

International Brangus Breeders Association Genetic Conditions Policy

Identification and recognition of genetic disorders continue to evolve in the livestock industry. Several genetic conditions have been identified that have an impact on Brangus cattle. Therefore, it is important that International Brangus Breeders Association (IBBA) and its members identify and manage known defects (and others genetic conditions as they are identified) through appropriate testing and recordation. Therefore, the IBBA Board of Directors (BOD) has placed high priority on development of a proactive breed specific genetic condition policy that allows for the identification and management of any problems or potential problems which might arise with genetic conditions in animals in the Brangus Database.

A. Reporting of Animals with Possible Genetic Defects or Genetic Conditions

International Brangus Breeders Association members who become aware of a possible genetic defect that has occurred in their herd or their commercial or registered customers herd, have a responsibility to immediately notify the IBBA Executive Vice President (EVP). A detailed explanation of the abnormality (Appendix 1) as well as photographs and video (if possible to obtain) of the suspect animal(s) should be sent to the EVP. Additionally, a tissue/blood sample from the suspected abnormal animal, its sire and its dam should be supplied for verification of parentage and potential defect testing. If possible, IBBA recommends that the suspected abnormal animal be viewed and descriptions detailed by a licensed veterinarian. Outlined reporting steps are:

1. Complete and submit the IBBA Genetic Defect report form.
 - Include ID, sex, pedigree, birthdate, thorough written description, etc.
2. Collect soft tissue and blood of the defected animal(s). Preservation (freezing, posting, etc.) of the whole animal is recommended if possible.
3. Take and submit photos and video (if possible to obtain) of defected animal(s).
4. The EVP collects and submits all material to a consulting veterinarian or university professor for analysis.
5. Completion of DNA tests requested by the consultant (e.g. 50K, 150k, 770K).
6. Consultant will report information back to the EVP upon completion of analysis.
7. Only the individual animal's owner and individual animal's breeder(s) reporting or submitting the genetic defect report form, IBBA EVP, and the research facility will be informed on the initial diagnosis.
8. EVP and research team (described in A item 4) will compile data from like disorders to determine if the disorder appears to be genetic in nature.
9. If determined or considered a genetic issue, research team will work to determine the related marker or allele, establish mode of inheritance, and determine allele frequency.

10. The EVP and consultant will report findings to the owners, breeder(s) and Breed Improvement Committee Chairman (who may then appoint a genetic condition subcommittee to consider the findings) who will then decide from the available information, based on economic relevance to the Brangus population, genetic impact, and ease of testing, whether to recommend the disorder be listed as a known disorder in IBBA.
11. The EVP (and genetic condition subcommittee if appointed) will report the decision from item 10 above to the breed improvement committee. The EVP and breed improvement committee will report all results to the IBBA BOD. Inclusion of the frequency of the defect in the Brangus population must be considered.
12. If approved by the BOD, a genetic test will be established based on the known marker data.
13. Final results and/or findings will be reported to the IBBA breeders.

When a direct DNA test is available to identify a carrier animal, a breeder is obligated to report animals positively tested for the genetic defect even if no progeny exhibiting a genetic defect has been produced.

B. Failure to Report

Knowingly failing to report animals with a possible genetic defect and/or non-compliance with all instructions given by IBBA regarding the collection and submission of required material may subject the member to disciplinary action under the provisions of the IBBA By-Laws, Article IX, Section III, Discipline, Suspension, or Expulsion: Any member or other person who violates the rules, regulations, constitution or Bylaws of the Association or impairs the reliability of the records of the Association or who offers to the Association for registration, certification, enrollment or transfer any animal known by such member or person not to be eligible for such registration, certification, enrollment or transfer or who knowingly misrepresents to the Association any material fact as to the sex, date of birth, age, description, ancestry or identity of any animal or who deceives the Association or another person in any matter in which the Association has any interest may, if he is a member, be censured, suspended or expelled and denied any or all of the privileges of the Association, after notice and an opportunity to be heard, as hereinafter provided. Such additional or other penalties or restrictions on the exercise of the privileges of the Association as are deemed proper and appropriate may also be imposed.

