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The diverse roles of nuclear receptors in the regulation of embryonic stem cell pluripotency

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Abstract

Extensive research has been devoted to the goal of understanding how a single cell of embryonic origin can give rise to every somatic cell type and the germ cell lineage, a hallmark defined as “pluripotency”. The aggregate of this work supports fundamentally important roles for the gene transcription networks inherent to the pluripotent cell. Among these, transcription networks have been identified that are both required for pluripotency, as well as sufficient to reprogram somatic cells to a pluripotent phenotype. Several members of the nuclear receptor (NR) super-family of transcription factors have been identified to play diverse roles in the regulation of pluripotency. The ligand-responsive nature of many NRs, coupled with the abundance of genetic models available has led to a significant advance in the understanding of NR roles in embryonic stem cell (ES) pluripotency. Furthermore, the presence of a ligand-binding domain may lend itself to the use of small molecules for a wide range of therapeutic and research applications, even in cases of NRs that do not respond to physiological ligands. Presented here is an overview of NR regulation of pluripotency with a focus on the transcriptional, proteomic, and epigenetic mechanisms by which they promote or suppress the pluripotent state.