VIA MEDICA

SHORT COMMUNICATION

Folia Morphol.
Vol. 62, No. 4, pp. 467–469

ISSN 0015–5659
www.fm.viamedica.pl

Localisation of oestrogen receptors (ERα and ERβ) in the human and rat epididymides

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[Received 17 September 2003; Accepted 23 October 2003]

The aim of the study was to compare the localisation of oestrogen receptors α and β (ERα and ERβ) in the human and rat epididymides. In the human epididymis the immunoexpression for ERα was detected in the nuclei of the caput epithelial cells, while positive reaction for ERβ was observed in the nuclei of the cauda epithelial cells. In the rat epididymis, immunoexpression for ERα showed nuclei of the caput and cauda epithelial cells. However, the reaction was stronger in cells of the caput epididymis. A positive reaction for ERβ was observed in the nuclei of smooth muscle cells of the epididymal duct and in the nuclei of interstitial tissue cells of the rat caput and cauda epididymis.

We have demonstrated that localisation of ERα and ERβ is cell-, region- and species-dependent.

key words: oestrogen receptor α and β, immunohistochemistry, human and rat epididymis

INTRODUCTION

Immature spermatozoa leave the testis together with testicular fluid and are transported to the epididymis via the rete testis. During the traverse through the epididymis the spermatozoa remain in a special microenvironment, necessary for sperm maturation and storage. The microenvironment is created by epididymal epithelial cells. The epithelial cells of the proximal caput of the epididymis (the efferent ductules and the first part of the ductus epididymis) [3], reabsorb nearly 90% of the fluid leaving the testis [9], thereby increasing the concentration of sperm in the epididymis. The function of the cells is regulated mainly by androgens — testosterone (T) and dihydrotestosterone (DHT), acting through androgen receptors (ARs) [8, 10]. However, the epithelium of the human and animal epididymides also contains both α and β oestrogen receptors (ERα and ERβ) [7]. There is documentary evidence that the function of the epididymis is regulated additionally by oestrogens [9].

MATERIAL AND METHODS

Epididymides were obtained from mature male Wistar rats (3–4 months old). The animals were anaesthetised with 90 mg/kg pentobarbital sodium by intraperitoneal injection. The epididymides were taken to prepare cryostat sections. The human epididymides, which were obtained from patients who were undergoing orchidectomy, were fixed in Bouin's solution and embedded in paraffin.

The paraffin sections of the human and the cryostat sections of the rat epididymides were incubated with primary antibodies as follows: monoclonal, mouse antibody ERα-1D5 (1:100) (DAKO A/S, Glostrup, Denmark); polyclonal rabbit antibody ERβ (1:100) (Affinity BioReagents, Golden CO, USA) overnight at 4°C in humidified chamber. Next, the specimens were incubated with secondary antibody (Vector Lab., Burlingeme CA). The reactions were visualised with ABC/HRP (DAKO/AS Denmark) and DAB method. To avoid a non-specific reactivity,

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Table 1. Localisation of oestrogen receptors α and β (ERα and β) in the human and rat epididymides

	Caput epididymis		Cauda epididymis		Smooth muscle cells		Interstitial tissue cells	
	Human	Rat	Human	Rat	Human	Rat	Human	Rat
ERα	+	+	–	+	–	–	–	–
ERβ	–	–	+	–	–	+	–	+

control sections were incubated without primary antibody.

The experiment received the approval of Local Ethics Committee.

RESULTS AND DISCUSSION

The positive reaction for ERs was localised in the nuclei of the cells. There were differences in the localisation of ERα and ERβ between the human and the rat epididymides. The results are presented in Table 1.

Oestrogen receptors α were detected in the nuclei of epithelial cells of the caput of the human (Fig. 1A) and rat (Fig. 2A) epididymides, and in the nuclei of the cauda epithelial cells of the rat epididymis (Fig. 3A). ERβ was localised only in the nuclei of the human cauda epididymis (Fig. 1B). Our results for the localisation of ERs in the epididymal epithelium are comparable to the observations of other authors [6, 7]. The same localisation of ERα in the human and rat caput epididymides is indicative of its similar function in both species. As has been mentioned above, the proximal caput of the epididymis takes part in the reabsorption of testicular fluid [9]. From the studies carried out in αERKO male mice it is well documented that this process is controlled by oestrogens through ERα [9]. The presence of ERα is necessary for the maintenance of the morphological components of the endocytotic apparatus in the epithelial cells of this part of the epididymis [5]. Moreover, αERKO male mice are infertile [9]. The function of ERβ is not fully understood. It is suggested, that one role of ERβ is to modulate ERα transcriptional activity [2].

