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TECHNOLOGY ABSTRACT

R1: A Mouse Embryonic Stem Cell Line Enabling Derivation of Completely Cell Culture-Derived Mice

Summary

High-efficiency mouse ES cell line enabling fully culture-derived mice and robust germline transmission.

Background

Embryonic stem (ES) cells are essential tools for generating targeted genetic modifications in mice—work that underpins functional genomics, disease modeling, and preclinical research. High-quality ES cell lines with strong developmental competence streamline the creation of transgenic and knockout mice while reducing failure rates, time, and cost. Traditional methods often require micromanipulation and can be limited by variable germline transmission efficiencies and the need for large founder cohorts. A robust, reliable ES cell line capable of producing completely ES-derived mice offers major advantages for researchers developing new disease models, studying gene function, and accelerating in vivo validation workflows.

Technology Overview

The R1 embryonic stem cell line is a well-characterized, early-passage ES cell line derived from a 3.5-day mouse blastocyst from a 129/SvJ × 129/SV-CP F1 hybrid cross. As a result, R1 maintains the desirable 129 inbred background commonly used for gene targeting while remaining heterozygous at both the albino and pink-eye loci. The line demonstrates exceptional stability and germline compatibility under multiple culture conditions, including growth on STO feeder cells or primary embryonic fibroblast feeder layers supplemented with standard concentrations of LIF, as well as maintenance on gelatinized plates.

One of R1's defining features is its superior developmental potential. Early-passage R1 cells have successfully generated fully ES-derived animals, demonstrating developmental robustness rarely observed in other ES cell lines. When genetically modified R1 cells are aggregated with tetraploid mouse embryos, approximately 15%

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of aggregates develop into completely ES-derived fetuses. This high efficiency enables rapid access to dominant phenotypes and gene expression patterns during prenatal development without requiring germline transmission, significantly accelerating functional studies.

Additionally, ES cell–derived fetal liver from R1-derived embryos provides a rich source of hematopoietic stem cells capable of reconstituting hematopoiesis in up to ten lethally irradiated adults. This capability supports efficient generation of immune-system–reconstituted mice for developmental, immunological, and hematopoietic research. Within the originating institute, R1 has already enabled successful targeting of nearly twenty genes in a single year, with germline transmission rates comparable to micromanipulation-based injection approaches but with reduced technical complexity and cost.

Benefits

- High efficiency in generating fully ES-derived mice
- Reliable germline transmission after genetic manipulation
- Compatible with multiple feeder and culture conditions
- Enables rapid prenatal phenotype assessment via tetraploid aggregation
- Provides fetal liver cells capable of robust hematopoietic reconstitution
- Reduces reliance on complex micromanipulation techniques

Applications

- Creation of transgenic and knockout mouse models
- Rapid functional genomics and gene validation studies
- Developmental biology and prenatal phenotype analysis
- Hematopoiesis and immunology research using ES-derived systems
- Preclinical disease model generation

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