**U.S. HORSE GENOME COORDINATION PROGRAM ACTIVITIES**

*Supported by Regional Research Funds, Hatch Act for the Period 1/1/16-12/31/16*

**Overview:** Coordination of Horse Genome Coordination Program is under the National Animal Genome Research Program (NAGRP) and the effort is based 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 a report provided during the July 2016 conference of the International Society for Animal Genetics (ISAG) in Salt City, Utah. The new assembly improved gene annotation, increased contig N50 from 112 KB to 1.4 MB, and eliminated most of the regions with ambiguous sequence (“Ns”). Some revisions are being made and the work will be published in 2017.

**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. The Illumina SNP70 continues to be available. These resources have been used for gene discovery during 2016 as reported in the accompanying bibliography, as well as reports made at various conferences during 2016.

**Objective 3:**

In 2016, three scientists (Carrie Finno of UC Davis, Rebecca Bellone of UC Davis and Jessica Peterson of the University of Nebraska) were awarded funds by the Grayson Jockey Club Research Foundation to collect tissues and begin conducting assays associated with the FAANG program. The work is also supported by the Horse Genome workshop community and funds have been provided from the coordinators USDA-NRSP8 funds to support tissue collection. The workshop is using an “adopt a tissue” approach for scientists to fund characterization of tissues of interest. And organizational meeting, supported by the Dorothy Russell Havemeyer Foundation, was held at the July 2016 ISAG conference to coordinate sharing of the tissues and work to characterize their gene expression.

In connection with the FAANG initiative, coordinator funds were used to support participation by Dr. Ted Kalbfleisch at the European Hackthon, an initiative designed to make the annotation information derived from the FAANG activities available for research.

#### **Database Activities:** .

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

**International Efforts:** The horse genome technical committee is an international activity with approximately one third of the participants coming from Europe, Africa and Australasia while the other half come from North America. Approximately 60 people participated in the workshop meeting in San Diego during January 2016. Jessica Petersen (Jessica.petersen@unl.edu) will chair the 2017 Horse Workshop and Stephen Coleman (Stephen.coleman@colostate.edu) will serve as vice-chair.

#### **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 2016 Hackathon meeting in Denmark, coordinator funds were used to support participation by Ted Kalbfleisch. 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.

**Future Activities:** During 2017 a workshop on Horse Genomics will be conducted at the Conference of the International Society for Animal Genetics (ISAG) in Dublin, Ireland.

Publications for 2016 (based on reports from 28 institutions)

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Funds Leveraged by the USDA-NRSP8 Horse Technical Committee for 2016 Based on 28 Labs Reporting

 Total for 28 Labs US Labs Reporting (N=18)

Local Funds: $930,651 $903,166

Industry Funds: $1,066,337 $843,934

Federal Funds: $5,734,236 $2,766,201

**Total: $7,731,224 $4, 513,301**