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Review article

Stem Cell Technology- A Perspective on Promises and Challenges for applications in livestock health and production

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Abstract

Cell culture complexity is as shared as that of culture failure due to contamination. All cell culture in laboratories and Stem cells technology has undergone remarkable transformation and offers ample opportunities in livestock production and studies of lineage commitment and molecular developmental dynamics. Innovations in cell culturing and preservation, genomics, cellular metabolomics, nanotechnology, and high throughput screening are expected to solve the major problems currently associated with stem cell technology. Also, reports are available on development of cell lines in some species of domestic animals"

Key words: *Stem cells, Pluripotency, Livestock health, Reproduction biotechnology*

1. Introduction

Since the beginning of 20th century, scientists have come to understand that all of the different types of blood and tissue cells in the body develop from what have come to be referred to as "stem cells." According to the National Institute of Health (NIH), stem cells have the "remarkable potential to develop into many different cell types in the body". Serving as a sort of repair system for the body, these cells in most multi-cellular organisms can theoretically divide without limit to replenish other cells as long as an animal is alive. The recent upsurge in publication on animal stem cells can be taken as reflection of the interest aroused by these cells due to unique biological properties and numerous applications (Munoz *et al*., 2009). Historically, the stem cells research started in 1981 with the milestone publications reporting the establishment of murine embryonic stem cells (Evans and Kaufman, 1981; Martin, 1981).

The stem cells are capable of maintaining the ability to multiply meiotically and differentiate into a diverse range of specialized cells types. The stem cells are categorized into two broad areas namely, embryonic stem cells and adult stem cells. In addition, the stem cells exhibiting stem cell-like characteristics can also be derived from the fetus, cord blood and amniotic fluid of the mammalian species. Embryonic stem (ES) cells are derived from the preimplantation hatching embryos, and are characterized by essentially unlimited self-renewal, and exhibit the ability to differentiate into all cell types in an individual. It is at this point that first step of differentiation takes place during mammalian embryonic development. The individual blastomeres now start to organize themselves into three distinct locations, namely, trophectoderm, the primitive endoderm. ES cells originate from primitive endoderm, which is a transiently existing group of cells in the embryo. *In vitro* produced blastocysts are commonly used as the starting material for ES cell lines.

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Characteristics of embryonic stem cells

ES cells are the pluripotent cells derived from inner cell mass (ICM) cells (Fig. 1) of pre-implantation embryo. They can be cultured and exhibit the capacity for long-term propagation and broad differentiation plasticity (Fig. 2). In addition to the ability to self-renew and differentiate, another important characteristic of stem cells is the ability to replenish their niche. Chemicals and media. The ES cells were first established as cell lines from the inner cell mass (ICM) of mouse blastocysts in