

論文内容要旨

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学位論文題目	Elucidation of infertility in crossbred cattle-yak and development of yak semen preservation method		
<p>内容要旨</p> <p>Yaks are long-haired members of the cattle family adapted to living in high mountains beyond the forest limit and are important domestic animals in the lives of Mongolian nomads. However, their reproduction relies on natural mating by males, and artificial insemination is not widespread. Managing yak reproduction affects productivity and income; hence, we believe that introducing AI technology will help stabilize livelihoods. Therefore, in Chapter 1, we describe the development of a semen cryopreservation method for yaks. The semen used for freezing was provided by spermatozoa derived from ejaculation and the epididymis following castration. The usefulness of adding the OEP to the semen extender was investigated to improve motility and viability after freezing and thawing. OEP is a surfactant that, together with egg yolk, protects against frost damage. The results showed that adding 0.75% OEP significantly improved the quality of semen from both sources.</p> <p>Having confirmed the usefulness of OEP addition, we turned our attention to the refreezing techniques. Using sex-sorted semen in cattle has become common in recent years, and efficient sexing is important for reproductive management. In Chapter 2, we investigated the effect of adding OEP to the semen extender for refreezing to improve semen quality after double freezing in cows. The results showed that adding 0.375% OEP improved motility, viability, and membrane integrity. However, despite the quality improvement, nearly 70% of sperm did not survive, indicating that more research is warranted.</p> <p>Concurrently with frozen semen, we examined infertility in male cattle-yaks. Mongolian nomadic herds contain not only yaks but also domestic cattle. Although yaks are members of the cattle family and there are crossbreeds between yaks and cattle, male cattle-yaks are sterile. Although male sterility has been elucidated at the epigenomic, genetic, and molecular expression levels, we examined the balance between cell proliferation and apoptosis using PCNA as a marker for cell proliferation and TUNEL staining for apoptosis. In Chapter 3, these indices were examined in germ cells and spermatogenesis-related somatic cells by comparing yaks and cattle-yaks. The results showed that spermatogenic cells proliferate both in the</p>			

yak and the cattle-yak. However, apoptosis in spermatogenic cells was significantly lower in cattle-yaks than in yaks, suggesting that an imbalance between cell proliferation and apoptosis may result in spermatogenesis arrest. In addition, although neither cell proliferation nor apoptosis in Leydig cells was observed in yaks, both were in cattle-yaks. However, the apoptosis index was lower than the cell proliferation index, suggesting that hyperplasia occurred. This phenomenon may contribute to infertility. In recent years, there has been a revolution in gene modification technology, which continues to advance. We hope that the creation of genetically modified animal models will advance research and explain infertility in Japan. Many issues are yet to be investigated to improve semen freezing technology and elucidate infertility issues in cattle-yak hybrids, further research is required to integrate these technologies.