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A NOVEL NATRIURETIC PEPTIDE ISOLATED FROM EEL CARDIAC VENTRICLE

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From 2500 eel ventricles (225 g), a new species of natriuretic peptide which possesses all spectra of actions known to be characteristic to atrial and brain natriuretic peptide (ANP and BNP), was isolated from eel cardiac ventricles, and have named ventricular natriuretic peptide (VNP). The basic structure of eel VNP is quite similar to ANP and BNP so far identified, but it has a uniquely long C-terminal 'tail' that extends from the second half cystine. Thus eel VNP appears to be a novel type of natriuretic peptide that has not been found in mammals. Eel VNP is, like eel ANP and BNP, much more potent than human ANP with respect to the vasodepressor activity in the homologous animal (eel). With respect to the natriuretic activity in the rat, however, eel VNP was much more potent than eel ANP and BNP, thus is almost equipotent to human ANP. Since VNP is secreted in a larger amount than ANP into the circulation of eels, VNP as well as ANP may be involved in the excellent osmoregulatory mechanisms of this catadromous fish. We are now examining whether or not VNP is present throughout vertebrate classes.

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TWO NOVEL PEPTIDES ISOLATED FROM THE INTESTINES OF THE EEL.

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Acetone extract of the intestines excised from 200 eels was forced through a C-18 cartridges. The retained material was applied to a reversed-phase column. Each fraction was bioassayed on phasic contraction of the ABRM of Mytilus in response to repetitive electrical pulses (15 V, 3 ms, 10 Hz, for 5 s). The active fractions were then subjected to a cation exchange column. Two peaks of potentiating activity on the phasic contraction of the ABRM. These peaks were further purified each other through several HPLC purification steps. The structure of the purified substances were determined by chemical analysis to be as follows:

EICP-1 H-Gly-Phe-Trp-Asn-Lys-OH
EICP-2 H-Phe-Pro-Ser-Ile-Val-Gly-Arg-Pro-Arg-OH

The peptides do not appear to be members of any other previously identified peptide family. Both of these new peptides also induced tonic contraction of the intestinal strips (longitudinal muscle) isolated from the eel. These peptides were termed EICP(eel intestine-contracting peptide)-1 and -2,respectively.

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CENTRAL NEUROTRANSMITTERS AND OSMOTIC VASOPRESSIN (VP) SECRETION.

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Effects of intraventricular (ivt) injections (10 µl) of antagonists on plasma VP (pVP) responses to agonists applied ivt (10 µl) and osmotic stimuli were examined in conscious rats. VP was measured by RIA. Dopamine (DA), an alpha-adrenergic agonist phenylephrine (PHE) (150 or 750 nmol) and a cholinergic agonist carbachol (CB; 1.4 nmol) augmented pVP 1.5 and 5 min later. A beta-agonist isoproterenol (150 nmol) was without effect. The effect of 750 nmol DA was prevented by either 150 nmol haloperidol (HAL), SCH 23390 (SCH; a D1 receptor antagonist) or sulpiride (SUL; a D2 antagonist), given 10 or 40 min before. The VP response to 750 nmol PHE was blocked by an alpha-antagonist phenoxybenzamine (POB; 150 nmol) given 10 min before. The CB-induced VP response was abolished not by a nicotinic blocker hexamethonium (HEX), but by a muscarinic blocker atropine (ATR)(28 nmol). The increase in pVP caused by a hypertonic solution (990 mOsm/kg; 10 µl) applied ivt was not affected by POB, HEX or ATR, whereas it was blocked by HAL. SCH, SUL and HAL (150 nmol), when given 10 min before the intraperitoneal injection (2 ml/100g) of 600 mM saline, inhibited rises in pVP 15 or 30 min after the osmotic load. These results suggest that osmotic VP secretion may be mediated or modulated by paraventricular dopaminergic neurons.

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LOCALIZATION OF VASOTOCIN-LIKE IMMUNOREACTIVE CELLS AND FIBERS IN TELENCEPHALON AND DIENCEPHALON OF ZEBRA FINCHES (Poephila guttata) AND BENGALESE FINCHES (Lonchura domestica).

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We examined the localization of vasotocin-like immunoreactive (ir-VT) cells and fibers in the brain of adult Zebra and Bengalese finches with immunohistochemical techniques. Cell bodies were located in the superchiasmatic nucleus, preoptic area, paraventricular nucleus (PVN), superoptic nucleus (SON), and ventro-lateral of hypothalamus. Fibers emerging from the PVN run toward lateral hypothalamus and redirected toward ventral hypothalamus along the lateral forebrain bundle. Axons from the PVN and SON formed tight bundles of the hypothalamo-hypophysial tract in the lateral hypothalamus and terminated into the medium eminence. Some fibers from the PVN and SON run toward telencephalic region. The overall organization of the ir-VT system in Zebra finch and Bengalese finch hypothalamus was similar to that described in the canary. In telencephalon, Ir-VT fibers were located around vocal control nuclei, RA (Robust nucleus of archstriatum) and HVC (Higher vocal center) of Bengalese finches and RA of Zebra finches.