

POTENTIAL, OPPORTUNITIES AND CHALLENGES OF LANYU MINIATURE PIG

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ABSTRACT

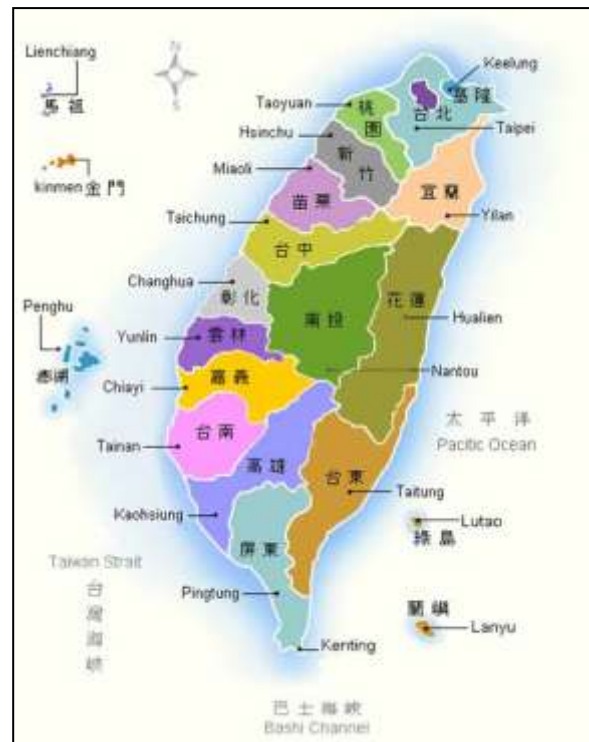
Lanyu miniature pig is conserved at Taitung Animal Propagation Station (TAPS), a branch of Taiwan Livestock Research Institute (TLRI) since 1980 with a founder herd of 4 male and 16 female pigs from a solitary island Lanyu (Orchid Island). Pig is physiologically and anatomically similar to that of the human, and its miniature size is a good size for the development of animal model on biomedical research. Recently, four selected breeds have been derived from Lanyu Pig and named officially during the period of 2003 to 2011. TAPS was accredited by AAALAC on animal care facilities and programs in 2013. Pig model on heart disease, tissue engineering, medical device, new therapy development, and organ transplantation has been conducted with the usage of Lanyu Pig. As per the present terms, 20 female pigs of Lanyu Pig and 70 percent of the designed throughput of pregnancy of the whole project will be off-loaded for establishment of a breeding herd in each cooperative institute, which will be helpful to promote Lanyu Pig development and to input global contribution of native genetic resources.

Key words: Genetics, Miniature pig, Utilization

ORIGIN

Lanyu miniature pig was named as Taiwan Small-eared pig characterized in small ears and small body size at mature stage. Pig has a black coat color, straight erect face and small ears.

Taiwan small-ear pigs disappeared from the main Taiwan Island before World War II



due to its less economically efficient on meat production. However, they do exist on a solitary island Orchid Island, also called Lanyu in Chinese. Lanyu is a separate island off Taitung County in southeast Taiwan in the Pacific Ocean. Conservation program of this indigenous Black Small-ear pig existence in Lanyu has been conducted by National Taiwan University since 1975 and by Livestock Research Institute since 1980. Based upon the source of conserved pig population, 1998 Mason's World Dictionary of Animal Breeds identified this Small-ear pig as named of Lanyu Pig for Taiwan Black Small-ear pig and introduce them come from a solitary island Lanyu. The Tao tribe on Lanyu raised indigenous Small-eared pigs before the official conservation policy made at 1987. They kept Small-eared pigs in bunkers. With not enough for food, the pigs were fed taro skins, garbage and human excrement. Century after century natural selection has given Small-eared pig a small body size. Also, the Tao traditionally choose a nursing piglet for food, which can reduce the litter size of nursing and ensure the sow's reproduction success under poor environmental conditions. Thus, both natural and artificial selections strategies helped the development of miniature pig in Lanyu.

