periments that burns abet the ulcer diathesis; that is, ulcers are provoked more readily and quickly with histamine in the presence of gastrointestinal congestion resulting from experimental burns. The evidence of gastric and/or duodenal ulceration in animals subjected to experimental burns depends upon the type, degree, extent, therapy, and period of observation of the burn. The incidence of ulcers in untreated dogs subjected to burns alone in this study was 2 of 11 dogs, or 18.2%; 7 of the 11 dogs died or were sacrificed within 5 days; the 2 dogs developing ulcers died on the 6th and 9th day. It is possible that, if the survival time in these animals were prolonged, the incidence of spontaneous ulceration in dogs with burn alone would be greater. Of the 14 dogs subjected to burning in addition to histamine administration, all showed erosion or ulcer within 5 days. Twelve of the 14 presented definitive ulcers, 8 of which were actively bleeding.

Conclusions. 1. Experimental burns, when accompanied by administration of histamine-in-beeswax mixture, produce gastric and/or duodenal ulceration in which the incidence of hemorrhage is high. 2. Experimental burns abet the ulcer diathesis.

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Morphologic Effect of Desoxycorticosterone Acetate on the Thymus.*

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A reciprocal relationship between adrenal and thymus size has been discussed by several investigators.[1-6] Adrenal enlargement caused by nonspecific damage,[3] by adrenocorticotrophin[7-11] or treatment with corticoids[12-15] is accompanied by thymus atrophy. In the absence of the adrenals, however, neither damage nor adrenocorticotrophin produce this effect.[12]

Wells and Kendall[15] claimed that though several glucocorticoids, such as dehydrocorticosterone, corticosterone and Kendall's compound "E," produce this response, desoxycorticosterone and its acetate (D.C.A.) do not at the doses of 10 mg every 3rd day for 9 days. This latter finding is in disagreement with that of Selye[16] and Selye

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1 Hammett, F. S., *J. Metabolic Res.*, 1925, **78**, 91.

2 Anderson, D. H., *J. Physiol.*, 1935, **85**, 162.

3 Selye, H., *Endocrinology*, 1937, **21**, 169.

4 Dohán, F. C., PROC. SOC. EXP. BIOL. AND MED., 1942, **49**, 404.

5 Ingle, D. J., PROC. SOC. EXP. BIOL. AND MED., 1938, **38**, 443; 1940, **44**, 174.

6 Kendall, E. C., *Ann. Rev. Biochem.*, 1941, **10**, 285.

7 Cramer, W., and Horning, E. S., *Lancet*, 1939, **1**, 192.

8 Moon, H. D., PROC. SOC. EXP. BIOL. AND MED., 1940, **43**, 42.

9 Noble, R. L., and Collip, J. B., *Endocrinology*, 1941, **29**, 234.

10 Houssay, B. A., *J. Am. Med. Assn.*, 1942, **118**, 833.

11 Dougherty, T. F., and White, A., PROC. SOC. EXP. BIOL. AND MED., 1943, **53**, 132.

12 Selye, H., *Brit. J. Exp. Path.*, 1936, **17**, 234.

13 Carriere, G., Morel, J., and Ginesti, P. J., *C. R. Biol. Paris*, 1937, **126**, 46.

14 Ingle, D. J., *Endocrinology*, 1939, **24**, 194.

15 Wells, B. B., and Kendall, E. C., *Proc. Staff Meet. Mayo Clinic*, 1940, **15**, 133.

16 Selye, H., *Canad. Med. Assn. J.*, 1940, **42**, 113.

17 Selye, H., and Albert, S., *Am. J. Med. Sci.*, 1942, **204**, 876.

TABLE I.
Effect of D.C.A. on Thymus, Iliac Lymph Nodes, Uterus and Body Weight.

Group	No. of animals	Body wt, g		Thymus wt, mg	Iliac lymph nodes wt, mg	Uterus wt, mg
		Initial	Final			
Cortical extract	9	76	75	198 ± 10.3*	13 ± 0.5	111 ± 8.9
D.C.A.	8	74	76	132 ± 7.5	13 ± 1	97 ± 7.8
Control	7	73	70	251 ± 14.3	12 ± 0.7	36 ± 3.4

* Means and standard errors.

TABLE II.
Effect of D.C.A. on Thymus, Iliac Lymph Nodes, Uterus, and Body Weight.

Group	No. of animals	Body wt, g		Thymus wt, mg	Iliac lymph nodes wt, mg	Uterus wt, mg
		Initial	Final			
Control extract	11	82	95	146 ± 9.8	15 ± 1	68 ± 4.7
D.C.A.	7	85	98	80 ± 5.8	19 ± 1.5	89 ± 12.7
Control	8	84	86	220 ± 16	18 ± 1.2	55 ± 5.4
Absolute control	10	81	99	179 ± 15	15 ± 0.9	53 ± 8.2

and Albert[17] who obtained marked thymic atrophy in normal male rats when sufficiently high doses of D.C.A. (10 mg daily for 14 days) were administered.

It is possible that in the experiments of Selye the high doses were damaging and so indirectly produced thymic atrophy through the animal's own adrenals. In order to clarify this problem an investigation has been performed concerning the effect of D.C.A. on the thymus of adrenalectomized rats, in which nonspecific damage could not be operative.

