

Somatic cell nuclear transfer in pigs: approaches to increase efficiency and expand application possibilities

Juan Li, MSc

This PhD dissertation was accepted by the Faculty of Health Sciences of Aarhus University, and defended on April 30, 2009.

Official opponents: Heiner Niemann, Ernst-Martin Furchbauer, and Hans Jakob Ingerslev.

Tutor: Arne Lund Jørgensen.

Correspondence: Juan Li, Blichers Allé 4 D, Foulum, 8830 Tjele, Denmark.

Dan Med Bull 2009;56:104

ABSTRACT

The aim of the present study is to increase efficiency with modification of procedures of handmade cloning (HMC) and further to expand the possibilities for application of this method.

During this work, two main modifications, including oriented bisection for enucleation (chemically assisted handmade enucleation and oriented handmade enucleation, Paper I and Paper II) and trichostatin A (TSA) treatment (Paper III and Paper IV) on cloned embryos or donor cells, have resulted in comparatively high efficiency by using the HMC method for the production of transgenic cloned embryos in the pig. It was also confirmed that oriented handmade enucleation method could be used widely in the lab either with non-transgenic or transgenic donor cells (Paper II). Further studies may be needed for wide applications of chemically assisted handmade enucleation method or TSA treatment for cloned porcine embryos.

Furthermore, the first cloned piglets in Denmark were born with modified HMC method with high efficiency (Paper V). HMC has been proven to be an efficient and simplified alternative to traditional cloning: micromanipulator-free somatic cell nuclear transfer in pigs with promising prospects of low cost production of genetically modified pigs. In addition, seven cloned piglets transgenic of a gene (APPsw) causing Alzheimer's disease were born and this technological achievement was ranked in the first level for research in Denmark during 2007 (Paper VI). That means that HMC together with the oriented handmade enucleation method can be applied for production of transgenic animals for human disease models or other usages with high efficiency. It will be one good way to establish the pig model for human disease.