Jersey Haplotype 1 (JH1)

Description of Condition and Requirements for Designation

With excerpts from Policies Regarding Undesirable Genetic Factors, published at http://www.usjersey.com/Reference/Policies_Undesirable_Genetic_Factors_rev1111.pdf

Effective February 22, 1983
Revised July 27, 2011

Statement of Policy

Every effort should be made within the breed to identify those animals that carry undesirable genetic factors. The American Jersey Cattle Association considers it the responsibility and obligation of each member of the Association and each breeder of Jersey cattle to report to the Executive Secretary any known case of an abnormal Jersey animal. The Executive Secretary shall maintain records of abnormalities and shall make available information from such records in accordance with rules established by the Board of Directors from time to time.

The Board of Directors considers it to be unethical practice to offer for sale an animal, male or female, an embryo or semen from an animal that has been designated a carrier of an undesirable genetic factor without first informing the prospective buyer of this fact. In practice this means that any advertising, descriptive material, or pedigree containing a designated carrier of an undesirable genetic factor shall carry a statement indicating designated carriers.

This statement of policy is made in belief that it is in the best interests of the breed and the breeders of Jersey cattle. It is made in the belief that it will serve the position of those who have taken the more difficult, positive, open approach to this fundamental concept of ethics in the improved breeding of dairy cattle. In the long run, all serve to gain by such a policy, but only to the degree that all cooperate in the acceptance and enforcement of this policy.

Identification of Undesirable Genetic Factors

In determining what genetic factors are considered to be undesirable in the Jersey breed, the Board of Directors shall consider such evidence as it considers appropriate. The Executive Secretary shall make such investigations of genetic factors occurring in Jersey animals as he or she may believe necessary or advisable and shall report the results of his or her investigations to the Board of Directors. Before recommending that the Board make a determination regarding the existence of an undesirable genetic factor, the Executive Secretary shall consult with at least two experts whose recommendations shall be submitted to the Board.

Jersey Haplotype 1 (JH1)
Statement of Designation Procedures

Designated June 2011, Revised November 2011

Description of Condition

Jersey Haplotype 1 (JH1) is a haplotype that impacts fertility. JH1 is associated with decreased conception rate; it is not associated with still births. When JH1 is inherited from both sire and dam, no live calf results. At this time, the exact physiological, morphological or biological condition is not fully understood nor has a candidate gene search identified any known causative mutations.

Requirements for Designation of JH1 Carrier or Tested Free Status

The Board of Directors will not designate an animal either a carrier or free of JH1 haplotype if the Board considers that there is a reasonable doubt that the animal is a carrier. The determination as to reasonable doubt depends upon the quality and amount of available evidence which will vary in each case.

The Board will designate a carrier animal based on the identification of the JH1 haplotype from a 6K or higher density genotype. Until an animal has been tested with a 6K or higher density genotype, the Board will not designate that animal as tested free of JH1 haplotype.

With respect to all sales sponsored by the Association, a bull shall not be accepted unless designated free of Jersey Haplotype 1.

Identification of Carrier Animals

When the Board of Directors shall determine that an undesirable genetic factor exists in the Jersey breed, the Board shall take whatever action it may consider appropriate to control and limit the genetic factor. Such action will include procedures to identify animals that are probable carriers of the undesirable genetic factor and to inform persons having an interest in the Jersey breed of the identity of such probable carriers. The procedures for publication of the identity of probable carrier animals, referred to as "designated" carriers, are contained in supplemental statements adopted with respect to each undesirable genetic condition.

For each undesirable genetic condition the Board of Directors shall adopt a separate statement of procedures for designating animals, referred to as "Statement of Designation Procedures," and designate an official report form to be used for reporting affected animals. The Board of Directors shall be responsible for designating animals as carriers of an undesirable genetic factor. When an animal has been designated as a carrier, the Executive Secretary shall notify the last recorded owner, the breeder, and the lessee, if any, by certified mail.

The Board of Directors may adopt procedures and rules by which a Jersey may be progeny tested for a particular undesirable genetic factor. The rules and procedures for progeny testing are contained in supplemental statements adopted with respect to each undesirable genetic condition.

The policy of the Association is to identify and designate Jersey animals as carriers of undesirable genetic factors when (1) genomic detection based on DNA analyses and/or (2) documentation of their own progeny is sufficient to accomplish designation.

Publication and Release of Information

Male and Female Animals

The Executive Secretary shall maintain a record of all animals that have been designated carriers of an undesirable genetic factor, and designation shall be noted on all advertising, descriptive material, or pedigrees published by the Association containing reference to a designated carrier.

Except as provided in this statement of policies, no information concerning the genetic condition of any animal shall be released by the Association without approval of the Board of Directors. *(text continues)*

Sales

For each undesirable genetic condition the Board of Directors shall establish policies for the marketing of carrier animals and their progeny in all sales sponsored or managed by the Association or Jersey Marketing Service.

Frequently Asked Questions: Jersey Haplotype 1

(December, 2011)

What is Jersey Haplotype 1?

Jersey Haplotype 1 (JH1) is the undesirable form of a haplotype on chromosome 15 (technical label, 355.10). Genetic research indicates that JH1 causes failed conception or embryo loss. Although not directly observed, the Animal Improvement Programs Laboratory has established that no live calf results that is homozygous for JH1 (homozygous meaning that it has inherited a copy of the haplotype from each of its parents). This was determined after studying 830,391 conception rate records for Jersey females.

Haplotypes with the same effect have also been identified in the two other breeds with genomic evaluations (Holstein and Brown Swiss). For all three breeds, the exact genetic or biological cause is not known at this time. Research to find answers is a high priority and in progress at the Bovine Functional Genomics Laboratory and AIPL.

