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THE NEUROHYPOPHYSEAL HORMONES OF THE FINBACK WHALE

(BALAENOPTERA PHYSALUS L.)

BY

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Abstract

Vasopressin and oxytocin of the finback whale's neurohypophysis were isolated by means of gelfiltration and column chromatography and identified as arginine-vasopressin and as oxytocin.

The position of the Cetacea in the animal world makes a comparative investigation of their neurohypophyseal principles significant. Former observations by GEILING [6–8] and VALSØ [13] revealed that extracts of the whale's posterior pituitary had a rather high vasopressor activity when compared to the oxytocic activity. It is tempting to correlate a relatively high content of antidiuretic hormone of the whale's pituitary with the aquatic living of this mammal.

The problem arises, whether the extreme ratio of the vasopressor and the oxytocic activity of the neurohypophysis is due to the presence of a new type of vasopressin, or merely to a relatively high content of lysine- or arginine-vasopressin.

After my work was completed, a paper of ACHER *et al.* [1, 4] was published reporting that oxytocin and vasopressin from the finback whale are identical with arginine-vasopressin and normal oxytocin. I can fully confirm this. The application of a different isolation procedure may justify the present communication.

Through the courtesy of Dr. Å. JONSGÅRD, Statens Institutt for Hvalforskning, Oslo, Norway, we obtained posterior pituitary lobes of the finback whale. The glands were extensively desiccated with acetone, and pulverized. 20 g of the dry material, assaying 1.7 pressor units/mg and 0.3[5] oxytocic units/mg, were extracted with 0.25 % acetic acid at 2° C. A solution in 0.25 % acetic acid of the lyophilized extract was filtered through a Sephadex G25 column (83 × 8 cm), which was equilibrated with 0.25 % acetic acid.

The distribution of the biological activities over the obtained high and low molecular fraction is summarized in the table.

Distribution of biological activity over high and low molecular fractions of the extract of the neurohypophysis of the finback whale

Fraction	Vasopressor act.[2] in % [1]	Oxytocic act.[3] in % [1]
High molecular	25	60
Low molecular	71	32

[1] % activity is calculated on the starting material.
[2] Determined with the method of DEKANSKI [5].
[3] Determined with the method of HOLTON [9].

From this experiment it seems evident that in 0.25 % acetic acid oxytocin is more strongly associated with neurophysin than vasopressin (compare WITTER *et al.* [15]).

Vasopressin could be easily isolated from the lyophylized low molecular fraction by chromatography of a solution in 0.25 % acetic acid over Amberlite CG 50. Elution with 0.25 % acetic acid and subsequently with 0.1 M ammonium acetate pH 5.0 yielded eluates containing 90 weight % of the applied material and having no biological activity. Then a gradient elution with increasing pH and increasing ammoniumacetate concentration was used (compare ACHER *et al.* [3]).

Rechromatography of the vasopressin containing fraction over Amberlite CG 50 yielded a pure product. After paper electrophoresis at pH 6.5 and paper chromatography in *n*-butanol : acetic acid : water = 4 : 1 : 5 (upper phase) or in *n*-butanol : pyridine : acetic acid : water = 30 : 20 : 6 : 24, only one ninhydrin positive spot could be developed [10], which also showed specific colour reactions for arginine [2] and tyrosine [2] residues. By acid hydrolysis arginine, aspartic acid, cystine, glutamic acid, glycine, phenylalanine, proline and tyrosine were found. The conclusion, that the antidiuretic hormone of the whale is identical with arginine vasopressin, was further confirmed by trypsin digestion [14], dinitrophenylation [12] and partial acid hydrolysis [11].

Oxytocin was isolated by means of paper chromatography from the fraction of the Amberlite column containing the oxytocic activity. The pure product behaved identical to pure porcine oxytocin on paper electrophoresis and paper chromatography. After acid hydrolysis the amino acids aspartic acid, cystine, glutamic acid, glycine, isoleucine, leucine, proline and tyrosine were present.

We must, therefore, conclude that the oxytocin of the whale is identical with common mammalian oxytocin.

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