

Preserving Genetic Resources



- Genetic resources for livestock are cryopreserved and stored in liquid nitrogen (-196°C; -320°F) using a variety of cryoprotectants. The germplasm collection is comprised of semen, embryos, ovaries, testis, and blood.
- Once cryopreserved these samples have unlimited longevity. Meaning that livestock from any era in the gene bank can be withdrawn and used at any time by industry or research communities.

Transplantation of cryopreserved ovaries into 3 to 5 day old chicks enables the reconstitution of chicken lines in 12 to 14 months. NAGP uses this approach to preserve poultry industry lines.



Hog Island sheep are representative of those raised by George Washington. This rare breed is still maintained at Mount Vernon. With shipping protocols developed by NAGP, samples were collected from rams in Virginia and sent to us for freezing and added to the collection.

Information about us:

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United States Department of Agriculture

Agricultural Research Service

**National Center for
Genetic Resources Preservation**

A graphic of numerous blue sperm cells swimming towards the right, set against a white background with a blue curved shape on the left.

ANIMALS





Why Preserve Animal Genetic Resources?

The mission of the National Animal Germplasm Program (NAGP) is to provide genetic security and increase genetic understanding of U.S. livestock. With secure and well documented genetic resources the livestock sector will have greater capacity to adapt to food insecurity and climate change challenges. We use an integrated approach comprised of information systems, genetics and cryobiology along with interaction with national and international partners to address these issues.

Utilizing Genetic Resources

- Samples from over 5,000 animals have exited our repository for research and industry to use in DNA analysis, reconstituting populations, or broadening genetic diversity in a breed. But to use such a resource an information management system is needed for all processes of genetic conservation.
- The NAGP collaborates with agriculture research agencies in Brazil and Canada developing an internet based information system to allow each country to better manage genetic resource collections, compare collections to in-situ populations, and exchange information among countries. The information management system not only keeps track of samples but also information about the production system, environment, and phenotypes of animals in the collection.
- The ability to access such a collection supports the livestock industry's drive to remain competitive and facilitates genomic research.



Holstein cow (born 2010) from the 1960 control line.

Did You Know?

- We are one of the world's largest animal gene banks with over 760,618 samples (semen, embryos, ovaries, blood), from 21,394 individuals from 33 species. Over 200 breeds and industrial populations are represented in the collection.
- Scientists from Iraq, Philippines, Kazakhstan, Brazil and Canada have completed long term training in animal genetic resources conservation with NAGP.

Acquiring Genetic Resources

- We acquire a broad range of germplasm and tissue samples from all sectors of the livestock industry, either as freshly collected or already cryopreserved.
- By acquiring a broad range of genotypes within breed and species a resource has been developed for the livestock industry and research community.
- To date of the 118 breeds in the collection 38 can be fully regenerated and another 22 are approaching that benchmark.
- Holstein is the world's most important milk producing breed. Our Holstein collection is more diverse than the national herd. The collection was made possible by industry generously supporting this program. Included in the collection are prominent bulls and research lines like a control line which has not been selected for milk production since 1960.



A university used semen from the collection to totally regenerate a line of pigs to study a human disease.

Evaluating Genetic Resources

- Building viable germplasm collections requires a continuous assessment of genetic diversity found among livestock populations. This can be accomplished by using pedigree or DNA markers.
- For cattle, sheep, goats, pigs and bison we have assessed the genetic diversity within the U.S. and collaborating countries, and compared the collection to in-situ genetic diversity for selected breeds. These results guide collection development and provide an overview to industry.



Angora goat numbers have greatly declined. Texas Angora producers generously provided access to goats for collecting embryos and semen for the collection