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Concentration gradient of noradrenaline from the periphery to the centre of the cornea
- A clue to its origin

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Title: Concentration gradient of noradrenaline from the periphery to the centre of the cornea - a clue to its origin

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Abstract

We set out to demonstrate that the major source of corneal catecholamines is its neuronal release from intrinsic sympathetic nerves rather than circulating or non-neuronal local production. Three concentric segments (central, intermediate, peripheral) were obtained by double trephination (9.5-7.25 mm) performed on corneas harvested from 3-4 month old rabbits and human corneas rejected for transplantation, along with aqueous humour, full iris tissue and blood samples. Endogenous catecholamines were quantified by high pressure liquid chromatography with electrochemical detection (HPLC-ED), and comparison with the uptake of radio-labelled noradrenaline (3H-NA) before and after incubation with cocaine was performed. Results are means \pm SEM. Ratios between enzymatic end products and their substrates were calculated. ANOVA was used for statistical analysis. Catecholamine levels were found to be about one log unit lower in the human cornea than in the rabbit cornea. In the rabbit, dopamine (DA), noradrenaline (NA) and adrenaline (AD) were identified by HPLC-ED in all corneal segments, whilst in the human cornea NA was identified only in the intermediate and peripheral corneal segments, and no AD was found. In the iris and aqueous humour only DA and NA were present. A concentration gradient for NA decreasing from the periphery to the centre of the cornea was identified in both species (NA/DA ratio higher than 1 in the periphery; low AD/NA ratio in all corneal segments), but not for DA or AD. After incubation with 3H-NA all corneal segments and iris tissue showed loading with the aforementioned gradient being reproduced, and a decrease in 3H-NA loading after cocaine was significant only in the peripheral corneal segment and in the iris of both species. Reduction in 3H-NA loading after incubation with cocaine shows that NA in the cornea is mostly of neuronal origin and demonstrates the presence of functional sympathetic nerves (also expectedly found in the iris); the existence of a gradient both for 3H-NA loading and loading reduction after cocaine points to a higher density of fibres in the peripheral cornea.

Keywords: cornea; sympathetic nerves; noradrenaline origin; concentration gradient; neuronal topography; rabbit; human

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