Data on the endocrine heart—neurosecretory cells of heart, producing coronary-dilatory, metabolically active glycopeptides with physico-chemical and biological properties similar to those of previously discovered cardioactive hypothalamic neurohormones—are summarized. Heart hormones participate in both local and distant regulation of heart metabolism and function. Formation and action of these heart hormones is closely related to hypothalamic cardioactive neurohormones K, C, and G and their protein precursors. Neurohormones from heart and hypothalamus comprise a system of neurohumoral connections between these two organs. A possible role of APUD cells in the generation of a number of heart peptides and glycopeptides exerting hormonal activity is discussed.

INTRODUCTION

We have already reported the discovery and isolation of a new group of cardioactive neurohormones—glycopeptides K, C, and G (1-4)—and their specific protein-carriers produced by magnocellular nuclei of hypothalamus (5, 6). It has been established that these protein-carriers are...
the precursors of cardioactive peptides (prohormonal forms), but not all intracellular proteinases involved in the generation of neurohormones K, C, and G are identified so far. We’ve managed to isolate and characterize the high-molecular-weight aspartic proteinase (M 90 K) from human and bovine brain that generates a cardioactive fragment, probably a prohormonal form of neurohormone C (NC) from its precursor-protein (7). The cardioactive hormones and their protein-carriers are stored in the hypothalamus in the form of protein-hormonal complexes that represent neurochemical systems regulating the metabolism and function of the heart and other organs (6).

In 1963 we put forward the prohormonal concept of genesis of vaso-pressin, oxytocin, ACTH, substance P (8), and cardioactive hypothalamic neuropeptides (9, 10). This concept has turned out to be true for other peptide hormones produced by APUD cells. Thus, hypothalamic neuropeptides are produced by limited proteolysis from their specific protein precursors, which are synthesized by a ribosomal mechanism. It is possible that neurohormonal regulation of heart metabolism and function is controlled by the metabolism of hypothalamus-specific proteins.

Different pathological conditions of the heart are probably caused by congenital abnormalities of the biosynthesis, release, and degradation of cardioactive hypothalamic-specific proteins that act in concert with local cardiac neurohormonal regulators. In the process of studying the effect of hypothalamic cardioactive neurohormones on the metabolism and function of the heart, the phenomenon of heart neurosecretion was discovered. We proved that heart neurosecretion is intimately connected with the neurosecretion of the magnocellular nuclei of hypothalamus. Biochemical and, perhaps, morphological interrelations between cardiac and hypothalamic neurosecretory cells contribute to the existence of physiological and biochemical equilibrium between not only these two organs but other organs as well.

Cardioactive Neurohormones of Hypothalamus. In 1962 we isolated two coronary dilatory compounds from rat hypothalamus (1) that were called neurohormones, because a) when injected i.v. in minute doses they cause a dilation of coronary vessels in cats, b) they are produced by the neurosecretory cells of hypothalamus, c) the heart turned out to be the target body (organ). These neurohormones are glycopeptides (3, 6). Isolation of these glycopeptides from v. vertebralis proves their release into systemic circulation and subsequent coupling with serum albumins and mainly gamma-globulins that transport them to the heart. Now we know that one of the three neurohormones—NC is anchored by cardiac proteins. The possibility of existence of specific cardiac receptors for it cannot be excluded. We’ve isolated a number of substances stimulating re-