



POULTRY GENOME NEWSLETTER 2004

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DRAFT CHICKEN GENOME SEQUENCE RELEASED 03/01/04

Chicken Sequence Released! The **Washington U. Genome Sequencing Center** (WUGSC) and the **National Human Genome Research Institute** formally announced the release of the draft chicken genome sequence on March 1. This achievement received considerable coverage in both the popular and scientific press. The official press release can be found at <http://www.genome.gov/11510730>. The initial assembly, based on 6.6X sequence coverage of the genome, has been deposited into GenBank (www.ncbi.nih.gov/Genbank), EMBL-Bank (www.ebi.ac.uk/embl/index.html), and DDBJ (www.ddbj.nig.ac.jp). As described in previous issues, the sequence derives from a single (female) UCD001 line inbred Red Jungle Fowl. Thanks to **Richard Wilson, Wes Warren, LaDeana Hillier and all the other WUGCS Staff**, past and present, who've produced the chicken genome sequence.

Viewing the Sequence. The sequence, along with alignments to the human genome, can be accessed at three different browsers: the U. of California, Santa Cruz Genome Browser, (<http://genome.ucsc.edu/cgi-bin/hgGateway?org=Chicken&db=0&hgsid=30948908>); the National Center for Biotechnology Information (NCBI) Chicken Genome Resources Guide, (<http://www.ncbi.nlm.nih.gov/genome/guide/chicken/>); and the European Bioinformatics Institute's Ensembl system, (http://pre.ensembl.org/Gallus_gallus/). Please be aware that these chicken browsers are still works in progress, and that you may find information or a type of graphics display at one of them that's more useful to you than another. See also the WUGSC chicken site at <http://genome.wustl.edu/projects/chicken/>. A paper is being prepared to describe the sequence and its primary attributes that will probably be submitted in June.

Draft Sequence. It's important to understand that the draft sequence is just that, a draft. If you access your gene(s) of interest, you may find that it includes one or more short stretches of unknown sequence (-NNNNNNN-) or you may find it's missing an exon or two or you may find an exon stuck somewhere else in the genome. Moreover, a considerable portion (~10%) of the blocks of known sequence (sequence contigs) are of uncertain location and are placed in the "chromosome unknown" pool. To take an extreme example, due to its relative lack of linkage map markers and its high repetitive content, much of what must be W chromosome sequence is not yet assigned to W. Similarly, there are also smaller pools of sequence contigs that are assigned to a chromosome, but whose location and/or orientation within that chromosome's sequence cannot be assigned with confidence (e.g., GGA1_random for chromosome 1). Some of these problems will be resolved by further annotation and experimentation, and corrections will be incorporated into future "builds" of the chicken genome sequence. As described in the last newsletter, funds are being sought for a "pre-finishing" phase that would eliminate some of the

sequence contig gaps in a cost-effective manner. Moreover, WUGSC is generating a proposal to "finish" the chicken sequence to the high quality levels now available for mouse and human. This would require a significant commitment of NHGRI resources. **Anyone wishing to support the request to NHGRI to finish the chicken genome sequence should contact Dr. Adam Felsenfeld (felsenfa@mail.nih.gov) of NHGRI as soon as possible, explaining how a finished sequence would be of value.**

BAC Contig Physical Map. The WUGSC BAC contig physical map, based on over 133,000 BAC fingerprints is comprised of about 260 contigs, nearly 80% of which have been anchored to the genetic linkage/chromosome map. This map provided an essential companion to the sequence assembly process. The mapping effort has been led by **Wes Warren** and **John Wallis** at WUGSC with assistance from **Jan Aerts** and **Martien Groenen** of Wageningen U. and others. Jan and Martien have developed the ChickFPC browser in AceDB format at <http://www.animalsciences.nl/ChickFPC/>, allowing one to search the map beginning with a known gene, marker, or BAC. (Keep in mind that some contigs are not aligned with chromosomes and that not all BACs have fingerprints within the database.) Thanks to all in the Groenen lab who've contributed to this resource.

