Application of assisted reproductive techniques for the preservation of indigenous pigs

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Indigenous pig breeds are still frequently used for human consumption at certain regions of the world or utilized as model animals for medical research. Therefore, they represent a considerable economic and scientific value. Recent epidemies of African Swine Fever threaten the existence of many native pig breeds worldwide which underlines the importance of in vitro gene banking. Cryopreservation of porcine gametes and somatic cells requires the application of assisted reproductive techniques (ART) such as in vitro embryo production (IVEP; employing in vitro maturation (IVM) of oocytes, in vitro fertilization (IVF) or intracytoplasmic sperm injection (ICSI) and subsequent embryo culture), or somatic cell nuclear transfer (SCNT). Nevertheless, reports on the application of these techniques for the preservation of native pig breeds are very scarce.

In the last decades, our laboratory established reliable protocols for sperm freezing, ART and oocyte/embryo vitrification in modern pigs. In recent years, we applied many of these techniques for the preservation of some indigenous Asian pig breeds. Boar sperm has been frozen for gene banking in several native Vietnamese breeds and in the Japanese Agu pig. We applied IVEP, oocyte vitrification, and zygote vitrification techniques in the native Vietnamese miniature Ban pig with efficacies similar to those of modern breeds [1-4]. Furthermore, production of blastocyst-stage embryos by SCNT has also been applied in native Vietnamese breeds [5]. Nevertheless, the difficulty of surgical embryo transfer under sterile conditions limits the application of these technologies for offspring production. In the Agu pig, IVM of oocytes and IVF with frozen sperm have been applied and, after the transfer of zygotes into recipients, live piglets could be obtained for the first time an indigenous pig breed [6]. Furthermore, neonatal Agu testicular tissue segments could be vitrified then grafted into immunodeficient mice to obtain spermatozoa which were utilized by ICSI to produce blastocyst stage embryos [7]. Cryopreservation of oocytes and zygotes is in progress in this breed.

In conclusion, the preservation of porcine genetic resources is an urgent task and gamete cryopreservation combined with ART is an efficient tool for this purpose. (Supported by JSPS KAKENHI 21K05912).

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