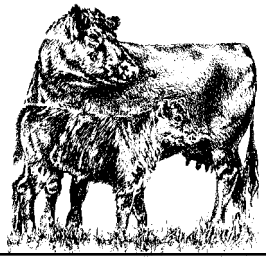

Western Beef Resource Committee *Fourth Edition*

Cattle Producer's Handbook

Genetics Section 826

Congenital Defects in Cattle

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Many undesirable traits show up in beef cattle. These range from poor performance and structural unsoundness to semilethal and lethal diseases. Causes of undesirable traits are varying amounts of genetic influence, environmental conditions, and interaction between the animal's genetic makeup and the environment in which they must live.

Congenital defects are present in all breeds of cattle. In most herds they are rather uncommon, however, occasionally the frequency within a herd will be of considerable economic importance. Congenital defects are abnormalities of structure or function present at birth and may account for a high percentage of the calf losses from just before to just after calving. The frequency of congenital defects ranges from less than 1 percent to over 3 percent within herds. Cattle producers should be conscious of the potential of defects and investigate all suspects.

Causes

The cause of many congenital defects is unknown. Some are inherited. The most common inheritance pattern is as a simple recessive trait. The defective calf receives a recessive gene from its sire and one from its dam. A few congenital defects are known to be caused by genes with incomplete dominance and a few are caused by two or more sets of genes.

Genetically caused congenital defects usually run in families. The parents of a genetically defective calf will generally have at least one ancestor in common. When more than one genetically caused defective calf is born in a herd in the same calving season, their dams are usually related (i.e., half sisters) and are sired by the same bull. A change in the breeding program is required to correct this situation.

Many congenital defects are caused by environmental factors. These include the level of nutrition, excess or shortages of certain nutrients, toxic plants or other toxic substances, infectious diseases, and extremes in temperature during pregnancy. Most environmentally caused congenital defects will occur in a short time during a calving season from cows that were managed as a group. After proper diagnosis, a change in management is necessary to correct these conditions.

Diagnosing the Cause

To determine the cause of defects, the cattle producer must have good records and know why every calf dies. Purebred breeders generally have very satisfactory breeding records that include sire and dam of each calf and breeding date. Management records should include which cows were in groups during each time period. Most breeders have a list of which cows are in each pasture. A date in and out of the pasture usually will help identify problems. Feed analysis reports, toxic plants present, and herd health and vaccination programs are of value also.

Of great value in controlling diseases as well as congenital defects is to know the cause of death of each calf. The cause of some deaths will be obvious. Others will be much more difficult to determine. If a producer does not know the cause of death, ask the local veterinarian or state diagnostic laboratory for help. Your breed association (see 845), A.I. organization, and Cooperative Extension System beef specialist can help you contact diagnosis personnel.

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You must act fast. Tissue of a dead calf, especially the nervous system, will deteriorate quickly in warm weather. If you cannot have the calf to the laboratory within a few hours after death, it should be well cooled before transportation. The best diagnosis can be obtained from a calf delivered alive. Call the diagnostic laboratory ahead so personnel can give you instructions on how to handle the calf and be ready when you arrive. Good diagnosis from one dead calf may save many others.

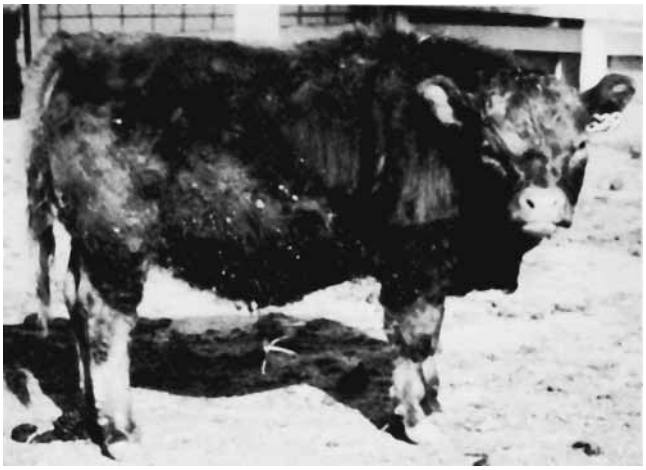

Fig. 1. Dwarfism. Notice short, blocky appearance with deformed nose causing labored breathing (snorter dwarf).

