

Deformed Calves from Poisonous Plants

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Birth of deformed calves is a troubling matter to cattlemen. There certainly are enough problems for ranchers every year with range conditions and market variables, without the additional problems of deformed, unmarketable calves. Cattlemen who know the factors that cause livestock prices to vary can usually manage to make a profit even so. Likewise when cattlemen understand the causes of deformed calves, they can take corrective action to reduce incidence and still manage to make a profit.

You all know what we are talking about. You've seen calves that were deformed at birth. They might have had crooked legs, crooked spine or neck, misshapen heads, cleft palate, deformed rib cage or other problems. They all share one thing in common. They looked that way at birth. They might have become worse with age. In serious outbreaks of problems like this losses could be 10-30% or even higher some years as some cattlemen have had. Now that's a serious matter and it's certainly understandable that some ranchers who have had problems like this have been reluctant to talk about it for fear there was something wrong with their breeding program. Is this concern warranted?

Are all deformed calves caused by breed problems or in other words are they are of genetic origin? Fortunately, no! There are three main causes of deformed calves. To be sure, some are of genetic origin, but others are infectious disease related, and still others are induced by range plants that cows eat while pregnant. In fact, in some range areas a large proportion are plant related. A competent veterinarian or county agent may be able to help a rancher untangle the puzzle and incriminate one of the three causes.

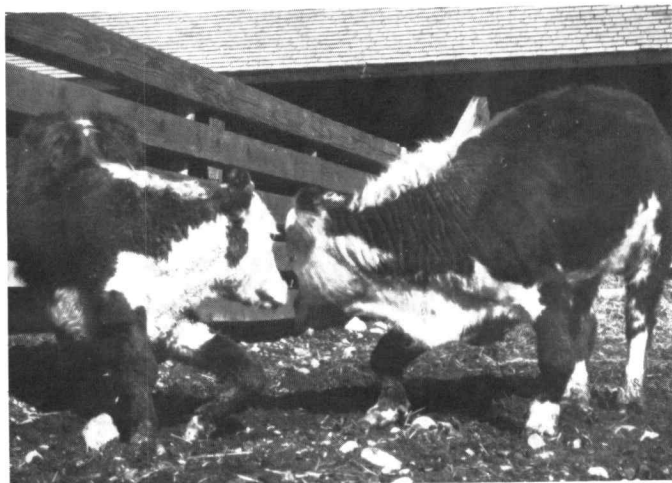
A number of factors might point to a plant cause for calf deformities: (1) a long history of the problems from year to year in a given area even though of quite variable incidence, (2) occurrence in different cattle breeds or lines, (3) occurrence in calves whose mothers grazed similar ranges during the 1st trimester of pregnancy, (4) no apparent infectious disease problems in the cows during early gestation, and (5) continuation of the problem even when unrelated bulls have been used.

Suppose the problem seems to be plant related, what plants are likely to be responsible? Presently only very few are positively incriminated by extensive feeding trials as causing calf deformities. Some others are speculated to be hazardous. Let's consider three examples where feeding trial information has positively incriminated the plants. The examples are the similar calf deformities induced by *Lupinus sericeus* or *caudatus* (silky or tailcup lupines), by *Conium maculatum* (poison hemlock), and by *Nicotiana glauca* (wild tree tobacco).



A typical crooked calf disease case. The animals may be quite healthy in appearance except for the deformities.

Lupine. A deformity condition that has come to be called crooked calf disease is of widespread occurrence in western United States, Canada, and Alaska. It has been known for decades and most western ranchers have either seen it or heard of it. Incidence is highly variable but can be extremely high. For years it was thought to be of genetic origin although some California ranchers and researchers speculated that one of the lupines (*Lupinus laxiflorus*) might be



Crooked calf disease in two animals. When the front leg deformities are this severe, the animals are soon reduced to walking about on the knee (carpal) joints because of inability to carry the increased weight on the deformed front legs.



Lupinus caudatus (tailcup lupine) in flower in western Wyoming.

responsible. But it wasn't until about 1966 that it became clear through feeding trials that lupines could produce the condition.