We have shown the immunoexpression of ERβ in the nuclei of smooth muscle cells of the duct wall and in the interstitial tissue cells of the rat epididymis (Fig. 2B, 3B). However, studies of other authors have demonstrated the localisation of both ERα and β in the stroma of the mammalian epididymis [1, 6, 7]. The presence of the only ERβ in rat stroma cells in our experiment may be attributable to the different histochemical procedures employed. The function of target stroma cells for ERs has not been precisely evaluated. It can be supposed that, as in the accessory sex glands [4], the cells may modulate the function of the epididymal epithelial cells.

In summary, we concluded that the localisation of ERα and ERβ is cell-, region- and species-dependent. The differences in distribution of ERs in the human and rat epididymides indicate that oestrogens could fulfill different functions in each region of the epididymis.

ACKNOWLEDGEMENTS

The research was supported by the State Committee for Scientific Research as a Solicited Project PBZ-KBN-084/P06/2002 from 2003 to 2005 year.

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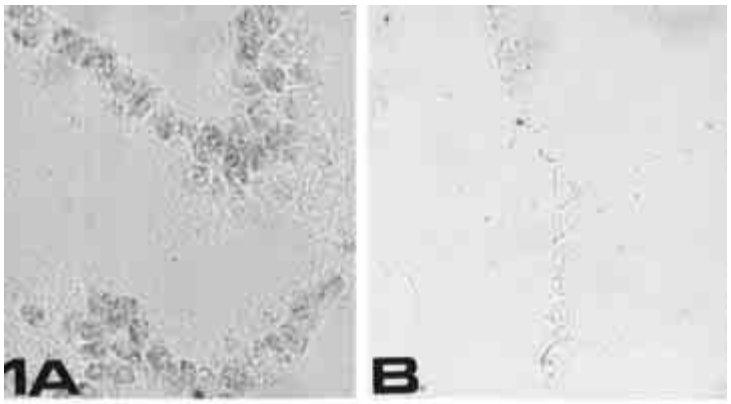
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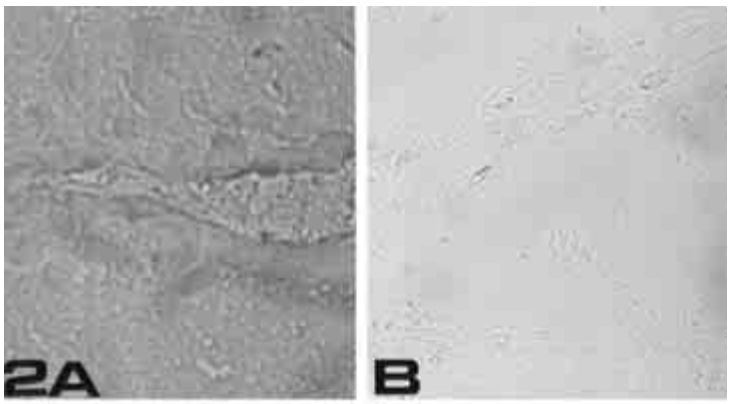
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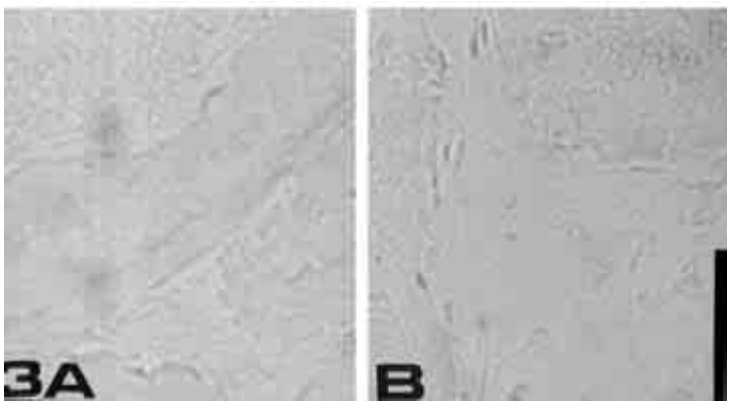
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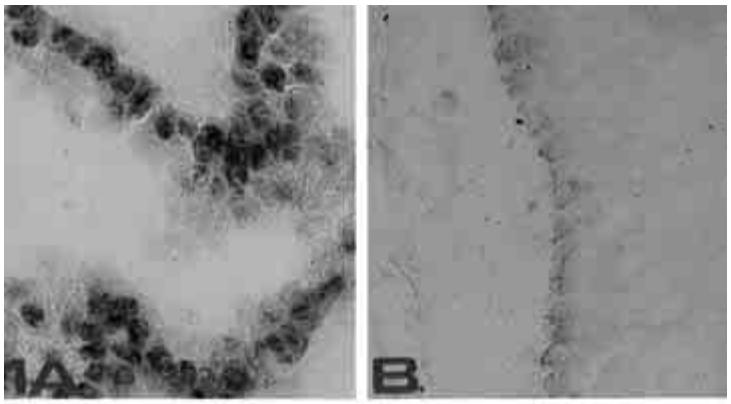
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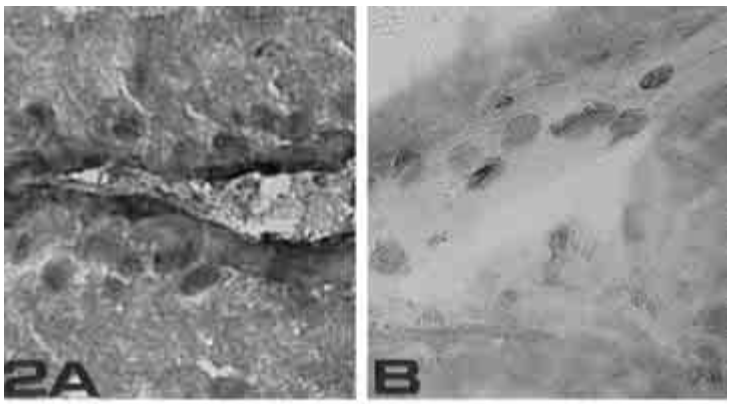
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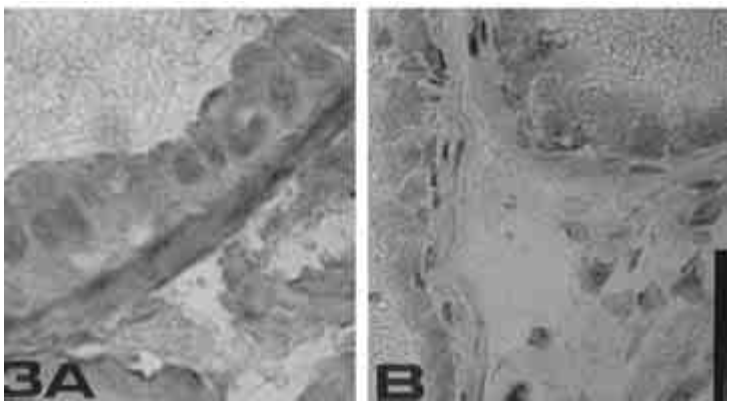
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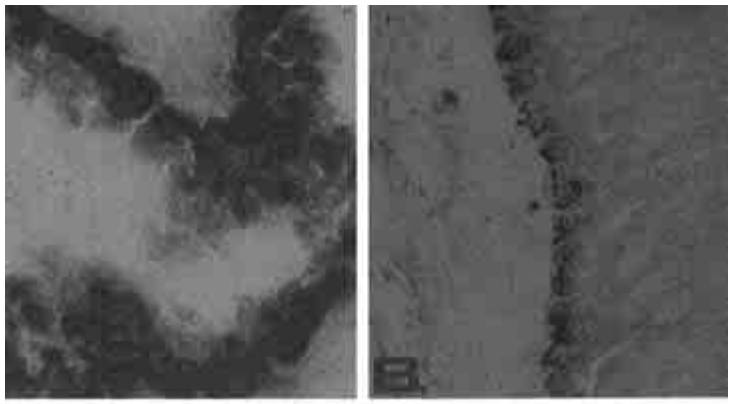
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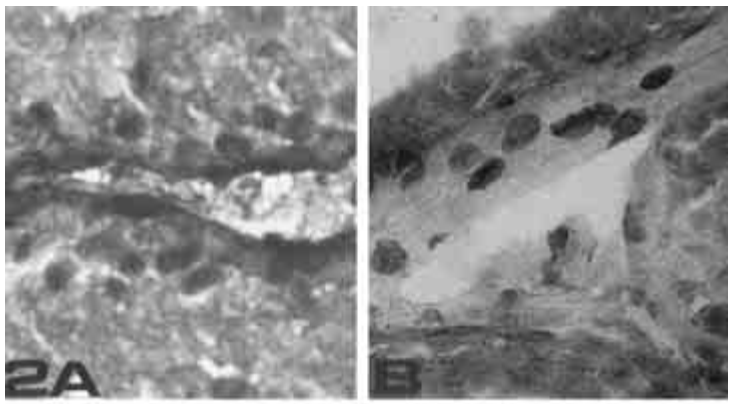
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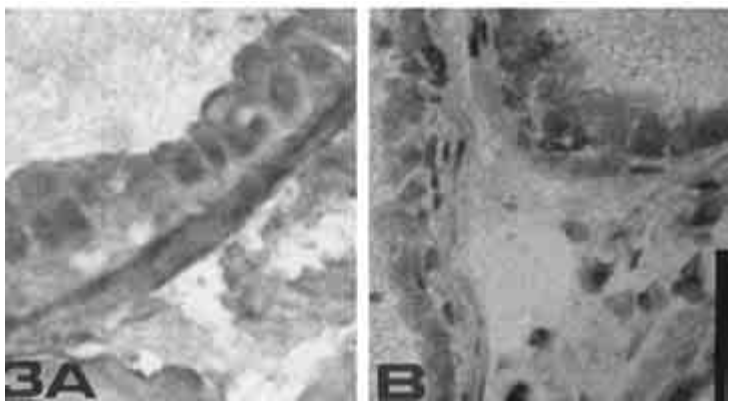
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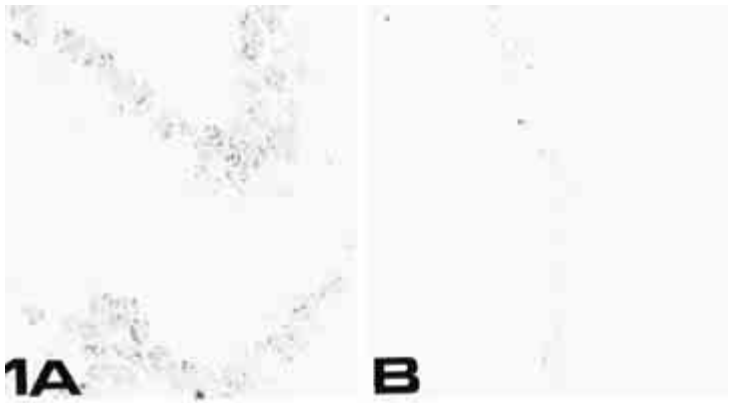

