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Digital Subluxation (DS): Breeding Outcomes

The new genetic condition discovered in Shorthorn cattle requires an entirely new though process relative to all of the other known conditions that exist in other breeds and in Shorthorns. First of all, DS is not a lethal condition from a genetic inheritance standpoint. Animals known as *homozygotes* are cattle that carry two copies of the undesirable gene. Homozygotes of DS, referred to as “DSH” in the registry, in rare cases can be animals that function normally in a breeding herd. Most cattle that are DSH will show some outward signs of the genetic condition. In this case, the condition is a malformation of the rear pastern or pasterns (ankle area) of the animal. The important aspect of DSH is to understand that ALL progeny of DS Homozygotes will be at least Carriers of the condition...or worse.

Carriers of the DS condition, known as DSC in the registry, also need to be handled differently when mating decisions are made. Though the original mutations happened in completely separate populations, the DS condition sits on the same chromosome as Pulmonary Hyperplasia with Anasarca (PHA). Unfortunately, in the development of the embryo, it appears that the presence of a PHA Carrier can impact the phenotype (physical appearance) of a DS Carrier. In other words, if you mate a PHAC to a DSC and the unfavorable copy of both genes is passed on, the resulting calf will likely have deformed rear limbs below the hock. In each case, there is a 25% chance this will occur. As a result, a Carrier of DS could show the condition and a homozygote could appear perfectly normal. If you are

testing unknown pedigrees for DS, it is highly recommended that you also test for PHA at the same time.

The following matrix details what possibilities exist when mating through, around, or away from the DS condition: F=Free, C=Carrier, & H=Homozygote

DSF X DSF= All progeny DSF with no outward signs of the condition.

DSF/PHAF X DSC/PHAF= 50% of the progeny will be DSC, 50% of the progeny will be DSF, rear limbs should be normal.

DSF/PHAC X DSC/PHAF= 25% of progeny will be DSC/PHAC and likely will show malformed rear limbs below the hock, 25% will be DSC/PHAF and appear normal, 25% will be DSF/PHAC and appear normal, 25% will be DSF/PHAF and appear normal.

DSC/PHAF X DSC/PHAF= 25% of the progeny will be DSH, rear limbs will likely be affected, but can also appear normal, 50% of the progeny will be DSC and rear limbs appear normal, 25% of the progeny will be DSF and rear limbs appear normal. Regardless of the outcome, if progeny of this mating are to be registered, testing will be required.

DSC/PHAC X DSC/PHAF= Though it is unlikely a DSC/PHAC animal will be mobile enough to breed, this mating will result in a 25% chance progeny will be DSF and normal in appearance, 25% will be DSC/PHAC and likely show rear limb

malformation, 25% will be DSC/PHAF and appear normal, 12.5% will be DSH/PHAC and likely show severe malformation of the rear limbs, and 12.5% will be DSH/PHAF, these animals may appear normal or have outward signs of the condition. Regardless of the outcome, if progeny of this mating are to be registered, testing will be required.

DSH X DSF= This mating is important to understand, because 100% of the progeny will be DSC. Again, if the Carrier status for PHA comes through here too, the resulting calf will likely be affected by the condition.

DSH/PHAF X DSH/PHAF= Though this mating is strongly not recommended, ALL progeny will be DSH/PHAF, though some progeny may appear normal in appearance.

Moving forward, the ASA will not allow registration of *breeding* animals that are homozygous for known genetic conditions (effective date to be announced later). With most known conditions, this is a non-issue since a lethal condition eliminates homozygotes from the population. In the case of DS, homozygotes can appear normal. Unfortunately, its interaction with PHA and the potential penetrance into the commercial sector makes it imperative that breeders take this seriously and work hard to educate their customer base. Bottom line, breeders should avoid mating any suspect pedigrees of PHA and/or DS to one another. The technology is readily available to test for these conditions; breeders should be proactive in testing their herd and potential sale cattle. ☐