Chicken SNPs. Through the efforts of **Bin Liu** and **Gane Ka-Shu Wong** and others at the **Beijing Genome Institute** and elsewhere, approximately 0.5X whole genome shotgun sequence information has been assembled for each of a White Leghorn, a broiler, and a Silkie genome. Because the WUGSC base sequence is from a Red Jungle Fowl (RJF), comparison of these three to the RJF and to each other has generated a very large collection of genetic polymorphisms, mostly single nucleotide polymorphisms or SNP. It's expected that these data will be very useful in future QTL studies and possibly in understanding the genetic basis for domestication and selection of the modern chicken. A paper describing these SNP will be submitted as a companion to the genome sequence paper, and the data should be made public shortly.

PAG XII & NAGRP/NC-1008 Meeting Report

PAG-XII was held **January 10-14, 2004** at the usual location, the **Town and Country Hotel, San Diego, CA**. See www.intl-pag.org/. The **NC-1008 Multistate Research** project committee that replaced NC-168 met concurrently, as did the **National Animal Genome Research Program, NRSP-8**. There was great excitement this year about the impending chicken genome sequence, attendance at NC-1008/NRSP8-Poultry was high and the content of this year's presentations on chicken genetics was unsurpassed. PAG highlights for chicken included **Wes Warren's** plenary lecture on "Analysis of the Chicken Genome" and **Laurie Gordon's** workshop presentation on comparison of the chicken, mouse and human sequences in regions orthologous to HSA 19. Interesting general talks were presented on topics of proteomics, RNAi, domestication and selection, molecular-based breeding and the use of wild germplasm. **Bill Muir** organized an outstanding NC-1008/NRSP8-Poultry Workshop with several excellent guest presentations in addition to regular Station reports. For the first time in recorded history, we followed a pre-arranged schedule and were able to keep to our respective time slots with no substantive difficulties. For details on presentations, titles and abstracts, go to <http://www.intl-pag.org/12/12-poultry.html>. **Chris Ashwell** is the new chair for NRSP8-Poultry with **Kent Reed** as secretary, and **Doug Foster** (a.k.a., "Old Fur Face") takes over as chair of NC-1008 with **Tom Porter** elected secretary. Finally, congratulations to **Melissa Schreiweis** of Purdue University, this year's recipient of the **Neal A. Jorgensen Student Travel Award for Poultry!**

WASHINGTON UPDATE:

The **NRI competitive grants Program** (www.reeusda.gov/nri/) **Animal Genomics, Animal Genome Reagent & Tool Development and Functional Genomics of Agriculturally Important Organisms deadlines are June 15, 2004.** Total 2004 NRI funding was finally approved at \$165M. New, multi-institutional special programs have been added to the '04 RFA, and it's unclear how much these will detract from individual investigator-based awards. Funding limits have also increased, most often to a total of \$500,000 (varies depending on program).

ON THE ROAD AGAIN. UPCOMING MEETINGS:

XXII World Poultry Conference, June 8-12, 2004, Istanbul Turkey. Email WPSA2004@WPSA2004.org or contact Servet Yalcin, Yalcin@ziraat.ege.edu.tr.

Poultry Science Association Annual Meeting (joint with American Dairy Science Assoc. and American Society of Animal Science), July 25-29, 2004, St. Louis, MO. See www.fass.org/2004.

ISAG 2004, 29th International Conference on Animal Genetics, Sept. 11-16, 2004, Surugadai Campus, Meiji University, Tokyo, JAPAN. See <http://www2.kobe-u.ac.jp/~isag2004/>

GSAC XVI, sponsored by The Institute for Genome Research, Sept. 27-30, 2004, Washington, DC. See www.tigr.org/conf/gsac for more information.

Ninth DISCOVER Conference on Food Animal Agriculture. "Protecting and Managing Animal Genetic Resources for Future Generations: The Next Steps", November 2-5, 2004, Cheyenne, Wyoming. See www.adsa.org/discover/ for further information.

Plant and Animal Genome XIII, joint with NC-1008 and NAGRP annual meetings, Jan. 15-19, 2005, Town & Country Convention Center, San Diego, CA. See www.intl-pag.org/.

