Reproductive Biology and Endocrinology

BioMed Central

Research

Differential expression of members of the E2F family of transcription factors in rodent testes

Kame S El-Darwish*[1], Martti Parvinen[2] and Jorma Toppari[1]

Address: [1]Departments of Physiology and Pediatrics, University of Turku, Kiinamyllynkatu 10, FIN- 20520, Turku, Finland and [2]Department of Anatomy, University of Turku, Kiinamyllynkatu 10, FIN- 20520, Turku, Finland

Email: Kame S El-Darwish* - kdarwish@saunalahti.fi; Martti Parvinen - marparvi@utu.fi; Jorma Toppari - jortop@utu.fi

* Corresponding author

Published: 05 December 2006

Reproductive Biology and Endocrinology 2006, **4**:63 doi:10.1186/1477-7827-4-63

Received: 13 October 2006
Accepted: 05 December 2006

This article is available from: http://www.rbej.com/content/4/1/63

Abstract

Background: The E2F family of transcription factors is required for the activation or repression of differentially expressed gene programs during the cell cycle in normal and abnormal development of tissues. We previously determined that members of the retinoblastoma protein family that interacts with the E2F family are differentially expressed and localized in almost all the different cell types and tissues of the testis and in response to known endocrine disruptors. In this study, the cell-specific and stage-specific expression of members of the E2F proteins has been elucidated.

Methods: We used immunohistochemical (IHC) analysis of tissue sections and Western blot analysis of proteins, from whole testis and microdissected stages of seminiferous tubules to study the differential expression of the E2F proteins.

Results: For most of the five E2F family members studied, the localizations appear conserved in the two most commonly studied rodent models, mice and rats, with some notable differences. Comparisons between wild type and E2F-1 knockout mice revealed that the level of E2F-1 protein is stage-specific and most abundant in leptotene to early pachytene spermatocytes of stages IX to XI of mouse while strong staining of E2F-1 in some cells close to the basal lamina of rat tubules suggest that it may also be expressed in undifferentiated spermatogonia. The age-dependent development of a Sertoli-cell-only phenotype in seminiferous tubules of E2F-1 knockout males corroborates this, and indicates that E2F-1 is required for spermatogonial stem cell renewal. Interestingly, E2F-3 appears in both terminally differentiated Sertoli cells, as well as spermatogonial cells in the differentiative pathway, while the remaining member of the activating E2Fs, E2F-2 is most concentrated in spermatocytes of mid to late prophase of meiosis. Comparisons between wildtype and E2F-4 knockout mice demonstrated that the level of E2F-4 protein displays a distinct profile of stage-specificity compared to E2F-1, which is probably related to its prevalence and role in Sertoli cells. IHC of rat testis indicates that localization of E2F-5 is distinct from that of E2F-4 and overlaps those of E2F-1 and E2F-2.

Conclusion: The E2F-1 represents the subfamily of transcription factors required during stages of DNA replication and gene expression for development of germ cells and the E2F-4 represents the subfamily of transcription factors that help maintain gene expression for a terminally differentiated state within the testis.