These feeding trials were conducted at the USDA Poisonous Plant Research Laboratory at Logan, Utah. Pregnant cows were fed either silky or tailcup lupines during various periods of gestation and in some cases their calves were born deformed. Both plants produced the condition, but cows were susceptible only during certain periods of gestation. The principal hazardous period proved to be the 40th-70th days of gestation. Based on the results of the feeding trials, we believe that period is the only period of serious concern to ranchers.

Deformed calves in the feeding trials were born with deformities like those of crooked calf disease field cases. Crooked calf disease deformities included bowing or twisting of legs with joints often locked in unusual positions. Either front or rear legs can be involved, but usually front. Careful examination of defleshed leg specimens shows that there can be malalignment of the joint bones or curvature or rotation of long bones. Some animals have spinal or neck curvature in addition to or instead of leg deformities. These curvatures can take on very bizarre forms with a hump or sway or twisting in either the back or neck or both. The head may therefore be cocked in an unusual angle. Sometimes some of the calves may have cleft palates.

So cows are mainly susceptible during the 40th-70th days. If ranchers let no cows of 40-70 day gestation period graze these lupines, the problems would be virtually eliminated. But that's usually not practical because the length of time the bulls are in with the cows may stretch that 40-70 day period over a couple months in many herds. But if the potency of the plant varied during the season, that might also be a factor that ranchers might exploit.

In fact plant potency does vary. Our chemical and feeding trial studies have identified the apparent active compound and shown that the plant is most potent when very young—up to 6-8 inches high, and briefly during seeding—when seeds are mature and before the pods have shattered and released the seeds. Plants are not so hazardous during flow-

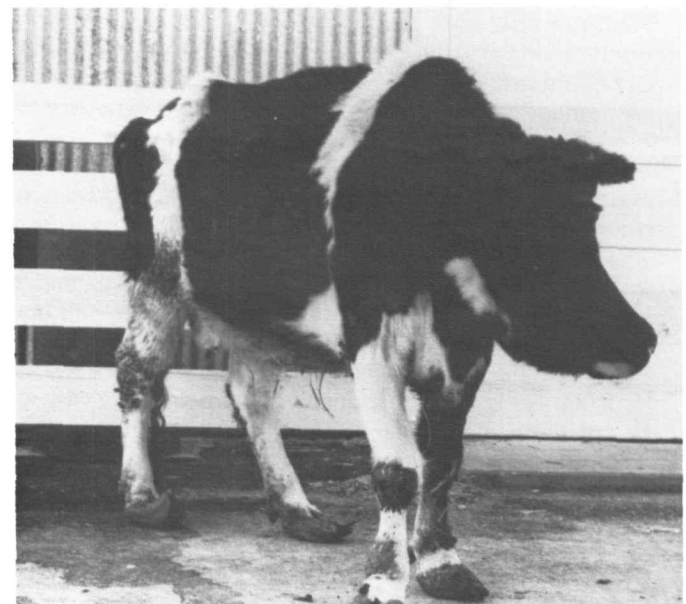


The deformed legs of crooked calf disease cannot be straightened by the animal, and when severe may result in the leg being locked in a unusable position.

ering and after seed pods have shattered. So there are hazardous grazing periods and there are safe grazing periods so far as plant composition is concerned.

Armed with these 2 facts (cows are susceptible during the 40th to 70th days of gestation and lupines are most hazardous when very young or in mature seed stages) ranchers and land management personnel can usually shift breeding periods and grazing periods enough to significantly reduce incidence. They can do this without major management changes usually by a slight breeding period shift and by keeping track each year of how lupine growth is progressing and then being a little flexible in grazing periods. Only in a very few cases has the problem been so intractable as to necessitate fall calving or other major management changes.

Are there any other management strategies or other techniques that can be used to reduce crooked calf disease incidence? Many people have advocated supplementation of grazing animals as a means of reducing incidence. There are as many recommended supplements as there are people



Curvature of the back or neck in crooked calf disease can be quite severe, sometimes resulting in the head being permanently cocked in a most unusual angle.



