Activation-induced Cytidine Deaminase and Its Role in Reliving the Promethean Dream

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Upon encountering antigens in the germinal centers of peripheral lymphoid organs such as the spleen or lymph nodes, mature B-lymphocytes undergo class switch recombination (CSR). CSR alters B cell expression between different immunoglobulin types. This mechanism requires activation induced cytidine deaminase (AID). However, recent speculation into AID activity has led to the conclusion that, due to its mutagenic properties, AID can function as an indirect demethylase with an ability to decrease heterochromatin sites resulting in increased expression within the genome. The aim of the experiment is the elucidation of AID and its regulatory mechanism within the induction of pluripotency. We hypothesize that when a cocktail of 4 transcription factors Oct4, Klf4, Sox2 and cMyc are introduced into fully differentiated cells using a retroviral vector, the cell undergoes a reprogramming process that promotes its conversion to an induced pluripotent cell. AID is thought to mediate this conversion. Using recombinant mice for AID mutations and various transfection techniques including CaCl2 transfection and electroporation, the transcription factors were introduced into the cell. AID expression was tested via Flow Cytometry and Western Blotting. Results with an LSRFortessa X-20 Cell Analyzer and Compound Confocal lens microscope at 150x indicated that upon infection with OKSM factors AID+ cells began reprogramming showing certain early pluripotent factors while AID knockout cells failed to maintain the pluripotent state for an extended period of time in addition to decreased AID levels in B cells indicating the success of the reprogramming process. AID's role in the optimization in reprogramming holds immense therapeutic potential in the field of regenerative medicine.

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