Influence of Circulating Adrenocorticotrophin on the Pituitary Adrenocorticotrophic Response to Stress in the Adrenalectomized Rat

REMOVAL of the adrenal glands results in a rise in the level of adrenocorticotrophic hormone in the blood of the rat. Cox and Hodges[1] reported that this increase did not occur until two weeks after adrenalectomy and that, after three to five weeks, there existed a remarkably high concentration of circulating hormone. These results were not inconsistent with the findings of Fortier[2], who showed that adrenalectomy caused a marked increase in the pituitary content of adrenocorticotrophic hormone after a similar time-lapse. It appears that there is an interval of at least two weeks before the rat pituitary gland adapts itself to secrete and maintain this enormously increased output of adrenocorticotrophic hormone in response to the absence of circulating corticoids. Therefore, it was of interest to compare the response to stress in adrenalectomized rats with low blood levels of corticotrophin with that in adrenalectomized animals with high blood levels of the hormone.

Adrenalectomized female Wistar rats were subjected to the stress of ether anæsthesia for 2½ min. at various times after the removal of their adrenal glands. The animals were decapitated, blood was collected from their trunks, injected intravenously into assay rats treated with hydrocortisone and its ability to produce depletion of adrenal ascorbic acid (which is a measure of its adrenocorticotrophic hormone content) determined, as described by Cox, Hodges and Vernikos[3]. The results were compared with those obtained using control adrenalectomized rats which were bled without being subjected to any previous stress. The results are summarized in Table 1.

It may be seen from Table 1 that exposure to ether vapour results in a marked increase in the circulating level of adrenocorticotrophin in the adrenalectomized rat. Furthermore, in contrast to the resting-level, the blood concentration of adrenocorticotrophic hormone after stress is independent of the time-lapse after adrenalectomy. The greatest increases occurred in the rats with the lowest initial levels of the hormone.

These results cannot be explained on the basis that the stores of corticotrophin in the pituitary gland become progressively exhausted after adrenalectomy, since several workers[2,4,5] have shown that removal of the adrenal glands results in a marked increase in the pituitary corticotrophin content. It appears more likely that the secretion of adrenocorticotrophin may be suppressed by a pre-existing high level of the hormone in the blood. The existence of such an 'auto feed-back' mechanism was also suggested by Kitay, Holub and Jailer[6], who found that the administration of exogenous corticotrophin to adrenalectomized rats prevented the usual fall in pituitary corticotrophin induced by stress. Thus, it appears that the circulating level of adrenocorticotrophic hormone may be yet another factor which may influence its release from the adenohypophysis.

Table 1. ADRENAL ASCORBIC ACID DEPLETIONS IN RATS TREATED WITH HYDROCORTISONE AFTER INTRAVENOUS INJECTIONS OF BLOOD FROM STRESSED AND NON-STRESSED ADRENALECTOMIZED RATS (3 ML./100 GM. BODY-WEIGHT)

Adrenal ascorbic acid level in saline-injected controls was 500 ± 10 mgm./100 gm. The figures in brackets indicate the number of animals injected

Time interval after adrenalectomy (days)	Mean ascorbic acid depletion (mgm./100 gm. adrenal tissue ± standard error)	
	Non-stressed	Stressed (ether 2½ min.)
5	−8 ± 13 (6)	126 ± 6 (12)
10	34 ± 8 (6)	146 ± 5 (12)
25	79 ± 8 (42)	139 ± 7 (6)
35	72 ± 12 (6)	155 ± 8 (6)

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Effect of some Lytic Agents on *Aerobacter aerogenes*

IN the course of a study of the surface structures of *Aerobacter aerogenes* the action of lysozyme has been investigated. Preliminary experiments indicated that the enzyme produced no observable changes in the optical density of cell suspensions. In an attempt to promote enzymic attack the conditions were varied by altering the concentration of lysozyme, the time and temperature of incubation, the origin and age of the bacteria, and the *p*H of the suspensions. Cells were also incubated with lysozyme and various concentrations of sodium chloride, magnesium chloride, versene[1] and *tris*-buffer[2]. No lysis which could be attributed to the action of lysozyme was observed under any of these conditions. Microscopic studies showed the appearance, in solutions containing 20 per cent sucrose, of spherical bodies, which were probably similar to the protoplasts obtained by Weibull[3] from *B. megatherium*. These, however, did not constitute more than 1 per cent of the cell population, except in one case, when bacteria incubated overnight with a 2 per cent solution of lipase were subjected to the action of lysozyme in 20 per cent sucrose. About 5 per cent conversion to spheres was observed. In a test for the presence of lysozyme substrate in the cell walls of *Aerobacter aerogenes*, washed cells were suspended in saline at *p*H 3·6 and incubated for 1 hr. at 40° C. with 200 μgm./ml. of lysozyme[4]. The optical densities of the suspensions were measured before and after incubation. The *p*H was adjusted to 10·0 by the addition of sodium hydroxide and the optical density measured immediately. A comparison with the results of a similar experiment in the absence of the enzyme showed that there was some lysis due to lysozyme. The specific substrate is thus present in the cell walls of the organism, but it is doubtful whether the amount available to the enzyme is sufficient to permit extensive lysis.

Lederberg[5] described the preparation of protoplasts from cells of *Escherichia coli* by allowing them to divide