Conium maculatum or poison hemlock in flower in central Utah.

doing the recommending. Most are based on increasing intake of various vitamins or mineral elements. But we know of no conclusive, scientific evidence that suggests they help. Of course, we haven't seen them all. But we have looked extensively at the experience of 6 ranchers that used vitamin and mineral supplementation of various kinds over about 20 years. Crooked calf incidence varied from year to year and it was often tempting to believe supplements were helping until incidence went up in a subsequent year despite the same supplement. Incidence variations could, however, be traced reliably in every case to gestation period of the cows or potency of the plants, or both, rather than to supplements being used. We believe that ranchers can effectively reduce incidence by using breeding period and plant hazard considerations rather than by other management strategies, although in some cases herbicide application may be practical as a means to reduce abundance of lupine. County agents can usually provide suggestions on herbicide treatment.

Poison hemlock. If all deformed calves were due to lupine ingestion by the pregnant cows, the problem would be easier to solve than it is. Actually we know from feeding trials that two other plants will induce similar deformities, and speculate that there may be others. One of these incriminated by feeding trials is poison hemlock. If you have no hazardous-type lupine on your range but are still getting crooked calves, poison hemlock might be the culprit. We have seen a few ranches where this was so.

Lupines are widely distributed on rangelands of North America, whereas poison hemlock is much less abundant but can still be a problem along water courses, ditch banks, and wet meadows. Poison hemlock should not be confused with *Cicuta maculata* (water hemlock) which is often found in similar habitat. Poison hemlock can be identified by purple spots on the stems. Water hemlock does not have these spots.

If pregnant cows of about 40-70 day gestation period graze poison hemlock, deformed calves will likely result. So cows are susceptible during the same period as they are with lupine ingestion. The plants are potent during much of their growth cycle but are usually not very abundant, so the best approach is to eradicate the poison hemlock by cultivation or by herbicide treatment. Again, county agents may be able to make suggestions on herbicide treatment.



Nicotiana glauca or wild tree tobacco growing in western Arizona along the Big Sandy River.

Tree tobacco. A third plant is known from feeding trials to induce similar deformities when pregnant cows ingest it at about 40-70 days gestation. That plant is wild tree tobacco. It is an introduced plant in the United States and grows only in the southern or warm coastal areas of the U.S. It may be a problem only in Arizona and California and likely of only minor importance even there. It is a plant of very low palatability—even less palatable than poison hemlock, which cows usually avoid. Only the lupines are readily ingested by cows. But tree tobacco can induce the deformities and so should be considered a possible problem. We have no information on incidence of deformities from this plant but speculate that it would be quite low because the plant is so unpalatable.

Other possible plant causes. Some of the so-called loco plants like *Astragalus pubentissimus* and *Astragalus lentiginosus* are believed to be responsible for some calf deformities. Extensive feeding trials in sheep have shown the plant will cause lamb deformities. Field investigation of outbreaks and very limited feeding trials in cows at the Poisonous Plant Research Laboratory suggest calves, too, may be susceptible. But extensive laboratory feeding trial work will be necessary before we can be sure that loco plants cause calf deformities.

Thermopsis spp. (poison bean plant) may possibly be responsible for some calf deformities. They have in them chemicals like the active ones from *Lupinus*, and are therefore suspect. But extensive feeding trials with various *Thermopsis* have so far failed to produce unequivocally deformed calves. These feeding trials are continuing and are expected to establish whether *Thermopsis* can be considered a hazard.

Summary

Birth of deformed calves can be caused by plants the pregnant cows ate during periods of gestation. Some members of the *Lupinus* (lupine), *Conium* (poison hemlock), and *Nicotiana* (tobacco) genera are known from feeding trials to produce calf deformities. A few other plants are suspected. When genetic defects or infectious diseases can be ruled out as responsible for an outbreak of deformities, plants may prove to be the cause. When plants can be incriminated, management changes can usually be relied upon to reduce the incidence to acceptable levels.