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Distribution of Vitamin D Receptor and 1a-Hydroxylase in Male Mouse Reproductive Tract

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Abstract

Vitamin D has been introduced as one of the main regulators of spermatogenesis. Here, for the first time, we evaluated the expression of vitamin D receptor (VDR) and 1a-hydroxylase in all organs of male mice reproductive tract by immunohistochemistry and Western blotting. Epithelial cells of epididymis, seminal vesicle, coagulating gland, ductus deferens, preputial gland, and prostate were the prominent cell types that concomitantly expressed VDR and 1a-hydroxylase. Nearly all cell types in testis expressed both proteins. Interestingly, VDR intensity in epididymis epithelial cells was reduced toward cauda, in which only strong staining of stereocilia was observed. Although been positive in caput epididymis, sperms lost their VDR expression in cauda region. In all organs, sperms failed to express 1a-hydroxylase. Specific bands of the VDR and 1a-hydroxylase were determined in all tissues, except testis in which novel unprecedented isoforms of 1a-hydroxylase were observed. Our findings could provide further convincing evidence of pivotal role of this hormone in male reproductive biology.

Keywords

mice, reproductive tract, vitamin D receptor, 1a-hydroxylase, testis, epididymis, prostate

Introduction

Spermatogenesis is a complicated process which involves a series of developmental and biochemical events. Produced in the testes, the spermatozoa mature and become functional in the epididymis, where they are stored until ejaculation. The process of spermatogenesis follows nearly the same steps in human and mice. In mice, mature sperms leave the epididymis and pass through different organs of male reproductive tract including ductus deferens and urethra during ejaculation. To be functional, sperms are to be fed with enriched secretions from organs with endocrine function including prostate, seminal vesicle, and preputial and coagulating glands.[1] Different steps of biochemical reactions and several endocrine factors have been reported to be involved in production and maturation of sperm.

In the last few years, the potential role of vitamin D3 (VD3) in the female and male reproduction has been the focus of many researches.[2-6] The active form of VD3, 1,25 dihydroxy vitamin D3, is a lipid-soluble hormone with well-known classical actions on bone metabolism and mineral homeostasis. Upon intake or synthesis in the skin, VD3 is enzymatically converted into its biologically active form by the action of 1a-hydroxylase and 25-hydroxylase. Many biological activities of VD3 are mediated through its receptor, vitamin D receptor (VDR), which belongs to the nuclear receptor superfamily of transcriptional factors.[7] Regulation of VDR gene expression is one of the main mechanisms through which target cells respond to VD3. Therefore, biological action of this hormone is largely determined by the extent of VDR expression levels in a given cell type.[8,9]

We recently showed that VDR is differentially expressed in reproductive organs of cycling[10] and pregnant mice[11] including endometrium, decidua, ovary, and placenta. Based on the

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