

NEUROPEPTIDE Y IS SPECIFICALLY LOCALISED IN TYPE II SYMPATHETIC AXONS INNERVATING THE AFFERENT AND Efferent ARTERIOLES IN THE RABBIT KIDNEY.

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The innervation of the rabbit renal juxtaglomerular vessels is almost entirely of sympathetic origin (1). The density of terminals on the afferent arterioles is ~3 times that on the efferent arterioles (1). In a previous study, we showed that in the juxtaglomerular region of the cortex, most of the sympathetic terminals formed specialised neuromuscular junctions with vascular smooth muscle cells. Also, we identified two structurally different types of sympathetic axons, TI and II axons (1,2).

The TI axon neuroeffector junctions were predominantly distributed on the afferent arterioles whereas the density of TII neuromuscular junctions was similar on both afferent and efferent arterioles (2). One interpretation of these data is that the two axon types have distinct origins and are responsible for differential control of afferent and efferent arteriole vasoconstriction and hence glomerular filtration.

A previous study by Reinecke and Forssman (3) showed that there was a separate population of sympathetic axons containing neuropeptide Y (NPY) that occurred on all the renal arterial vessels but appeared to be equally distributed on the afferent and efferent arterioles, similar to the distribution we found of Type II axon terminals. In this study we investigated whether these two axon types could be differentiated further by their peptide content providing further evidence that they originate from two separate populations of neurons.

The kidneys of 3 rabbits were fixed by perfusion under deep pentobarbitone anaesthesia using a method previously described (1). The fixative consisted of 4% paraformaldehyde and 0.2% glutaraldehyde in phosphate buffer, pH 7.4. Vibratome sections (100 µm thick) were cut and processed for immuno-peroxidase labelling for NPY. Standard negative and positive control sections were processed at the same time. These sections mounted on slides in epoxy resin with plastic coverslips and polymerised. These sections were reviewed in the light microscope and areas containing afferent and efferent arterioles and interlobular arteries in longitudinal orientation were identified and re-embedded for electron microscopy. Short series (~15 sections) of ultrathin sections were cut of the re-embedded tissue and mounted on Formvar coated slot grids and stained. Analysis of the innervation was conducted on the mid-section of each series as previously described (1). To positively identify TI and II axon terminals, each varicosity was checked in neighbouring sections. From the analyses of the innervation around 8 vessels (3 afferent and 2 efferent arterioles and 3 interlobular arteries), the NPY positive terminals were all of TII axons whereas no TI axon terminals were immunoreactive for NPY.

We conclude that NPY is selectively localised in TII axons. This data provides additional evidence that TI and II axons originate from separate populations of neurons and are responsible for differential control of pre- and post-glomerular vascular resistance. This data has also provided us with a valuable tool to investigate the differential control of afferent and efferent arteriole resistance physiologically.

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2. Luff SE, Hengstberger SG, McLachlan EM, Anderson WP. Distribution of sympathetic neuroeffector junctions in the juxtaglomerular region of the rabbit kidney. *J Auton Nerv Syst* 40:239-254, 1992
3. Reinecke M, Forssmann WG. Neuropeptide (neuropeptide Y, neurotensin, vasoactive intestinal polypeptide, substance P, calcitonin gene-related peptide, somatostatin) immunohistochemistry and ultrastructure of renal nerves. *Histochemistry* 89:1-9, 1988