

U.S. HORSE GENOME COORDINATION PROGRAM ACTIVITIES

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Overview: Coordination of Horse Genome Coordination Program is under the National Animal Genome Research Program (NAGRP) and is the effort at the University of Kentucky. CSREES support is allocated from NRSP-8 and provided to the Agriculture Experiment Stations by off the top funding. The NAGRP is made up of the membership of the Animal Genome Technical Committee, including the Horse Species Subcommittee.

Coordinators:

Ernest Bailey, PhD; professor, University of Kentucky
Samantha Brooks, PhD; assistant professor, University of Florida
Molly McCue, DVM, PhD, DACVIM; professor, University of Minnesota

Objectives:

1: Advance the status of reference genomes for all species, including basic annotation of worldwide genetic variation, by broad sequencing among different lines and breeds of animals.

2: Develop strategies to identify and exploit genes and allelic variation that contribute to economically relevant phenotypes and traits, in part through improving functional annotation of the genomes of our species.

3: Facilitate analysis, curation, storage, distribution and application of the enormous datasets now being generated by next-generation sequencing and related "omics" technologies with regard to animal species of agricultural interest.

Objective 1:

New Reference Genome Assembly

Ted Kalbfleisch Ted, Jamie MacLeod and Ludovic Orlando were funded by the Morris Animal Foundation to create a new assembly of the reference sequence, the putative Ecab 3.0. Partial support for a postdoctoral student is provided by USDA-NRSP8 coordinators' funds. The grant proposal and work is underpinned by data provided by workshop participants including whole genome sequence information from TWILIGHT (reference horse) and from horses of other breeds. The work began in 2015 and is planned for completion in August 2016.

Whole Genome Sequences

In connection with research projects, many of which are cited in the reference section, over 200 horses have had their whole genomes sequenced. Many of those sequences are being used for the new assembly described in the previous paragraph and were used to identify SNPs for construction of the 670K SNP assay tool described below.

Access to reference DNA

The primary CHORI 241 BAC library was moved from the Childrens' Hospital of Oakland to the laboratory of Samantha Brooks (co-coordinator) at the University of Florida. This action was necessitated by the closing of the commercial operation of the BAC library. This move ensures continued research access to the library.

OBJECTIVE 2:

New SNP assay tool

The 670K SNP chip was made available in late 2015 for research on horses. This initiative was driven by Dr. Molly McCue (co-coordinator) of the University of Minnesota with support of students, co-workers and funding from several agencies including the USD-NRSP8 coordinators' fund. Geneseek

(NE) is a commercial laboratory offering testing .

Objective 3:

During 2015, the horse workshop group was invited to join the FAANG initiative. Jamie MacLeod of the University of Kentucky serves on the guiding committee for FAANG and also oversees cooperation among scientists studying the horse. During 2015, three scientist (Carrie Finno of UC Davis, Rebecca Bellone of UC Davis and Jessica Peterson of the University of Nebraska) applied for funds to collect tissues and begin conducting assays associated with the FAANG program. We are waiting to hear the results of that application. Regardless, we have committed NRSP8 coordinator funds to collection of tissues to benefit this or future applications. A meeting of the horse genome workshop committee is being planned for the ISAG meeting to be held in Utah in July 2016 to make plans.

Database Activities: Two databases compile published genetic data for horses:

<http://locus.jouy.inra.fr/cgi-bin/lgbc/mapping/common/intro2.pl?BASE=horse;>
<http://www.thearkdb.org/> .

Several genome browsers have been developed at the University of California, Santa Cruz, ENSEMBL and NCBI: <http://www.genome.ucsc.edu/cgi-bin/hgGateway?hgsid=95987985&clade=vertebrate&org=Horse&db=0;>

http://www.ncbi.nlm.nih.gov/mapview/map_search.cgi?taxid=9796;

<http://www.equinegenome.org/Equinegenome.org.html>http://pre.ensembl.org/Equus_caballus/index.html.

A SNP database is available: <http://www.broad.mit.edu/mammals/horse/>.

A RNAseq database: <http://macleod.uky.edu/equinebrowser/>

A major entry point for databases and other relevant information about the horse genome workshop and participants is the workshop website: <http://www.uky.edu/AG/Horsemap>.

International Efforts: The horse genome technical committee is an international activity with approximately half of the participants coming from Europe, Africa and AustralAsia while the other half come from North America. Approximately 80 people participated in the workshop meeting in San Diego during January 2016.

Communication: Communication within the horse genome workshop is facilitated by an email list for sharing information by the Horse Genome Coordinator and through the website:

<http://www.uky.edu/AG/Horsemap>. One of the major aspects of the website is to increase its value for informing members of the horse industry about the scientists using horse genomics to solve important problems and to explain the value of horse genomics

Travel and Meeting Support: For the 2015 Fall FAANG meeting in Washington DC, Coordinator funds were used to support participation for 6 scientists. For the January 2016 PAG conference, travel awards were provided to 19 students, including one Jorgenson award, and travel support for two invited speakers to the Horse Genome Workshop and one for the NRSP8 general meeting.

Future Activities: During 2016 a workshop on Horse Genomics will be conducted under the auspices of the Dorothy Russell Havemyer Foundation in conjunction with the USDA-NRSP8 at the Conference of the International Society for Animal Genetics (ISAG) in Salt Lake City Utah. The workshop will focus on the need and likely applications of gene expression tools for the horse. In addition, the ISAG conference will include a workshop on application of genomic tools to address health and performance issues of interest for horse owners and horse breeders.

Publications for 2015 (based on reports from 20 institutions)

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