Jumonji domain-containing protein-3 (JMJD3): a critical epigenetic regulator in stem cells

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Video Byte

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Abstract

The expression of human genes is partially modulated by epigenetic mechanisms. There is a dramatic epigenetic transformation during transition of embryonic stem cells (ESCs) to specialized cells and the reprogramming of somatic cells to become induced pluripotent stem cells (iPSCs). Aberrant epigenetic changes can contribute to carcinogenesis and other disorders. The histone demethylase Jumonji domain-containing protein-3 (JMJD3) regulates the trimethylation of histone H3 on lysine 27 (H3K27me3), which is an important epigenetic event associated with transcriptional silencing. JMJD3 function has been studied in relation to immune diseases, cancer, and tumor development. Recent studies have suggested that JMJD3 also plays a major role in cell fate determination of pluripotent and multipotent stem cells. JMJD3 specifically enhances self-renewal ability and reduces the differentiation capacity of ESCs and multipotent stem cells. JMJD3 is also involved in many other processes including proliferation, tumor invasion, apoptosis, and signaling regulatory pathways. These roles make JMJD3 a potential epigenetic modification tool to generate specific cell types from pluripotent or multipotent stem cells, but off-target effects could limit its utility. Thus, the downstream targets of JMJD3 need to be examined further to determine its utility.