C. Determining if Abnormality is Genetic in Nature

The International Brangus Breeders Association will have no part in determining whether or not the reported abnormality is the result of a genetic defect or an environmental issue. IBBA will only serve as the coordinator of information between the owner and breeder of the suspected animal and a genetic defect consultant. The IBBA Executive Vice President will be responsible for selecting a genetic consultant(s) who has the scientific credentials and ability to determine if abnormal animals are, or are not, the result of genetic defects.

All cases of abnormal animals will be observed and determination made by the genetic defect consultant. The appointed genetic defect consultant will determine if adequate evidence is present to establish a definite genetic cause of a particular suspected abnormality.

D. Notification to IBBA Membership and Beef Industry

After recommendation by the breed improvement committee and approval by the board of directors, any newly identified defect will adhere to the Genetic Testing Disorder policy implemented in February 2014 for testing at any approved commercial lab. Genetic defect conditions will be noted for all animals as identified by pedigree and DNA test in the IBBA database with the following protocol summary:

1. The phrase "potential carrier" refers to animals that are deemed to have "impacted genetics" due to confirmed carriers of such genetic defects in their pedigree.
2. All recorded animals with impacted genetics shall remain recorded (registered, certified, appendix, ultrablack, ultrared, etc).
3. All progeny of identified carrier animals can be recorded without submitting to DNA testing if they don't become an AI sire or donor dam.
4. All animals used as an AI sire or donor dam that have been identified to have impacted genetics for any defect will be required to be tested for such defect.
5. All animals identified to have impacted genetics will have the below notation on each recording certificate, listed on individual animal detail page on IBBA website, and be required to have same notation in any sale catalog and other printed material where animal has name, number, pedigree, part of pedigree, etc.
F - animal tested FREE of defect (e.g. DDF, NHF, OSF)
C - animal tested as a CARRIER (one copy of allele) of defect (e.g.DDC)
A - animal tested as AFFECTED (two copies of allele) (e.g. DDA, NHA)
PC - animal that hasn't been tested for defect but has carriers in pedigree (e.g. DDPC, NHPC)
IC – INFERABLE CARRIER; animal is the parent of tested carrier progeny when other parent is tested free.
6. Once an animal with "impacted genetics" is tested for DD, AM, NH, CA or OS, the above-mentioned notation (PC) will be deleted from the recording certificates, animal detail page on IBBA website, any and all other areas of former notation, and the following notation will be placed beside recorded name/registration number of all tested animals or known tested pedigrees:
7. All animals that have been tested of known genetic conditions will have those notations listed beside animals recorded name/registration number.
8. Any animal tested as carrier animal or affected animal can be retested at a second lab to confirm first test results.

CURRENTLY IDENTIFIED GENETIC CONDITIONS REPORTABLE TO IBBA

This list is dynamic which should be updated periodically for development of new DNA tests and applicable genetic defects that may be added or removed.

1. **Alpha-Mannosidosis [AM]** - Lethal nervous disease of Angus and Angus-derived cattle. Cattle affected with Alpha-Mannosidosis usually fail to thrive and develop a progressive incoordination and an aggressive disposition when disturbed. Affected animals usually die before reaching sexual maturity. **DNA TEST AVAILABLE**
2. **Chediak-Higashi Syndrome (CHS)** - A disorder associated with bleeding tendency and characterized by insufficient platelets that affect several species. CHS is manifested clinically by partial oculocutaneous albinism, photophobia, an increased susceptibility for infection, and a hemorrhagic tendency. Histological examination of skin, hair, and eyes has revealed that the basis for the partial albinism is a clumping of melanin granules. **DNA TEST AVAILABLE**
3. **Hypotrichosis (Hairlessness) [HP]** – Partial to almost complete lack of hair. Affected calves are often born with very short, fine, kinky hair that may fall out leaving bare spots or areas particularly susceptible to rubbing. **DNA TEST AVAILABLE**
4. **Oculocutaneous Hypopigmentation (OH)** - A non-lethal, simple recessive genetic condition. Affected calves have eyes with irises that are pale blue around the pupil with a tan periphery. Their hair coats have a slightly bleached color. While some affected calves may have sensitivity to light, they are otherwise normal functionally and physiologically. **DNA TEST AVAILABLE**
5. **Osteopetrosis (marble-bone disease) [OS]** – Calves born dead prematurely (10-30 days premature). Typically, calves possess a short lower jaw and impacted molars. Bones of calf are fragile and can be broken with ease. **DNA TEST AVAILABLE**
6. **Pulmonary Hypoplasia with Anasarca [PH]** – Calves born with extremely large amounts of fluid in the body cavity and between the body and skin. This results in abnormally large calves that require birthing assistance. **DNA TEST AVAILABLE**
7. **Syndactyly (mule foot) [SD]** –Toes of hoof are fused together. Can range from one hoof to all four. **DNA TEST AVAILABLE**
8. **Tibial Hemimelia [TH]** – Calves have excessively large abdominal hernias. Are unable to stand due to twisted rear legs combined with fused