What is a haplotype? Is a haplotype different from a gene?

A haplotype is a region of closely-linked genetic markers (single nucleotide polymorphisms, or SNPs) that are located on one chromosome and that are inherited as a group. As such, a haplotype encompasses multiple genes.

There are many haplotypes, most of them good or benign, but a few of them not so good. AIPL geneticists are looking at Jersey 50K genotypes for frequently occurring haplotypes that may have important effects. Pedigrees are examined to check if the haplotypes have a logical inheritance pattern across generations within families. Then, the geneticists determine how the haplotype is associated with phenotype using production, fitness and type information from the national dairy records system.

Why did the Board of Directors designate Jersey Haplotype 1 as an undesirable genetic factor?

Reproductive efficiency is an important Jersey breed characteristic, and a key to the profitability of your Jersey business. By designating JH1 as an undesirable genetic factor *(see Policies Regarding Undesirable Genetic Factors, at www.usjersey.com/Reference/Policies_Undesirable_Genetic_Factors_rev1111.pdf)*, information will be available to all Jersey owners so that they can limit carrier-to-carrier matings and manage the impact of JH1 on embryo loss.

Does this mean that I need to eliminate it from my herd?

Eliminate, no. Manage, yes.

JH1 is fairly common in the Jersey breed and has been present—though not identified—for at least five decades. According to AIPL, its frequency over the past 40 years has been between 20% and 25%. The current frequency is 23.4%. Eliminating JH1 is not really practical.

Nor is it desirable. “Imagine the genetic progress in milk yield, milk composition, conformation, health, and even fertility that would be lost by discarding thousands of haplotypes that are favorable for these traits while trying to eliminate the haplotype affecting fertility,” points out geneticist Kent Weigel of the University of Wisconsin-Madison. “In practice we try to select bulls and cows that have inherited more good haplotypes than bad. Over time, this process of balanced selection increases the frequency of favorable haplotypes, and the genes that are inherited with them, and the performance of the population is enhanced.”

“Managing” means evaluating bulls that have the JH1 haplotype for what they can bring to your bottom line. Some of the economic impact of Jersey Haplotype 1 is already accounted for in Jersey Performance Index™ and USDA Net Merit indexes because daughter pregnancy rate (DPR) is incorporated in these selection tools. What is recommended is to continue multi-trait selection based on JPI and/or NM$ with added attention to sire conception rate (SCR).

“Managing” also means avoiding matings with greater probability of embryo loss. “This is where we can use our new information powerfully,” Weigel says. “Nearly every Jersey sire whose semen is marketed for artificial insemination (A.I.) has been genotyped, so the genotypes of the service sire and the sire of the cow are usually known. In herds that rely heavily on A.I., it is possible to foresee almost every potential mating of a daughter of a bull with the JH1 haplotype to a service sire with the JH1 haplotype.

“Computerized mating programs offer a simple, inexpensive solution for avoiding affected matings,” Weigel says, “so producers should use these programs and follow through on the mating recommendations.”

How will I know if an animal is a carrier of JH1?

The AJCA Board policy is to designate JH1 haplotype status based on 6K or higher density genotypes. Two labels will be used: JH1C for carrier or JH1F for tested free. These will be printed on Official Performance Pedigrees, Performance-Progeny Reports and genetic evaluation reports.

I saw changes in carrier status of some bulls in the December proofs. How did this happen?

AIPL geneticists have continued their research efforts since the original discovery, and can now detect a smaller segment of the affected DNA that is responsible for the fertility issues. Most of the changes in JH1 status involve the detection of crossovers believed to carry the lethal segment. This more sensitive analysis resulted in a change in carrier status for 12 bulls and also a few females. A list of the bulls is published in the print and online Green Books.

What can I expect if I mate two known carriers of Jersey Haplotype 1?

There is a 25% chance that the embryo would inherit two copies of JH1 and not live to be born.

OUTCOMES FROM MATING CARRIERS OF JH1

JH1C FEMALE JH1C MALE	Normal (N)	JH1
Normal (N)	**N - N** *Normal* *Non-carrier*	**N - JH1** *Heterozygous* *Carrier*
JH1	**JH1 - N** *Heterozygous* *Carrier*	**JH1 - JH1** *No calf born*

The chance that the calf would be a carrier is 50%. But there’s also a 25% probability that this mating would result in a calf that does not inherit JH1 from either parent.

What’s the economic impact of mating two known carriers?

If a bull with the JH1 haplotype were mated to 100 genotyped cows known to carry JH1, 50 eggs would carry the haplotype, and 25 would encounter sperm that would lead to failed conception or early embryonic loss.

It is assumed that homozygous embryos are lost in the first 60 days of gestation, for an average increase of roughly 42 days open. The cost of one extra day open this early in lactation is $2. Economic loss would then be 25 cows x 42 days per cow x $2 per day, or $2,100.

The more typical situation will be this: A JH1 carrier bull is being considered as a mate for the daughters of another JH1 carrier bull. For 100 such cows, 50 would have the JH1 haplotype, 25 eggs would carry the haplotype, and 12.5 matings would be affected, for a total cost of $1,050 (12.5 matings x 42 days x $2 per day).

How will JerseyMate™ handle JH1?

JerseyMate discounts potential matings including JH1 carriers for the potential cost of days open based on the probability of inheriting the JH1 haplotype. The economic impact of a lost embryo due to JH1 is estimated at $84 (42 days open x $2.00/day).

JerseyMate may recommend carrier to daughter-of-carrier matings. When this happens, it is because the potential economic gain is more than dollars lost from the impact on fertility due to JH1.

JerseyMate automatically eliminates matings of designated JH1 carrier bulls to designated JH1 carrier females.

December 8, 2011