ADRENALINE, EOSINOPHIL CELLS AND LUMINAL

By

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The so-called second Thorn test, as developed by Recant et al. (1950), is rarely used to-day as a test of adrenocortical function. It has been discarded since clinical investigations have shown that administration of adrenaline does not cause any increase in the urinary 17-ketosteroid excretion (Jeffries et al., 1952; Wolfson, 1953; Elmadjian et al., 1955), in the corticosteroid excretion (Lahhart & Spengler, 1953; Sandberg et al., 1953; Thorn et al., 1953), or in the blood corticosteroid level (Lahhart & Spengler, 1953; Ely et al., 1954; Nelson, 1953; Sandberg et al., 1953; Spengler, 1953; Hunter et al., 1955). It was also found that after the administration of adrenaline, eosinopenia may occur despite the presence of an insufficient adrenal cortex (Recant et al., 1950; de Fossey & Deltour, 1950; Jordan, 1951; Ruppel & Hitzelberger, 1951). In order to produce an eosinopenia by the administration of adrenaline to adrenalectomized patients the presence of corticosteroids is required (Best et al., 1952; Muehrcke et al., 1952). The corticosteroids would thus seem to play a definite role, whereas the presence of an intact adrenal cortex seems to be of no significance in adrenaline induced eosinopenia.

Experiments in mice have shown that adrenaline has an inhibitory effect on the adrenal cortex (Verschoof, 1957 a and b). Although no such inhibition has hitherto been demonstrated in human subjects it is none the less likely – in view of the abovementioned data from the literature – that the eosinopenia observed after the administration of adrenaline may not be correlated with some functional condition of the hypophyseo-adrenal system.

The question arises as to whether the eosinopenia caused by adrenaline develops exclusively by peripheral routes. The literature comprises reports on animal experiments which tend to suggest an influence exerted by the hypothalamus on adrenaline-induced eosinopenia. Hypothalamic lesions are capable of neutralizing the decrease in circulating eosinophils caused by adrenaline
Electrical stimulation of certain hypothalamic areas, moreover, can give rise to eosinopenia (Hume, 1952; Anand & Dua, 1955). In man, too, the reaction of the circulating eosinophils to the administration of adrenaline is frequently disturbed if there are lesions in the thalamic and the postero-lateral hypothalamic regions (Perloff et al., 1952). The investigation described in this paper was made in order to bring about an inhibition of the reaction of the eosinophils to adrenaline by hypothalamic inhibition induced by means of drugs.

**MATERIAL AND METHODS**

The effect of luminal on the Thorn test II was investigated. Although the specific effect of barbiturates on the hypothalamus has by no means been established with certainty, there are data from the literature which tend to indicate such an effect (bibliography given by Schwarz, 1955).

Patients in whom the intravenous corticotrophin test had normal results were given 0.3 mg. adrenaline subcutaneously. The eosinophils were counted after 0, 1, 2, 3 and 4 hours. During blood sampling the patients rested in bed. Counts were made every hour as the maximal decrease is known to occur sometimes within four hours (Stolte & Bakker, 1953; Swanson et al., 1952). If the test had approximately normal results, then this was repeated in the same manner in the same patient one hour after intramuscular administration of 100 mg. luminal. The maximal decreases were then compared.

After the administration of luminal only, the number of circulating eosinophils does not change much, as shown in 3 patients: there was a slight rise in one patient, a slight fall in another patient and no change in the third.

**RESULTS**

The results are shown in Table 1 and Fig. 1. The 19 pairs of observations included 17 instances with a positive, and 2 with a negative difference. Application of the sign criterion (see Rümke, 1953) shows that, at an unreliability

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<th>Table 1. Greatest decrease in circulating eosinophil cells after administration of A. adrenaline. B. adrenaline + luminal.</th>
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* Greatest % decrease, calculated as follows: \[
\left( \frac{\text{maximum-decrease value at 0 hrs.}}{1} \right) \times 100
\]
threshold of 0.01, the critical value for 19 pairs of observations is 3. Our result, therefore, lies within the critical zone associated with an unreliability threshold of 0.01. This tends to support the assumption that luminal has a statistically significant inhibitory effect on the eosinopenia induced by adrenaline. Application of Student’s t-test to the two series of observations shows highly significant differences between the average decreases in the eosinophil count with and without luminal ($t = 3.9; P = 0.001$).

**DISCUSSION**

The abovementioned observations show that luminal causes a statistically significant reduction of the decrease in circulating eosinophil cells following the administration of adrenaline. It is of course possible that the injection of luminal causes a decrease in the circulating eosinophils before the injection
Table 2.
Number of eosinophil cells at 0 hrs. A. without, B. with luminal pretreatment.

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| A | 45 | 138 | 220 | 369 | 84 | 137 | 51 | 148 | 154 | 154 | 94 | 140 | 149 | 120 | 105 | 117 | 176 | 148 | 110 |
| B | 43 | 165 | 165 | 390 | 63 | 137 | 51 | 143 | 214 | 220 | 126 | 117 | 198 | 126 | 166 | 105 | 143 | 154 | 121 |

of adrenaline, and that this may impede the development of the adrenaline-induced eosinopenia. In order to establish this, eosinophil counts made at 0 hours in two series were compared (Table 2). It was found that pre-treatment with luminal caused an increase in eosinophils in 10 cases; in two subjects the count remained unchanged, and in 7 cases there was a decrease. These findings constitute an argument against the hypothesis that pre-treatment with luminal cause a decrease in the eosinophil count.

Thus it has been shown that the adrenaline-induced eosinopenia is not exclusively developed in the peripheral blood but that the central nervous system too exerts a definite influence. Further investigation is required in order to establish whether a specific influence on the hypothalamus is involved here.

SUMMARY

Administration of luminal caused a reduction of the decrease in eosinophils in the peripheral blood following the administration of adrenaline. The central nervous system – and probably the hypothalamus in particular – exerts an influence on the eosinopenia caused by adrenaline.

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REFERENCES


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