Focussing on neuronal differentiation in the olfactory epithelium of the developing mouse

C. Lehner¹, A. Wagner², H. Tempfer¹, R. Gehwolf¹, H. Bauer², H.-C. Bauer¹,²

¹Paracelsus Private Medical University, Applied Cell Biology, Salzburg, Austria
²University of Salzburg, Organismic Biology, Salzburg, Austria

Published on 23 Oct 2010

In a previous study we have identified a novel murine gene (GenBank X83587) which was found to be the mouse homologue of human Co-REST, a co-repressor to the neuronal silencer REST (repressor element-1 silencing transcription factor). Co-REST mediates the transcriptional repression of REST-responsive genes by recruiting histone deacetylases and other chromatin modifying enzymes to the repression site. In recent studies a REST-independent role of Co-REST in gene repression has been documented. A major role of the REST/Co-REST repressor complex is to restrict neuron-specific gene expression in extra-neural tissue. Accordingly, the occurrence of REST and Co-REST in neural tissue at early developmental stages has raised much interest in a potential role of this repressor complex in the timing of neural stem cell maturation.

Although expression of Co-REST has been related to long-term gene silencing mechanisms, its role in stem cell biology is still debatable. In a previous study we have shown that, in contrast to REST, Co-REST expression persists in the developing mouse CNS beyond newborn stage and - at low levels - throughout adulthood.

In this project we have been focussing on the stage-specific expression of Co-REST in the mammalian olfactory epithelium (OE), which is known to harbour a pool of highly dynamic neurogenic cells (neural stem/precursor cells, NSCs/NPCs). Using immunohistochemistry and in situ hybridization we have determined the spatio-temporal expression pattern of Co-REST in the developing and adult mouse OE. Co-expression studies have been performed using antibodies against stem cell-related transcription factors, NPC-associated cytoplasmic proteins, and neuron-specific terminal differentiation markers.

Here we have shown that the stem cell-associated proteins Sox2 and Nestin are co-localized in the young OE, showing prominent staining in basal and apical regions. Interestingly, expression of Co-REST is detectable exclusively in Sox2/Nestin-free areas. On the other hand, a considerable overlap of Co-REST and Doublecortin expression is visible in the OE from E10.5 on, which provides evidence to suggest that Co-REST may be considered a reliable marker for early neurons or neural precursor cells but does not indicate stem cell quality of OE cells.