joints in the rear legs. May possess deformed head. **DNA TEST AVAILABLE**

9. **Arthrogrposis Multiplex (curly calf) [AM]** – Calves are born dead or die shortly after birth. The spine and legs appear crooked or twisted and the joints of the legs are often fixed in positions. Front legs are contracted and rear limbs may be contracted or extended. Calves are small and appear thin due to limited muscle development. There may be a cleft affecting the nose or palate. **DNA TEST AVAILABLE**
10. **Contractural Arachnodactyly [CA]** - CA calves are normally born alive and most can walk, suckle and survive. The birth weight of CA calves is normal. The phenotype is subtle and hence CA may not initially be recognized as an inherited defect. Contractures which reduce the range of angular movement of the upper limb joints are present at birth in CA but are much less severe, without rigid joint contractures. Due to these contractures, CA calves at birth assume an abnormal crouched posture, resembling an elk or deer fawn, with the feet placed more to the rear than normal, hocks pulled up and back and the spine slightly arched. In their first days of life, CA calves are also flat down on their pasterns. Although there is a reduced range of movement ("contracture") in the upper limb joints, particularly the hip, stifle and hock, there is an increased extensibility of the lower limb joints, particularly the pasterns. CA affected calves are reported as taller and more slender, than their unaffected siblings. **DNA TEST AVAILABLE**
11. **Neuropathic Hydrocephalus [NH]** – NH was recognized as a genetic condition on June 12, 2009. Calves that are carried are born near term and may have 25-35 pound birth weights. Some evidence also points toward possible early abortions due to the defect. The cranium is markedly enlarged (volleyball to basketball sized). The bones of the skull are malformed and appear as loosely organized bony plates that fall apart when the cavity is opened. The cranial cavity is filled with fluid and no recognizable brain tissue is evident. The spinal canal is also dilated and no observable spinal tissue is found. **DNA TEST AVAILABLE**
12. **PRKG2 Gene Mutation for Dwarfism [D2]** - D2 was recognized as a specific strain of dwarfism on September 7, 2007. There are several types of dwarfism, but all dwarfs appear shorter and some smaller than normal. The legs are short and body is short, and the animal may appear to have a potbelly and a thick or blocky shape. The head may be normal (long-nosed or long-headed dwarf) or the face may appear shortened. Muscling is often normal and, thus calves may be a thick appearance. **DNA TEST AVAILABLE**
13. **Congenital Hypotrichosis (dilutogeny rat-tail syndrome) [CH]** - These calves are characterized by short, curly, malformed, sometimes sparse hair

and a lack of normal tail switch development. Rat-tail syndrome is controlled by interacting genes at two loci and cattle expressing the syndrome must have at least one dominant gene for black color and be heterozygous at the other locus involved. **DNA TEST AVAILABLE**

