gallinarum*. They also claimed that adding wheat germ oil to the diet reduced the incidence of related diseases. Their statements are not supported by any definite figures, although their study "involved about 1,000 paralyzed birds."

Those who come in contact with the industry recognize the seriousness of avian neurolymphomatosis and the allied neoplastic conditions. Such methods of reducing mortality to the extent claimed by Butler and Warren would be well worth the expense of the added wheat germ oil.

The writer has investigated the curative effect of wheat germ oil in a study of 41 fowls showing clinical symptoms of fowl paralysis from the research flocks of this department. Ten of these birds were treated by intraperitoneal injection, 21 by feeding, and 10 birds served as non-treated controls. The source of vitamin E consisted of two lots of cold-pressed wheat germ oil, one of which had been lecithinized to reduce rancidity. These birds were, for the most part, White Leghorns of from 9 to 12 months of age. The procedure included recording (1) the symptoms and date of entry to the test and (2) gross lesions found during a complete routine autopsy. All hens were kept in flat-bottom battery cages with food and water easily accessible. They were not removed for autopsy until extremely emaciated or completely paralyzed for more than one day. The duration of the tests varied from 3 days, in extreme cases, to more than three months in less severe cases.

Ten fowls received wheat germ oil injected intraperitoneally, 1 cc per day, later reduced to 0.5 cc per day. Three of these received a total of 2 cc per bird, 3 got 3 cc each, 2 got 4 cc each, and the other two received 8 cc each of the wheat germ oil. Eight of these 10 birds showed at autopsy gross lesions of neurolymphomatosis involving the sciatic, brachial or

[1] W. J. Butler and D. M. Warren, *Jour. Amer. Vet. Med. Assoc.*, 92 (N. S. 45): 204–206, 1938.

abdominal nerves. The symptoms noted for one bird were "injury or paralysis of the right leg." This one improved and was returned to the laying pen. She was probably injured rather than paralyzed. Another fowl showed symptoms of unsteadiness on legs and jerking head movements. This bird apparently recovered, but one of the controls showing similar symptoms recovered without any treatment and hatched 33 out of 34 eggs in the past breeding season.

Twenty-one hens were fed wheat germ oil, 14 receiving 6 cc or more, and of these fourteen, 8 received 14 cc or more. Of the 21 birds 14 showed at autopsy gross lesions of neurolymphomatosis, one showed lymphomatosis of the liver, another showed tumors of the feet, comb and internal organs. Two others, with typical symptoms, were negative. Of two birds with uncoordinated head movements, one improved and laid 29 eggs in the next 50 days. The other is still affected, showing no improvement.

Of the 10 controls 7 showed gross lesions of neurolymphomatosis on autopsy, one showed lymphomatosis of the liver and ovary, and one which had shown only uncoordinated head movements as symptoms was negative. One bird returned to laying condition for a brief period but eventually died. This hen never regained control of its paralyzed right leg. One bird (mentioned above) recovered completely.

Fowls showing uncoordinated head movements, twisting of neck to one side or over the back, generally eventually die of inanition. In some cases gross and microscopic lesions of neurolymphomatosis have been observed in the eighth or ninth cranial nerves of these birds. In other cases it is doubtful if the condition actually represents true neurolymphomatosis.

The evidence presented, involving 31 paralyzed fowls treated with cold-pressed wheat germ oil in amounts similar to or greater than those suggested by Butler and Warren, does not support their contention that vitamin E or wheat germ oil can bring about quick recovery from true *neurolymphomatosis gallinarum*.

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A PARADOX IN THE SCORING OF COMPETING TEAMS

LET us suppose that a number of teams of three men each are competing in an academic contest and that the best three teams are to be selected on the basis of a special examination. How shall the merits of the several teams be computed?

Two possible methods of scoring suggest themselves: (1) we may list all the contestants in order of rank, and define the rank of each team as the sum of the ranks of its members; or (2) we may consider only the actual examination-grade of each contestant, and define the score of each team as the sum of the scores of its members. The first method we may call the rank method, the second the sum-of-the-grades method.

The rank method is regularly used in scoring intercollegiate cross-country runs. It should be noted, however, that the situation in the case of the cross-country run is not the same as the situation in the case of the academic examination. In the athletic contest, the order of rank in which the men cross the finishing line supplies the only data available (since the individual times are not usually recorded), while in the academic case we have not only the rank of each contestant but also his actual examination-grade, on the basis, say, of 100. The sum-of-the-grades method is used in the popular frog-jumping contests. Here the score for each "team of three" (consisting, to be sure, of three jumps of a single frog) is computed by adding the lengths of the individual jumps recorded for that team.

In many practical cases it will make no difference which method is used. Nevertheless, the question has a certain theoretical interest which seems to be worth discussing.

The purpose of the present paper is to show that

TABLE I

I			II			III			IV			V			VI		
B_1	98	1	B_1	98	1	B_1	98	1	B_1	98	1	B_1	98	1	B_1	98	1
						D_1	97	2	D_1	97	2						
A_1	96	2	A_1	96	2	A_1	96	3	A_1	96	3	A_1	96	2	A_1	96	2
D_1	94	3				D_2	94	4									
C_1	93	4	C_1	93	3	C_1	93	5	C_1	93	4	C_1	93	3	C_1	93	3
A_2	92	5	A_2	92	4	A_2	92	6	A_2	92	5	A_2	92	4	A_2	92	4
D_2	91	6	D_1	91	5												
C_2	89	7	C_2	89	6	C_2	89	7	C_2	89	6	C_2	89	5	C_2	89	5
			D_2	88	7							D_1	88	6			
B_2	87	8	B_2	87	8	B_2	87	8	B_2	87	7	B_2	87	7	B_2	87	6
C_3	84	9	C_3	84	9	C_3	84	9	C_3	84	8	C_2	84	8	C_3	84	7
												D_2	83	9	D_1	83	8
B_3	82	10	B_3	82	10	B_3	82	10	B_3	82	9	B_3	82	10	B_3	82	9
									D_2	81	10				D_2	81	10
A_3	80	11	A_3	80	11	A_3	80	11	A_3	80	11	A_3	80	11	A_3	80	11
D_3	79	12	D_3	79	12	D_3	79	12	D_3	79	12	D_3	79	12	D_3	79	12
A	18		A	17		B	19		B	17		C	16		C	15	
B	19		C	18		A	20		C	18		A	17		B	16	
C	20		B	19		C	21		A	19		B	18		A	17	