

**U.S. Department of Agriculture
Agricultural Research Service**

MATERIAL TRANSFER RESEARCH AGREEMENT

This Agreement is authorized by the Federal Technology Transfer Act and is governed by its terms.

PARTIES:

ARS: USDA, ARS, Beltsville
 Animal Improvement Programs Laboratory
 10300 Baltimore Avenue
 Beltsville, MD 20705
 Tel: 301-504-8665
 FAX: 301-504-8092
 E-mail: john.cole@ars.usda.gov

Recipient: North Carolina State University
 Department of Animal Science
 North Carolina State University
 Box 7621, Raleigh, NC 27695-7621

Recipient's Scientist: Dr. Christina Maltecca
 Tel: 919-515-0812
 FAX: 919-515-6884
 E-mail: christian_maltecca@ncsu.edu

PURPOSE:

To provide Recipient with predicted transmitting abilities and reliabilities for sire and daughter calving ease for Brown Swiss, Holstein, and Jersey bulls, and associated know how; hereinafter also collectively referred to as the Material.

Recipient will provide ARS with results from an analysis of gene networks associated with dystocia in the three breeds for which data are available, including breed-specific and breed-independent associations, and associated know how.

The Material is released to Recipient under the following conditions:

1. The Material shall only be used for: the identification of genetic mechanisms, specifically networks of genes, transcription factors, or expressed proteins, associated with dystocia (calving ease) in the specified breeds of dairy cattle, and supporting research.
2. Recipient shall not transfer the Material, in whole or in part, to a third party without the express written consent of Provider. Any third party requesting a sample shall be referred to Provider.

3. The Material shall remain the property of ARS and shall not be used for commercial or profit making purposes.
4. Recipient shall keep ARS informed of the results obtained through use of the Material, provide ARS with a copy of any manuscript that describes the work with the Material prior to submission for publication, and acknowledge ARS's contribution to the work reported.
5. Recipient shall not in any way state or imply that this Agreement or the results of this Agreement is an endorsement by ARS of its organizational units, employees, products, or services: except to the extent permission is specifically granted by an authorized representative of ARS.
6. The Parties acknowledge and agree to comply with all applicable laws and regulations of the Animal Plant Health and Inspection Service, the Center for Disease Control, and/or Export Control Administration pertaining to possession or transference of technical information, biological materials, pathogens, toxins, genetic elements, genetically engineered microorganisms, vaccines, and the like.
7. ARS shall assume sole responsibility for any claims or liabilities that may arise as a result of ARS' use of the Material.
8. Material shall be returned, destroyed, or otherwise disposed of, as instructed by ARS, no later than the expiration of this Agreement.
9. ARS shall meet with Recipient's representative(s) to determine inventorship if an invention should arise during Recipient's work with the Material.
10. The provisions of this Agreement are to be deemed severable and the invalidity, illegality or unenforceability of one or more of such provisions shall not affect the validity, legality or enforceability of the remaining provisions.
11. Confidentiality:
 - a. Recipient shall not disclose Material marked "Confidential" or "Proprietary" to anyone third party nor use such Confidential Information for any purpose other than that given above without ARS's written permission.
 - b. Recipient shall use the same degree of care to protect Confidential Information received under this Agreement as it uses to protect its own information of a similar nature, but in any event not less than reasonable care under the circumstances.

