Abstract

Somatic cell nuclear transfer (SCNT), the technique commonly known as cloning, permits transformation of a somatic cell into an undifferentiated zygote with the potential to develop into a newborn animal (i.e., a clone). In somatic cells, chromatin is programmed to repress most genes and express some, depending on the tissue. It is evident that the enucleated oocyte provides the environment in which embryonic genes in a somatic cell can be expressed. This process is controlled by a series of epigenetic modifications, generally referred to as “nuclear reprogramming,” which are thought to involve the removal of reversible epigenetic changes acquired during cell differentiation. A similar process is thought to occur by overexpression of key transcription factors to generate induced pluripotent stem cells (iPSCs), bypassing the need for SCNT. Despite its obvious scientific and medical importance, and the great number of studies addressing the subject, the molecular basis of reprogramming in both reprogramming strategies is largely unknown. The present review focuses on the cellular and molecular events that occur during nuclear reprogramming in the context of SCNT and the various approaches currently being used to improve nuclear reprogramming. A better understanding of the reprogramming mechanism will have a direct impact on the efficiency of current SCNT procedures, as well as iPSC derivation.

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Keywords: Epigenetics; Somatic cell nuclear transfer; iPSCs; Embryo

Contents

1. Introduction ................................................................. 1870
2. Mechanisms of reprogramming ................................................ 1871
3. Extreme chromatin make over ................................................ 1871
   3.1. Role of histones .................................................. 1871
   3.2. Non-histone changes ............................................. 1872
4. DNA methylation has a say ................................................ 1872
5. The right set of genes .................................................... 1876
6. The best is yet to come ................................................... 1877
7. Conclusions ............................................................... 1879
References ........................................................................ 1880

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