

The adrenergic and cholinergic innervation of the thyroid chicken gland

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The morphology and distribution of the cholinergic and adrenergic nerve fibres were described in the thyroid gland of the domestic hen. The adrenergic structures were visualised with glyoxylic acid and with immunohistochemical staining for tyrosine hydroxylase (TH), the marker for adrenergic nerve structures. Cholinergic structures were visualised using the Karnovsky and Roots method. It was found that the thyroid gland is supplied with numerous adrenergic and cholinergic nerve fibres, which occur as small or large bundles or single nerve fibres. These were located around blood vessels, under the fibrous capsule and in the vicinity of secretory vesicles.

key words: chicken, thyroid gland, innervation

INTRODUCTION

The thyroid gland has rarely been an object of anatomical studies. There is a significant scarcity of reports dealing with the innervation of the gland. Nerve fibres containing noradrenaline (NA) have been found in the thyroid gland of the rat [9], man [8], mouse, hamster, dog, sheep and pig [7]. Nerve elements containing the activity of AChE were found in the thyroid gland of the rat [3–5, 9], pig [6] and man [10]. The electrical stimulation of intrinsic nerve fibres results in the release of neurotransmitters inducing thyroxine [1]. The regulation of its secretion may be influenced by a vasodilatory parasympathetic component of the autonomic nervous system [2]. The adrenergic component may also play an important role in the regulation of thyroid activity [10]. To date, there are no reports dealing with the innervation of the avian thyroid gland. It was therefore decided to study the adrenergic and cholinergic innervation of the thyroid gland of the domestic hen, a bird of great economic importance.

MATERIAL AND METHODS

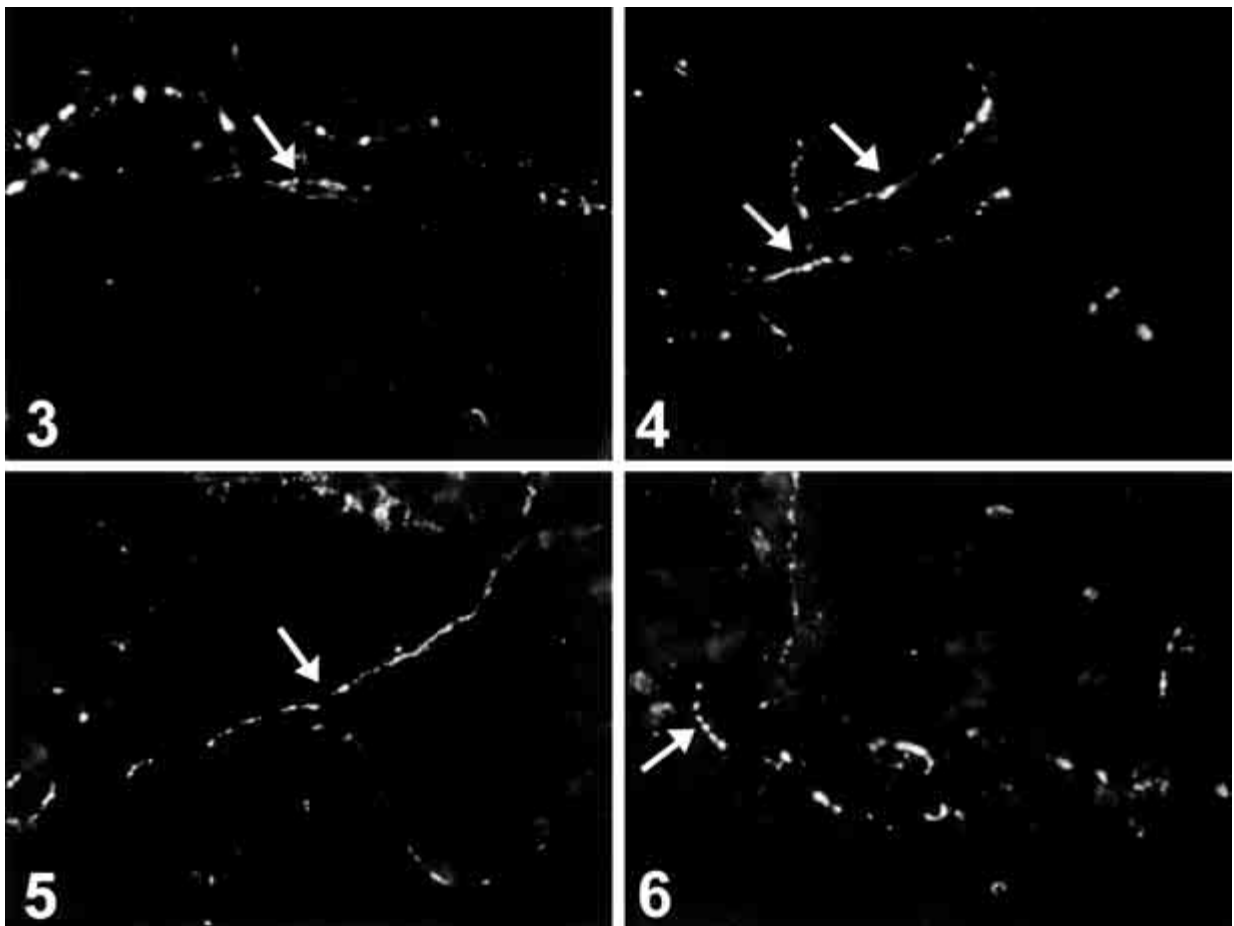
The study was performed on 3 cocks and 3 hens of the green-legged variety. The adrenergic nerve fibres were visualised by the glyoxylic acid method of Torre and Surgeon, as well as with immunohistochemical staining for TH. Cholinergic nerve fibres were visualised by the Karnovsky and Roots method of detecting the activity of acetylcholinesterase (AChE). The specificity of the immunohistochemical staining was verified with omission and replacement tests.