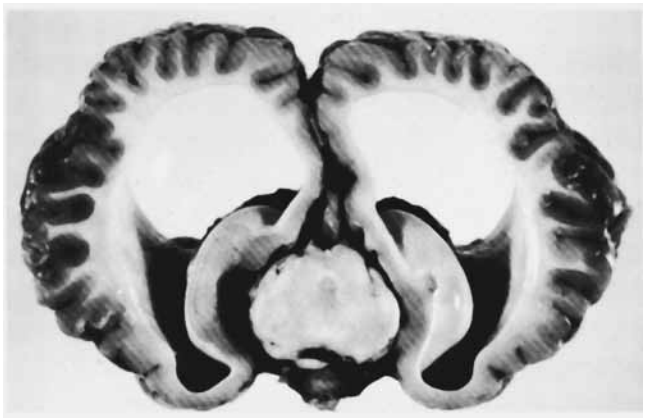

Fig. 2. Waterhead (internal hydrocephalus). Calf was born dead. Notice dilation of internal aspects of cross-section of this brain.

Fig. 3. Marble bone (osteopetrosis). This calf was aborted 3 weeks before its term. Notice thick bone with no bone marrow cavity.

Genetic Defects

Dwarfism

Several types of dwarfism are caused by both environment and genetics. Each of the three genetically caused dwarfisms discussed here are different traits caused by different sets of genes.

- **Snorter dwarfism** causes short, blocky appearance with deformed bone growth in the nasal passages, which causes difficulty in breathing. Inherited as a simple recessive (Fig. 1).
- Long head dwarfism causes small size but does not affect the bone growth in nasal passages. Inherited as a simple recessive trait.
- Compress dwarfism is inherited as incomplete dominance. An individual with one compress gene and one normal gene has an extremely compressed body conformation. The individual with two compress genes is a dwarf and is usually lethal.

Water Head (Internal Hydrocephalus)

Excess fluid is present in the brain (Fig. 2). Calves are usually born dead or die shortly after birth. Environmental factors can cause the disease as well as being inherited as a simple recessive.

Marble Bone (Osteopetrosis)

The calves are usually born dead 2 to 4 weeks early. Bones are solid and do not contain marrow, making them brittle and easily broken (Fig. 3). Inherited as a simple recessive trait.

Hairlessness (Hypotrichosis)

Partial to almost complete lack of hair (Fig. 4). Hair develops and is lost so an affected animal will vary somewhat in expression from month to month. Inherited as a simple recessive trait.

Rigid Joints (Arthrogryposis)

Many environmentally caused forms appear, but one form is inherited as a simple recessive. The joints of

Fig. 4. Hairlessness (hypotrichosis) in a calf.

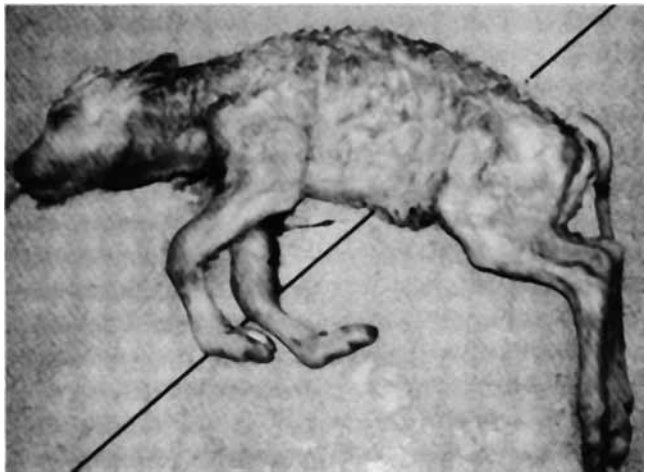

Fig. 5. Rigid joints (arthrogryposis) in a calf. Notice rigid front legs. These calves have a cleft palate.

Fig. 6. Extra toes (polydactyly).

Fig. 7. Mulefoot (syndactyly). Notice single toe on right foot as compared to the left normal front foot.

all four legs are fixed symmetrically, and cleft palate is present (Fig. 5).

Extra Toes (Polydactyly)

One or both front feet are usually affected, but all four may have the outer dew claw develop into an extra toe (Fig. 6). At least two sets of genes are involved in the inheritance of this trait.

Fig. 8. Weaver calf (progressive bovine myelo-encephalopathy). Notice unsteady posture of this animal.

Fig. 9. Photosensitivity (protoporphyria). Notice skin lesions due to sunlight.

Mulefoot (Syndactyly)

The two toes are fused together to produce only one toe. The front feet are most often affected but all four may be affected (Fig. 7). These cattle cannot tolerate hot temperatures. Inherited as a simple recessive trait.

