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Translation and application of equine genomics: The Havemeyer principles

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Dear Editors,

Recently, scientists participating in the 12th Dorothy Russell Havemeyer Foundation Workshop on Horse Genomics created a statement of the principles guiding their collaboration. The principles are not unique to the horse genome workshop but are really a statement of how all scientists approach investigations and their responsibility to the stakeholder community they serve. In this case, our stakeholders are those people who own, work and enjoy horses. The statement, which we refer to as the Havemeyer Principles, are an affirmation that the horse genome project is not just a technical exercise, but rather a collaboration designed to empower research on horses and find solutions to problems that have defied earlier technologies. Furthermore and perhaps the most important aspect is the principle that we are responsible to our stakeholders.

When we began the horse gene mapping program in 1995 under the auspices of the Dorothy Russell Havemeyer Foundation, many people asked when the project would be finished. We had no idea. When the whole genome sequence of the horse was completed in 2006 and published in 2009, many asked if this was the end of the project. It could have been. However, the activity was more than a technical accomplishment. The motivation for the genome scientists was to find solutions to problems that had long vexed horses and horse owners. Indeed, most of the participants in the workshop were not molecular geneticists but rather were veterinarians, microbiologists, immunologists, reproductive biologists and animal scientists. The genome studies created tools that are now being applied in those disciplines.

Today the work continues with the goal of using the genome sequence to better understand how genes work together to fight infectious diseases, fail and cause disease or function to create more athletic individuals. This work is being done in concert with an international project called 'Functional Annotation of Animal Genomes (FAANG)' involving scientists working on diverse animal species. While there are approximately 21,000 genes in the genomes of all mammals, each tissue will express only 10,000 to 12,000. The set of genes

expressed is characteristic of the tissue, its function and its state of health. We believe that this information will lead to discoveries that benefit the health and performance of horses.

The Havemeyer Principles enshrine the following key elements:

- scientific discovery should be reproducible and subject to the peer-review process;
- scientific research projects must conform to best practice in relation to owners' consent for use of samples and research ethics;
- industry stakeholders must be provided with the opportunities for education so that scientific developments are best communicated for translation into practice that will have the greatest potential to benefit the horse;
- clear differentiation must be made between scientific developments, commercial opportunity and opinion;
- some genetic tests may be diagnostic for the presence or absence of a trait; others may be used as a screening and selection tool for prediction of potential to develop a trait;
- the integration of genetic information with traditional breeding approaches will be important for the sustainability of a healthy horse population for the future.

The statement also reiterated that the equine genomics research community continues to welcome collaboration and cooperation with the equine industries.

The Consensus Statement on the Translation and Application of Genomics in the Equine Industries can be found at the following link: <https://horsegenomeworkshop.com/values>