The adult boar of exotic breeds is, in general, heavier than that of gilt and it was not the case in Lanyu miniature pig. Reasons for this are as follows: (1) The artificial selection method used by the Tao tribe resulted to larger male pigs slaughtered for meat and the smallest male pig reserved as the special male piglet for replacement. (2) Early sexual behavior, such as mounting each other starting from 4 months of age, occurred in pre-pubertal boar. Early puberty in male piglet also results appetite loss and standing at attention for females, and thus loss his body weight.

POTENTIAL

The Lanyu Pig utilization roadmap (TAPS section) commenced delivery of mature boars back to the origin land Lanyu (village section) after it was concerned by Agriculture Ministry Bao-Ji Chen in summer of 2012 for risk management of local genetic resources and re-utilization. The roadmap is part of the Lanyu Pig conservation and utilization project, which also includes a social-cultural utilization in local society. Starting from the genetic resources from the national conservation herd on TAPS, its genetic materials will pass through the sow herd at Lanyu villages and connects the piglet production for cultural activity at festival. It will take three years to construct and measure genetic distribution of mature boars in the Lanyu village section of the roadmap, which could undergo a test run of one boar one village basis in 2014. For those farms of having artificial insemination technology, semen collection, dissemination and storage of Lanyu Pig shall be promoted locally, even internationally, for possible new breed development by crossbreeding with other breeds from hog production farms and regeneration rate of the frozen-thawed semen under ex-situ conservation.

OPPORTUNITIES

Lanyu Pig has suitable organ size for surgical practice on liver, kidney, lung and heart transplantation in medical education program and is worth of treasure sources for research and education purposes in Taiwan biomedical industry. The foreign investment in Lanyu Pig production shall be encouraged in near years, it will increase in the future as Lanyu Pig prepares to generate out more of its cell culture lines and cancer research for new drug targeting therapy in human health. In August 2010, the symposium on Minipigs in Biomedical

Research at Taiwan offered opportunities for sharing needs of biomedical colleges and has awarded several new concerns to miniature pig farming firms. One contentious issue related to utilization of Lanyu Pig is the exportation of genetic materials and international cooperation projects on what, where, when and how. As per the present terms, 20 female pigs of Lanyu Pig and 70 percent of the designed throughput of pregnancy of the whole project will be off-loaded for establishment of a breeding herd in each cooperative institute, which will be helpful to promote Lanyu Pig development and to input global contribution of native genetic resources.

CHALLENGES

Bio-utilization of miniature pigs from Lanyu has been a priority for TAPS since the early 1980s, especially after it overtook the pig farm at National Taiwan University as the Taiwan's largest overall laboratory pig in 2000. To ensure the bio-security of Lanyu Pig pure-lines (Lanyu 200 and Lanyu 300), TAPS has constantly been making efforts to diversify its reproductive management systems with pedigree tracking. Besides bypassing of Lanyu Pig pure-lines, a noteworthy implication of these pure-lines lies in the fact that they will carry genes from Lanyu 200 as close as possible to Lanyu miniature pigs and by the marker-assisted selection of mitochondrial DNA and XY-chromosomal markers. Further, these pure-lines will also provide TAPS a potential direct line to study adaptation and fertility in oversea environment and perform a crossbreeding project with various breeds for biomedical research. This will provide a significant cost advantage to the biomedical research entities in the forthcoming human cancer research. However, what Taiwan will be watching with concern is the change in bio-utilization and conservation of Lanyu Pig. It is expected that as early as possible, application of semen in crossbreeding will shift part of Lanyu Pig resources from genetic security focus to the development of new utilization schemes. As other cooperative institutes and/or breeding farms take on the path of economic utilization, it will bring both challenges and opportunities for TAPS to have the international cooperation on utilization of Lanyu Pig and it will show a global science value of miniature Lanyu Pig.