Weaver Calf (Progressive Myeloencephalopathy)

Calves start developing a weaving gait at 6 to 8 months and get progressively worse until death at 12 to 20 months (Fig. 8). Inherited as a simple recessive trait.

Photosensitivity (Protoporphyria)

Animals are sensitive to sunlight and develop scabs and open sores when exposed to sunlight (Fig. 9). The liver is also affected, and the animals may suffer from seizures. Inherited as a simple recessive trait.

Fig. 10. Bulldog calf (achondrodysplasia).

Fig. 11. Double muscled calf on pasture. Notice outline of hind legs and deep creases between muscles.

Bulldog (Achondrodysplasia)

This trait is inherited as an incomplete dominant (Fig. 10). The homozygous may be aborted dead at 6 to 8 months gestation. Symptoms are a compressed skull, nose divided by furrows, and shortened upper jaw giving the bulldog facial appearance. The heterozgous is a small, heavy muscled animal.

Double Muscling

Animals are extremely heavily muscled (Fig. 11). However, considerable variation exists in the expression of this trait. Inherited as a simple recessive trait.

Parrot Mouth (Brachygnathia Inferior)

Cattle have a short lower jaw (Fig. 12). Inherited as a simple recessive trait.

Other Congenital Defects

Many other genetically caused undesirable traits are known. The beef cattle geneticist at your land-grant university will have knowledge of most of them and will be able to help if a problem arises.

Many abnormal conditions are not genetically caused. Two-headed calves and calves with extra legs are caused by mistakes in development and not the genetic makeup of the individual or its parents. Freemartin heifers are caused by circulation of the male twin's hormones through the developing female fetus. Some hydrocephalus can be caused by BVD (bovine virus diarrhea) infection during pregnancy. Crippled-calf disease is caused by the cow eating lupines between days 40 and 60 of pregnancy.

Fig. 12. Parrot mouth (brachygnathia inferior). Short lower jaw in a calf.

Controlling Genetic Diseases

The best control of genetic diseases is to avoid animals that carry these genes. Bulls or semen should be purchased from reputable breeders, produced by parents who are not known to carry undesirable genes. Long established inbred lines that have not recently produced genetic undesirables are usually quite safe. Commercial producers who use a crossbreeding system rarely have a problem.

The elite purebred breeder or owner of A.I. bulls may wish to test for simply inherited traits before bulls are heavily used. If the undesired trait is dominant, no test is needed since the bull would show the trait if he had one dominant gene. If the trait is inherited as incomplete dominance, the individual that has only one undesired gene can usually be identified and testing is not needed. Testing is usually useful only when the trait is inherited as a simple recessive trait.

When only one nonlethal, undesired recessive trait is of concern, the cheapest test is to mate the bull to cows having that undesired trait. For example, if horns are not desired, the polled bull to be tested would be mated to horned cows. If any horned calves are produced, the polled bull has one gene for horns.

If the undesired trait is lethal, the dead cows cannot be used to make the test. If only one lethal trait is of concern, the test should be made using cows that have produced calves with this lethal trait. If a calf is produced that has this lethal trait, the bull has one recessive gene for the trait.

If the breeder is concerned about **all** recessive traits, sire-daughter matings should be made. This is time consuming and expensive, and only truly outstanding bulls will be able to pay for this test. All calves from the

sire-daughter matings must be observed closely and all recessive traits recorded. The sire will have a recessive gene for any recessive traits observed.

What to Do with Carriers

An animal that has one undesirable recessive gene may have thousands of desirable genes. The animal's desirable genes should be weighed against its undesirable genes. If the desirable genes can be found in other animals without the undesirable gene, carriers should be slaughtered and replaced. When the production traits are superior, these animals can be used in a crossbreeding program to produce beef. Heifers should not be kept for breeding.

If the individual is extremely superior in production traits, a superior son can be produced that does not carry the undesired gene. The outstanding carrier bull would be mated to a small group of very outstanding cows. The best two to four sons produced would be selected and used in test matings to known carrier cows. The best son that does not carry the undesired gene would then be used and all carriers slaughtered. This would take several years, and only truly superior individuals could justify such a procedure.

In most cases, the bull that carries the undesirable recessive gene should not be used to produce breeding animals. His daughters should be worked out of the herd and replaced with superior animals that do not carry undesirable genes. Purebred cattle producers should work with their breed associations (see 845), Cooperative Extension and land-grant university personnel, and veterinarians to eliminate and avoid problems.

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