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## Developmental and Stage-Specific Expression of Smad2 and Smad3 in Rat Testis

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Members of the transforming growth factor beta type (TGF $\beta$ ) superfamily and their receptors are expressed in the testis, and are believed to play important paracrine and autocrine roles during testicular development and spermatogenesis. The Smad proteins are downstream mediators for the family of TGF $\beta$  growth factors. Smad2 and Smad3 are associated with both TGF $\beta$  and activin signaling. However, very little is known about the expression and regulation of the Smad signaling proteins in the testis. In the present study, we have determined that Smad2 and Smad3 proteins are expressed in the postnatal testes of rats from 5 days to 60 days of age. Expression levels for both proteins are higher in young rats than in sexually mature rats. Smad2 and Smad3 messenger RNA levels parallel protein expression. Smad2 and Smad3 proteins are mainly localized in the cytoplasm of meiotic germ cells, Sertoli cells, and Leydig cells. Smad3 protein is localized to the nucleus of preleptotene to zygotene primary spermatocytes in young rats. Both proteins are expressed throughout all stages of the cycle of seminiferous tubules but are expressed at their lowest levels at stages VII–VIII in the seminiferous epithelium of adult rats. The presence of these downstream mediators in these cell types supports a role for TGF $\beta$  and activin during spermatogenesis. The difference between the expression of Smad2 and Smad3 suggests that they may have different functions within the testis.

Key words: Spermatogenesis, development, growth factors

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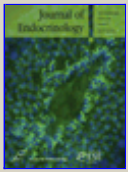
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