



Intestinal Stem Cells

New concepts and methods

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Quiescent stem cells and the immortal DNA strand in the intestinal epithelium : Rest in peace ?

The intestinal epithelium consists of a continuously renewed monolayer of cells, in which five well described differentiated cell types have been described. This epithelium is divided into two functionally distinct compartments. The villus compartment contains differentiated cells whereas the crypt compartment contains proliferative cells. Adult tissue-specific stem cells, which sustain the life-long renewal of this epithelium, are found at or near the crypt base. In spite of strong research efforts, the exact nature, potential heterogeneity, hierarchy, molecular markers and physiological properties of these stem cells are still the matter of intense debates. The presentation will address two aspects of intestinal epithelial stem cell biology, including the identification of markers for a putative population of quiescent stem cells, and asymmetric segregation of chromosomes as a property of intestinal epithelial stem cells.

The double-cortin like kinase 1 (Dclk1) protein has been proposed as a marker for quiescent stem cells in the intestinal epithelium. Instead, we and others found that Dclk1 is expressed by rare, poorly characterized, differentiated cells of the epithelium, called tuft cells, rather than by quiescent stem cells. Tuft cells represent an additional cell type in the intestinal epithelium and still lack a clearly defined function.

Asymmetric segregation of chromosomes allows rapidly dividing stem cells to retain the template DNA strands during successive rounds of cell division and has been proposed as a protection mechanism in rapidly dividing stem cells to avoid the accumulation of mutations due to replication errors. We have revisited this hypothesis in two populations of crypt cells and found that asymmetric segregation of chromosomes is not a common feature of intestinal epithelial stem cells.