- c. The Confidential Information shall be excluded from confidentiality if Recipient can demonstrate that (a) it had possession of the information prior to disclosure, or (b) the information generally is available to the public at the time of disclosure, or becomes generally available, after disclosure, through no fault of Recipient; or (c) Recipient receives the information from a third party having the right to the information and who does not impose confidentiality.
 - d. It shall not be a breach of this Agreement if Recipient is required to disclose the Confidential Information by a valid order of a court or other government body, or as otherwise required by law, or as necessary to establish the rights of either party under this Agreement: PROVIDED THAT Recipient shall provide prompt prior notice thereof to ARS to enable ARS to seek a protective order or otherwise prevent such disclosure, and PROVIDED FURTHER THAT the Confidential Information otherwise shall continue to be confidential.
 - e. Recipient will treat all information generated or gathered under this agreement in accordance with the Freedom of Information Act.
- 12. This Agreement may be executed in any number of counterparts, each of which when so executed shall be deemed to be an original and all of which taken together shall constitute one and the same agreement. Signature by facsimile shall also bind each of the parties to this Agreement.
 - 13. ARS is an agency of the U.S. Government and any rights or obligations created under this Agreement are freely transferable within the U.S. Government and shall not be deemed a "transfer."
 - 14. If the Parties hereto decide, at some future date, to engage in a cooperative research project or program using the Material, a formal Cooperative Research and Development Agreement, or other research Agreement, must be negotiated and entered into between the Parties.
 - 15. This Material Transfer Agreement shall be construed in accordance with United States of America Federal Law as interpreted by the Federal Courts in the District of Columbia.
 - 16. Either party may unilaterally terminate this entire Agreement at any time by giving the other party written notice not less than sixty (60) calendar days prior to the desired termination date.

This Material Transfer Research Agreement shall become effective upon date of final signature and shall continue in effect for a period of three (3) years; provided, however, that the obligations assumed by ARS, regarding the maintenance of confidentiality, under this Agreement shall remain in effect for two (2) years from the expiration of this Agreement.

ACCEPTED FOR THE AGRICULTURAL RESEARCH SERVICE

James A. Poulos III
James A. Poulos III (Technology Transfer Coordinator)

May 30 2013
Date

Tom Moreland
Tom Moreland (ADO)

6/27/2013
Date

ACCEPTED FOR NORTH CAROLINA STATE UNIVERSITY:

Christian Maltecca
Christian Maltecca (NCSU Scientist)

5/15/2013
Date

By signing below, the ARS Scientist and ARS Research Leader acknowledge that they have read, understood, and agreed to the terms and conditions of this Agreement.

John B. Cole
John Cole (ARS Scientist)

05/10/2013
Date

George R Wiggins
George Wiggins (ARS Research Leader)

05/13/2013
Date

**Agricultural Research Service
Agreements Information Management System
Statement of Work**

Title: Identification of gene networks associated with dystocia in dairy cattle.

Objective: The Jersey, Brown Swiss, and Holstein breeds express low, moderate, and high rates of dystocia, respectively, but the mechanism underlying those differences has not been identified. The objective of this Agreement is to use predicted transmitting abilities of genotyped animals from those three populations to identify gene networks associated with dystocia in dairy cattle.

Approach: Previous research by ARS has identified a genetic marker on chromosome 18 that is associated with calving difficulty in Holsteins, but not Brown Swiss or Jerseys, and no genes with large effects on dystocia have been identified in the Brown Swiss breed. This implies that non-additive gene action is responsible for much of the differences observed between breeds. A systems biology approach based on the adaptive weight matrix (AWM) technique will be used within breed to identify gene pathways that are enriched with SNP having statistically significant effects on dystocia. Data also will be pooled into a single data set and the AWM analysis repeated. Gene networks common to all breeds and the pooled dataset can plausibly be said to represent fundamental modules controlling the phenotypic expression of dystocia. Genetic evaluations for Jersey calving ease are not routinely computed, but will be calculated from the national dataset by ARS. The NORTH CAROLINA STATE UNIVERSITY and ARS will jointly design the experiment. The methods will be applied by the NORTH CAROLINA STATE UNIVERSITY to the data provided by ARS. Results will be interpreted and prepared for publication by ARS and the NORTH CAROLINA STATE UNIVERSITY.