Experimental. Two series of experiments were performed. In the first, 30 female albino rats weighing 65 to 80 g were employed. All were adrenalectomized and maintained on 1% NaCl instead of drinking water. Treatment was begun 24 hours postoperatively. The animals were divided into 3 equal groups. The first group received 1 cc of cortical extract (Connaught Laboratories, Toronto) divided into 2 daily subcutaneous injections. The second group was injected with 10 mg of D.C.A. suspended in 0.4 cc of water in 2 daily subcutaneous injections. The third group received 10 mg of cholesterol in the same manner as the D.C.A. group and served as controls. During the first 2 days of treatment a few animals, which did not appear to be entirely healthy, were sacrificed. At the end of 5 days treatment all remaining animals were killed with chloroform and bled. The thymus, iliac lymph nodes and uterus were fixed in "Suza" then dissected and weighed. The results are summarized in Table I which indicates that while the thymus weights in the animals of the 2 treated groups were markedly reduced, no change was seen in the weights of the lymph nodes. The uterus on the other hand was stimulated both by cortin and by D.C.A.

In order to confirm these observations a second experiment was performed. The procedure was the same as that employed above, except that the duration of treatment was 6 instead of 5 days and all doses were doubled. The additional D.C.A. and cholesterol were administered intraperitoneally. A fourth intact control group was also added.

Table II summarizes the results of this experiment and indicates that here again, in the corticoid-treated groups, the thymus and the uterus are influenced in the same manner as they were in the first series.

Microscopically the structure of the thymus was characterized by a marked diminution of thymocytes with some proliferation of the stroma in both corticoid-treated groups, especially in that receiving D.C.A. In the same groups the uterus and vagina revealed histologic signs of stimulation, similar to that obtained by a mixture of folliculoid and luteoid substances.

Discussion. The above experiments show that short-term treatment with large doses of D.C.A. causes thymus atrophy. The fact that entirely negative results have been obtained by other investigators[15,18,19] can probably be explained by the relatively small doses of D.C.A. employed. On the other hand the length of the treatment is also important since Selye[20] has shown that continued treatment with D.C.A. not only fails to cause atrophy but increases the size of the thymus.

It must be remembered that thymus atrophy is elicited not only by corticoids. Selye[21] has shown that in chronically-treated rats all steroid hormones cause a certain degree of atrophy in this gland and that all hormonally active steroids have some folliculoid activity. Furthermore this author[22] claimed that in adrenalectomized animals the only hormones which are able to cause thymus involution are the corticoids and the folliculoids.

It has not been proven yet, whether or not the antithymic action of D.C.A. is due to its folliculoid property. This possibility should not be neglected. In this regard it will be interesting to determine whether folliculoids influence the thymus and the lymphatic organs in the same manner as do the glucocorticoids, namely whether they cause lymphocyte breakdown and release of gamma globulins which are not influenced by D.C.A.[23,24] in the doses employed.

Summary. In short-term experiments, large doses of desoxycorticosterone acetate cause marked thymus atrophy. Thus it appears that this effect is not the exclusive characteristic of the glucocorticoids and furthermore that the nonspecific damage of D.C.A. has not been operative since the result was obtained in adrenalectomized rats.

18 White, A., and Dougherty, T. F., PROC. SOC. EXP. BIOL. AND MED., 1944, **56**, 26.

19 Carnes, W. H., Ragan, C., Ferrebee, J. W., and O'Neil, J., *Endocrinology*, 1941, **29**, 144.

20 Selye, H., *J. Anat.*, 1941, **76**, 94.

21 Selye, H., *Rev. Canad. Biol.*, 1942, **1**, 577.

22 Selye, H., Harlow, C., and Collip, J. B., *Endokrinologie*, 1936, **18**, 81.

23 Dougherty, T. F., and White, A., *Endocrinology*, 1944, **35**, 1.

24 White, A., and Dougherty, T. F., *Endocrinology*, 1945, **36**, 207.

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Prolongation of Consciousness in Anoxia of High Altitude by Glucose.*

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Dietary factors relating to anoxia tolerance in the human have been put to test recently in the investigations of King *et al.*,[1] Green *et al.*,[2] and Eckman *et al.*[3] These workers have been concerned with the effects of diet on visual, psychomotor, and mental performance in persons exposed to intermediate degrees of oxygen deprivation such as occur at altitudes of 15,000 to 17,000 feet. The comparisons made show the contrasting effects of meals varying with re-

* The views expressed in this paper do not necessarily reflect those of the Army Air Forces. The experimental work was done in the Altitude Training Section at Drew Field, Fla.

1 King, C. G., Bickerman, H. A., Bouvet, W., Harrer, C. J., Oyler, J. R., and Seitz, C. P., *J. Av. Med.*, 1945, **16**, 69; King, C. G., Bouvet, W., Crook, M. N., Harrer, C. J., Oyler, J. R., and Schwimmer, D., *Science*, 1945, **102**, 36.

2 Green, D. M., Butts, J. S., and Mulholland, H. F., *J. Av. Med.*, 1945, **16**, 311.

3 Eckman, M., Barach, B., Fox, C. A., Rumsey, C. C., and Barach, A. L., *J. Av. Med.*, 1945, **16**, 328.