14. **Double Muscling - Myostatin nt821 gene deletion [M1]** - M1 was recognized as a strain of double muscling on June 20, 2011. Animals are extremely heavily muscled in appearance, including abnormally large, wide and rounded rump and thighs with prominent creases between muscle groups. There is usually little covering fat, and bones are thin. **DNA TEST AVAILABLE**
15. **Developmental Duplication (DD)** – DD was recognized to be a simply inherited recessive genetic condition passed through certain lines of Angus cattle. Animals affected with this condition can sometimes be born with an extra limb or part of an extra limb (a condition referred to as polymelia). **DNA TEST AVAILABLE**
16. **Heterochromia Irides (white eye)** - Cattle usually have a dark black iris because of dark pigment in the eye. White eye is a condition where the pigment of the eye is absent, giving the eye a white or silver appearance.
17. **Pompes Disease (white eye)** – Brahman cattle have a percentage of the population that carry the condition referred to as generalised glycogenosis (Pompe's disease). It is an autosomal recessive disease that has been recorded in humans and various animal species including Shorthorn and Brahman cattle in Australia. This disease is caused by a deficiency of the enzyme acid a glucosidase (AAG) which results in an excessive accumulation of glycogen within lysosomes in many tissues. **DNA TEST AVAILABLE**

Appendix 1

IBBA Genetic Defect Report

Mail Completed Form To:
International Brangus Breeders Association
P.O. Box 809
Akins, TX 78263

Owner: _____ IBBA Member #: _____
Address: _____ Phone: _____
_____ Email: _____

Attending Veterinarian: _____ Phone: _____
Address: _____ Email: _____

Animal (I.D./ Reg#) possessing physical abnormalities: _____

Sex: _____ Date of Birth: _____ Date of Death (if applicable): _____

Was calf a twin: _____ If yes, I.D. of twin _____

Sire Breed & I.D./ Reg#: _____

Existing blood/DNA case, Lab/Case#: _____

Dam Breed & I.D./ Reg #: _____

Existing blood/DNA case, Lab/Case#: _____

Breeding record of dam when abnormal calf was conceived

First Service Date: _____ Bull I.D./ Reg#: _____

Second Service Date: _____ Bull I.D./ Reg#: _____

Third Service Date: _____ Bull I.D./ Reg#: _____

Detailed description of abnormal animal (Completed by veterinarian, if possible):

I certify that the provided information is correct and agree to comply with all instructions further given by IBBA.

Signature of Owner: _____ Date: _____

The IBBA EVP continues to monitor various other traits/disorders in beef cattle for their frequency in the current DNA tested Brangus population. Below is a list of currently available tests that can be monitored through our GeneSeek DNA provider:

- Anhidrotic Ectodermal Dysplasia (EDA-R244X)
- Arachnomelia-SM
- B-mannosidosis
- Bovine Blood Coagulation Factor XIII Deficiency (F13)
- Brahman-Dwarfism
- Calpain 316
- Calpain 4751
- Calpain 530
- Chediak-Higashi syndrome (CHS)
- Chondrodysplasia-BD1
- Chondrodysplasia-BD2
- Color Dilutor
- Congenital muscular dystonia (CMD1)
- Congenital muscular dystonia (CMD2)
- Congenital myasthenic syndrome (CMS)
- Crooked Tail Syndrome-BB
- Dun Color
- Erythrocyte Membrane Protein Band III
- Glycogen Storage Disease-Myophosphorylase
- Homozygous Black Coat Color
- Hypotrichosis KRT71
- Hypotrichosis PMel17 (rat tail)
- Ichthyosis Fetalis
- Idiopathic Epilepsy
- Leptin – several loci
- Mannosidosis
- Maple Syrup Urine Disease (MSUD)
- MFN2-Degenerative Axonopathy
- Mulefoot
- Horned/Poll
- Pompes 1057 BR
- Pompes 1783 SH
- Pompes 2454 SH
- Protoporphyrin
- Pseudomytonia
- Pulmonary Hypoplasia with Anasarca (PHA Dexter)
- Pulmonary Hypoplasia with Anasarca (PHA Shorthorn)
- Stearoyl-CoA Desaturase (SCD1)
- TH-outcast
- Tibial Hemimelia (TH)