RESULTS AND DISCUSSION

The AChE-positive and adrenergic nerve fibres reach the thyroid gland following the arterial blood vessels. The nerve fibres run in parallel to the blood vessels (Fig. 1). Both types of nerve fibre occur as single fibres or as smaller or larger bundles. The adrenergic nerve fibres were more numerous than the AChE-positive ones. The presence of the nerve fibres of both types was very often detected in close proximity to the secretory vesicles (Fig. 2), beneath



Figures 1, 2. AChE-positive nerve fibres around artery (Fig. 1) and in close vicinity of secretory vesicles (Fig. 2). Arrows indicate nerve fibres ($\times 400$).



Figures 3–6. Adrenergic nerve fibres in the glandular stroma. Arrows indicate nerve fibres ($\times 400$).

the fibrous capsule and in the glandular stroma (Fig. 3, 4). Single nerve fibres had a varicose appearance (Fig. 5, 6).

The results presented allow us to conclude that

the thyroid gland of the hen is supplied with cholinergic and adrenergic nerve fibres. Since there have been no recorded studies on the innervation of the avian thyroid gland, this paper is the first report de-

scribing the presence of two important groups of nerve fibres in this endocrine gland. To date, the presence of adrenergic nerve fibres has only been described in the mammalian thyroid gland [7] around blood vessels and close to the glandular epithelium. It was also found that adrenergic neurons stimulate the glandular epithelium to release thyroxine [7]. Inter-species differences regarding the pattern of the adrenergic innervation of the organ have also been reported [6, 7].

The functional significance of cholinergic nerve fibres in the thyroid gland is not very well understood. It appears that these nerve fibres can enhance cGMP accumulation in the human thyroid gland [10] and cause vasodilatation of the intraglandular blood vessels in the rat [2].

The possibility cannot be excluded that these nerve fibres play an important role in the secretory processes in the gland [1]. It is probable that the role of the nerve fibres in the avian thyroid gland is similar to that described in the mammalian gland. However, the inter-species differences which have been revealed, call for great caution in drawing far-reaching conclusions.

The present paper can be regarded as an introduction to further studies on the autonomic innervation of the thyroid gland in birds.

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