CHICKEN CHIPS, ESTs and cDNAs

A 13K chicken spotted cDNA glass slide array is now available from the Array Facility at the Fred Hutchinson Cancer Research Center, FHCRC. This is the result of combined efforts of FHCRC (**Jeff Delrow** and **Paul Neiman**), the U. of Delaware (**Joan Burnside**), GSF, Munich (**Jean-Marie Buerstedde**) and the Roslin Institute (**Dave Burt**). A similar resource is being made available by **ARK-GENOMICS** at the Roslin Institute (<http://www.ark-genomics.org/resources/chicken.html>) for those outside the U.S. FHCRC arrays are available at \$150 per array. Email requests to genomics@fhcrc.org. A technical report describing details of the construction and use of the arrays and the source of the cDNAs spotted can be downloaded from <ftp://milano.fhcrc.org/ArrayLab/chicken13k/tech.report/>.

Affymetrix, Inc. and a consortium of chicken geneticists are discussing the content for a synthetic oligo "chicken chip" that could be available late this year. Preliminary estimates are that the chip would target 42,000 mRNA sequences (chicken plus a limited number of chicken pathogens) with 16 probe pairs/sequence. Suggestions or comments can be sent to **David Hanna** (David.Hanna@affymetrix.com) of Affymetrix.

The **BBSRC/Dundee/Nottingham/Sanger/Sheffield/UMIST Gallus gallus cDNA sequencing project** (mentioned last issue) has announced the public availability of an enlarged set of (full length) chicken cDNA sequences finished at the Sanger Institute. 16212 cDNAs have passed quality control and will be available from EMBL/Genbank shortly. A (very large) file

with all 19076 finished cDNA sequences is available at
www.sanger.ac.uk/Users/mdr/chicken/all_chicken_cDNAs_20_04_04.fasta.gz

POULTRY MICROSATELLITES

Microsatellite primer kits: Information on chicken microsatellite primer pairs can be found at <http://poultry.mph.msu.edu/resources/microkits.htm>. A version of a framework primer kit (with 147 well-spaced microsatellite marker primer pairs) called the "Comprehensive Mapping Kit #7" is available. Only this and the Population Tester Kit, designed for the rapid testing of the suitability of populations and/or chicken microsatellites for a given application, are still available, as demand has waned in recent months. If interested, contact: (dodgson@msu.edu) or (hcheng@msu.edu), describing your desired use of primers.

THE BAC PAGE!

The **chicken BAC library** constructed at Texas A&M by **Hongbin Zhang** and colleagues, using (a female of) the UCD001 Jungle Fowl line as its DNA source, consists of over 115,000 BACs (~39,400 each in three sublibraries with *Bam*HI, *Eco*RI and *Hind*III partial digest inserts, called TAM31, TAM32, and TAM33, respectively; Lee et al., *Animal Genetics* 34: 151; Ren et al., *Genome Research* 13: 2754). Filter sets with 36,864 BACs from the *Bam*HI and *Hind*III sublibraries are available, email dodgson@msu.edu. **Pieter de Jong** (Children's Hospital of Oakland Research Institute) has made a **chicken BAC library with ~195 kb inserts (CHORI-261)**, using the same UCD001 source DNA. CHORI-261 has ~73,700 BACs for ~12x haploid genome coverage. Pieter has also generated a **turkey BAC library (CHORI-260)** using DNA from an inbred Nicholas Turkey Breeding Farms bird. If interested in either library and/or filter arrays, see www.chori.org/bacpac/. **Coordination funds have been used to purchase a limited number of CHORI-261 chicken BAC filter arrays and a set can be provided on request while supplies last.** Pieter's group has also constructed a **fosmid library** using the same source DNA. If interested, contact BACPAC at www.chori.org/bacpac/.

Your gene/marker of interest may already have BACs identified that contain it! See our list of over **720 different genes and markers that have now been placed on over 5700 specific BAC clones** from the TAM31, TAM32, TAM 33 and CHORI-261 libraries. These are listed at <http://poultry.mph.msu.edu/resources/Resources.htm#bacdata>.

IN MEMORIAM

This issue ends on a very sad note. **Nat Bumstead** of the **Institute for Animal Health at the Compton Laboratory** passed away on April 19 after a long illness. As most readers know, Nat was a world leader in research on the genetics of avian infectious disease and one of the pioneers of poultry genomics. His lab generated the first full genome DNA-based chicken linkage map, and he was very active in the efforts to sequence the chicken genome. I'm sure that all who knew him will agree that he was not only among the finest scientists, but also one of the nicest people in our business. He will be sorely missed and our condolences go to his family and many friends.

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