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Establishment and maintenance of pluripotent stem cell in mouse and human

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Pluripotent stem cells (PSCs) are unique cell populations with the ability to maintain undifferentiated state in culture, to proliferate indefinitely, and to generate a wide variety of cell types upon differentiation. PSCs are characterized as embryonic stem (ES) cells and embryonic germ (EG) cells according to their origin. Human ES cells form relatively flat, compact colonies whereas human EG cells form tight, more spherical colonies. Human ES cells express stage-specific embryonic antigens 3 and 4 (SSEA-3 and SSEA-4), and alkaline phosphatase. Undifferentiated mouse ES cells and human EG cells do not express SSEA-3, but do express SSEA-1, alkaline phosphatase. Mouse ES cells require leukemia inhibitory factor (LIF) for undifferentiated proliferation. In contrast, LIF alone is not sufficient to prevent differentiation of human ES cells *in vitro*. Instead, continued and undifferentiated propagation of human ES cells require feeder layer and basic fibroblast growth factor (bFGF). PSCs produce teratomas after injection into nude mouse. Each injected mouse forms a teratomas including three embryonic germ layers. For the quality control of PSCs, morphology of PSCs have to be observed daily under the inverted microscope. Monthly, mycoplasma test of PSCs must be performed. Also, PSCs must be tested by Oct4 RT-PCR, immunocytochemical and karyotyping characterization studies every 6 month. Because the research in PSCs will be a particularly valuable model for the study of the cell differentiation, organogenesis, and transplantation medicine, establishment and optimal maintenance of PSCs lines are important for efficient stem cell research.