Influence of Stress on the Amount of "Gomori-Positive" Granules in the Outer Layer of the Median Eminence of Bilaterally Adrenalectomized Rats *

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With 1 Figure

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Summary

The effect of an experimentally induced stress reaction on the amount of "Gomori-positive" granules, demonstrable in the median eminence of bilaterally adrenalectomized rats was studied. Application of formalin s.c. or histamine i.m. from the 15th to the 17th day p.o., or i.p. injection of Pyrifer® from the 15th to 21st day p.o., with simultaneous administration of 1 % NaCl drinking fluid, has no effect on the amount of granules. On the other hand, the amount of granules diminishes if the animals, during a 3-day treatment with formalin, histamine or Pyrifer®, are given solely tap water to drink.

Water deprivation from the 15th to the 17th day after bilateral adrenalectomy also causes a marked reduction in the amount of granules.

It is assumed that the granules represent the morphological correlate of the corticotropin-releasing factor (CRF). The findings are related to the results of pharmacological studies on the behaviour of the CRF-activity during stress.

Key words: Corticotropin-releasing factor, stress, median eminence, rat, histology.

Introduction

In the outer layer of the median eminence of the rat, light microscopically visible granules occur which are stainable by tech-

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niques related to the method of Gomori (1941). Most distinctly they can be demonstrated with crotonaldehyde fuchsin (Brinkmann and Bock, 1970). Electronmicroscopically they are composed of elementary granules, the diameter of which varies from 600 Å to 1400 Å depending on the experimental conditions (Wittkowski et al., 1970; Wittkowski and Bock, 1972). The amount of granules visible in the light microscope is very small in normal animals. After bilateral adrenalectomy, however, there is a marked increase in their amount (Arko et al., 1963; Bock and aus der Mühlen, 1968; Stöhr, 1969; Schneider et al., 1973). This augmentation can be completely or partially prevented by administration of corticoids, depending on the dose (Bock et al., 1969; Bach and Hennes, 1972; Bock, 1972; Brinkmann and Bock, 1973). The change in the amount of granules after adrenalectomy and corticoid treatment corresponds to results of pharmacological investigations concerning the activity of the corticotropin releasing factor (CRF) under the same experimental conditions (Vernikos-Danellis, 1965; Bock, 1972; Brinkmann and Bock, 1973). For this reason it is assumed that the granules represent the morphological correlate of the CRF (Bock, 1970, 1972; Rinne, 1970, 1972; Ishii, 1972; Wittkowski and Bock, 1972; Akimayev et al., 1973).

The aim of this investigation was to elucidate the effect of stress (cf. Selye, 1950, 1953) on these granules. Stress enhances the activity of the hypothalamo-pituitary-adrenal axis (e.g. Selye, 1936, 1937, 1950, 1953; Fortier and Selye, 1949; De Groot and Harris, 1950; Porter, 1953; Yates et al., 1961; Smelik, 1963; Makara et al., 1970). This involves an increase of CRF production in the medial basal hypothalamus (Vernikos-Danellis, 1964, 1965 a; Halász et al., 1967; Hiroshige et al., 1971) and an increase of CRF secretion (Anderson, 1966), which leads to enhanced production and release of ACTH by the pituitary gland (Sayers and Sayers, 1947; Sydnor and Sayers, 1954; Hodges and Vernikos, 1959; Jacobowitz et al., 1963; Vernikos-Danellis, 1963, 1964, 1965 b; Fortier, 1966; Guilemin, 1967; McCann and Porter, 1969). Should the "Gomori-positive" granules of the outer layer of the median eminence of the rat indeed represent the CRF or its carrier protein, it is to be expected that their amount is influenced by stress.

All stress experiments were performed on rats which had survived a bilateral adrenalectomy for 14 days. Adrenalectomized rats, like normal rats, respond to stressors with an increase of CRF production (Vernikos-Danellis, 1965 a) and an enhanced release of ACTH (Sydnor and Sayers, 1954; Hodges and Vernikos, 1959, 1960; Hodges and Jones, 1964). This points to an augmented CRF secretion. In contrast to normal rats, adrenalectomized rats possess a moderate