Statement of Mutual Interest: Both parties are actively engaged in independent research projects to identify causal mechanisms associated with heritable traits in livestock species. The parties agree that meeting the objectives of this project will strengthen and enhance ongoing research within the scope of this Agreement. ARS has research expertise in genetic evaluation of calving traits, as well as a national database of predicted transmitting abilities and SNP genotypes for U.S. Brown Swiss, Holstein, and Jersey bulls and cows. NORTH CAROLINA STATE UNIVERSITY has extensive research experience in the analysis of genomic data.

The North Carolina State University Agrees To:

1. Collaborate with ARS to identify a list of genotyped Brown Swiss, Holstein, and Jersey bulls for which predicted transmitting abilities for sire and daughter calving ease will be analyzed to identify gene networks (the "Data").
2. Obtain SNP genotypes for the animals represented in the Data from the Cooperative Dairy DNA Repository.

3. Collaborate with ARS to identify the statistical tools that will be applied to the Data in order to identify gene networks associated with dystocia ("the Methods").
4. Apply the Methods to the Data. The results of those analyses will be shared with ARS.

ARS Agrees To:

1. Calculate predicted transmitting abilities and reliabilities for sire and daughter calving ease of Jersey bulls.
2. Transmit to NORTH CAROLINA STATE UNIVERSITY a file of predicted transmitting abilities for sire and daughter calving ease of genotyped Brown Swiss, Holstein, and Jersey bulls.
3. With NORTH CAROLINA STATE UNIVERSITY, develop the procedure for analyzing the Data.
4. With NORTH CAROLINA STATE UNIVERSITY, interpret the results of the procedure and prepare the results for publication.

It Is Mutually Understood and Agreed that:

1. Both parties will share equally in the exchange of research data obtained.
2. Both parties will collaborate in the analysis and interpretation of results.

MUTUAL AGREEMENTS

1. The details of the cooperative work shall be planned and executed jointly by the North Carolina State University and the ARS. Outlines covering working plans and methods of procedure shall be prepared jointly subject to revision by joint action as work progress requires. Copies of these plans, as required, will be filed with the North Carolina State University and ARS.
2. A complete report of the results of the research and experimental work shall be submitted each year by the individual or individuals in direct charge of the cooperative work: one copy to be furnished to the North Carolina State University and one copy to ARS. A final report must be submitted within 90 days of project completion.
3. Patents and Inventions:
 - a. "Subject Inventions" shall mean any invention conceived or first reduced to practice under this Agreement, and which is patentable or otherwise protectable under Title 35 of the United States Code, under Section 2321 of Title 7 of the United States Code, et seq., or under the patent laws of a foreign country.
 - b. Each party shall promptly make written disclosure to each other of each Subject Invention, said information shall be treated in confidence by the receiving party until such time as a patent is applied for by the other party (see Appendix L).
 - c. Each party shall provide, when requested by the other, all information in its possession pertaining to a subject invention which may be necessary or useful in the preparation, filing, and prosecution of patent applications covering the Subject Invention.
 - d. Publication and/or oral disclosure of Subject Inventions shall be delayed in order to preserve the United States and/or foreign patent rights, PROVIDED said patent protection shall be promptly and diligently sought.
 - e. All rights, title, and interest in any Subject Invention made solely by employee(s) of ARS shall be owned by ARS.

**Estimated Budget
Total Years (3 years)**

	ARS Receive Funds for	ARS In-House	COOPERATOR In-House
A. Salaries and Wages (list # FTEs hired, GS level and # years as footnote. e.g. 2 GS 3 Students, 2 years each)	0	12,000	32,100
B. Equipment	0	0	0
C. Materials and Supplies	0	1,250	2,000
D. Travel	0	0	0
1. Domestic	0	0	0
2. Foreign	0	0	0
E. Facilities	0	0	0
F. Other Direct Costs	0	0	0
G. TOTAL DIRECT COSTS		14,000	35,500
H. Indirect Costs (11.1%)	0	0	0
I. TOTAL COSTS.....\$	0	14,000	35,500