Figure 1. Oestrogen receptors in the human caput and cauda epididymis. The strong positive immunohistochemical reaction for ERα in the nuclei of epithelial cells of the caput epididymis **(A)** and the weak reaction for ERβ in the nuclei of epithelial cells of the cauda epididymis **(B)**. Scale bar, 50 μm.

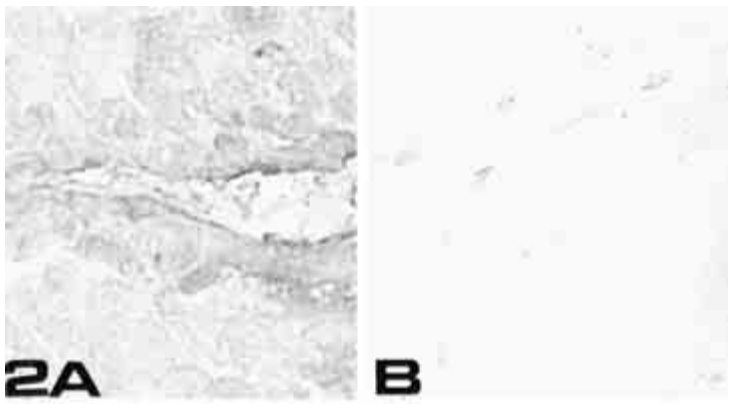

Figure 2. Oestrogen receptors in the rat caput epididymis. The immunoexpression for ERα is visible in the nuclei of epididymal epithelial cells **(A)** and the expression of ERβ in the nuclei of smooth muscle cells and in interstitial tissue cells **(B)**. Scale bar, 50 μm.

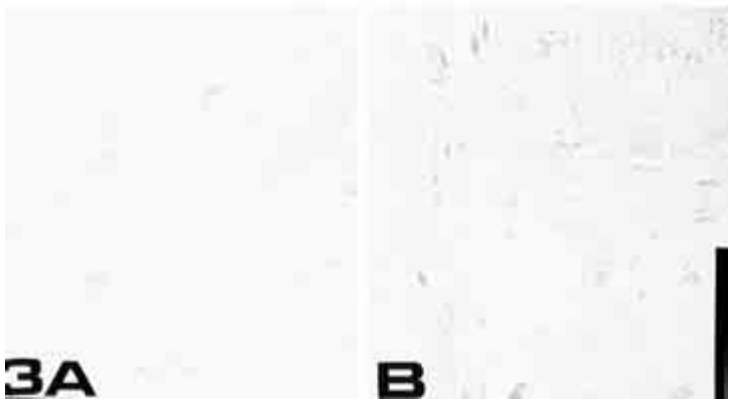

Figure 3. Oestrogen receptors in the rat cauda epididymis. The weak immunoexpression of ERα in the nuclei of epididymal epithelial cells **(A)** and the expression of ERβ in the nuclei of smooth muscle cells of the epididymal duct and interstitial tissue cells **(B)**. Scale bar, 50 μm.

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