

## Congenital hypothyroid dysmaturity syndrome in foals

Over the past few years, in conjunction with Dr Melissa Hines in the equine medicine department of the VCS, we have been examining the epidemiology of a syndrome in foals, which is manifest by prolonged gestation and the birth of foals that commonly have mandibular prognathism, the fine skin and soft silky haircoat of premature foals even though they are over term, incomplete ossification of the cuboidal bones of the limbs, flexural deformities of the forelimbs, and commonly ruptured digital extensors. Some have hydrocephalus and some patent urachus. The case fatality rate is quite high and many of the foals have to be destroyed. The syndrome is called the congenital hypothyroid dysmaturity syndrome. There is no palpable goiter in either the foal or the mare nor obvious change in the thyroid at postmortem but histologically there are characteristic changes. Diagnosis is probably best from radiographic examination of the cuboidal bones of the limbs, particularly the carpus. Dr Melissa Hines can provide more details on the clinical manifestations, differential diagnosis and the treatment.

We have examined/visited over 20 herds, which have had this problem and are aware of many more that we have not visited. It has occurred in all herd sizes and there is no breed or sex predisposition. Iodine supplementation in the herds has been quite variable, none, in the salt or occasionally in a mineral supplement block. One of the difficulties we have with this syndrome is that there is no lab in the US that does animal tissue iodine analysis. Usually there is only one or two foals in a herd born affected but some herds have more. It almost invariably occurs in foals born late in the foaling season. These are from mares bred late in the breeding season, and not just the effect of the prolonged gestation. Most of the affected farms have been small farms where the mares are fed hay year around, kept inside during the winter, and then let out in the early spring to exercise yards or sometimes pastures. The mares that are still pregnant at the time that they are let out are at the ones at risk, although not all of the mares with this exposure have affected foals. All of these herds have had their mares grazing over the common "weeds of waste places" during the last 2 –3 months of pregnancy. We have also seen this syndrome in five horse herds where the horses are run outside all winter and are fed hay in cleared areas of the pasture. (I enclose graphs of the data from these herds to show the risk patterns). In three of these herds the syndrome occurred two to three years after the herd was newly established on these pastures which is compatible with our hypothesis of cause below.

The syndrome was initially reported by workers in Saskatchewan in the late 1980's and occurs across the Canadian Prairie Provinces into British Columbia. The Canadians conducted a case/control study and found a between-farm difference in the nitrate levels in the hay. However, the nitrate concentrations that they report are very low. In our study, the disease has occurred mainly east of the Cascades with a particular clustering north of Spokane up to the border (and across) and also in Northern Idaho and northeaster Oregon. In part, this might be a reflection of recognition and reporting of the syndrome, because we certainly have also seen it in the Okanogan valley, Methow valley and in the Central Basin. Our studies show that it is the late born foals that are at risk. All horses in the affected herds have the same feed and water exposure risk throughout pregnancy but the mares of the late born foals also have an exposure risk of early growing plants on the pastures or exercise areas they a put out to in early Spring. In many of these herds there has been little grass on these areas and the exposure has been largely to weeds particularly those that are the early

growing winter annuals. Based on the findings in our herds we believe it occurs because of the ingestion of weeds by mares in late pregnancy. Whereas we cannot rule out the possibility that the syndrome reflects an intake of nitrates from these weeds we believe that the risk is from the ingestion of *Brassica* spp or mustards. These are winter annuals and are predominant in early spring. *Brassica* species contain glucosinolates, which can be broken down to thiocyanates and to thiouracil analogs. Both of these are goitrogenic. The effect of thiocyanates is weak and can be reversed with iodine supplementation, whereas the damage to the thyroid by thiouracil analogs cannot. Part of our reasoning in incriminating mustards is that an identical syndrome was produced in lambs, way back in the 1950's, by the administration of thiouracil to ewes in late pregnancy. The *Brassica* species we have commonly incriminated are Shepherd's purse (*Capsella bursa-pastoris*). Blue mustard (*Chorispora tenella*) Flixweed, (*Descurainia sophia*) Claspings pepperweed, (*Lepidium perfoliatum*) Field pennycress (*Thlaspi arvense*) and Tumble mustard (Jim Hill mustard, *Sisymbrium altissimum*,

There is also a risk for this syndrome if mustards are present in the alfalfa or hay that is fed in late pregnancy. One reason for incriminating mustards is that one of the first outbreaks of this problem that we saw was in a horse herd that was being fed hay from newly seeded alfalfa which had a heavy contamination of Jim Hill mustard. In this herd all of the foals that were born alive were affected, but there was also a very high abortion rate. We have another similar herd where 8 of 9 foals were either aborted in late pregnancy or were born affected. Again there was heavy mustard contamination in the hay.

Mares may have more than one affected foal. In one case we have a mare that through her breeding life had four affected foals. This was the CVMWSU CID herd and the early cases are documented at postmortem but this was before we recognized this problem as a syndrome. These cases were late in the foaling seasons and this mare was one of about 26 mares in the herd, depending on the year. They grazed a generally good mixed grass pasture but in this there are pockets of mustard species. She, and another mare that had two affected foals, were the only mares that had affected foals over an 8 year period. This could suggest an eating behavior predisposition. On some farms we have offered Shepherd's purse to mares that have had affected foals and they have eaten it whereas the majority of mares with normal foals refused it.

There are other possible risk or contributing factors and it is possible that this disease could have a multifactorial cause or that there might be more than one cause. We cannot ignore nitrates as the Canadians have made this association for farms in Canada. There is an underlying selenium deficiency in many, but not all, of these herds and this might also be a risk factor, as selenium is involved in the conversion of T4 to T3. Paradoxically, one can produce a similar syndrome in pregnant mares by feeding excess iodine or seaweed. We think mustards are our main risk. I suspect that any mustard species has potential to produce this, certainly they all have glucosinolates, although the glucosinolate type varies between mustards.

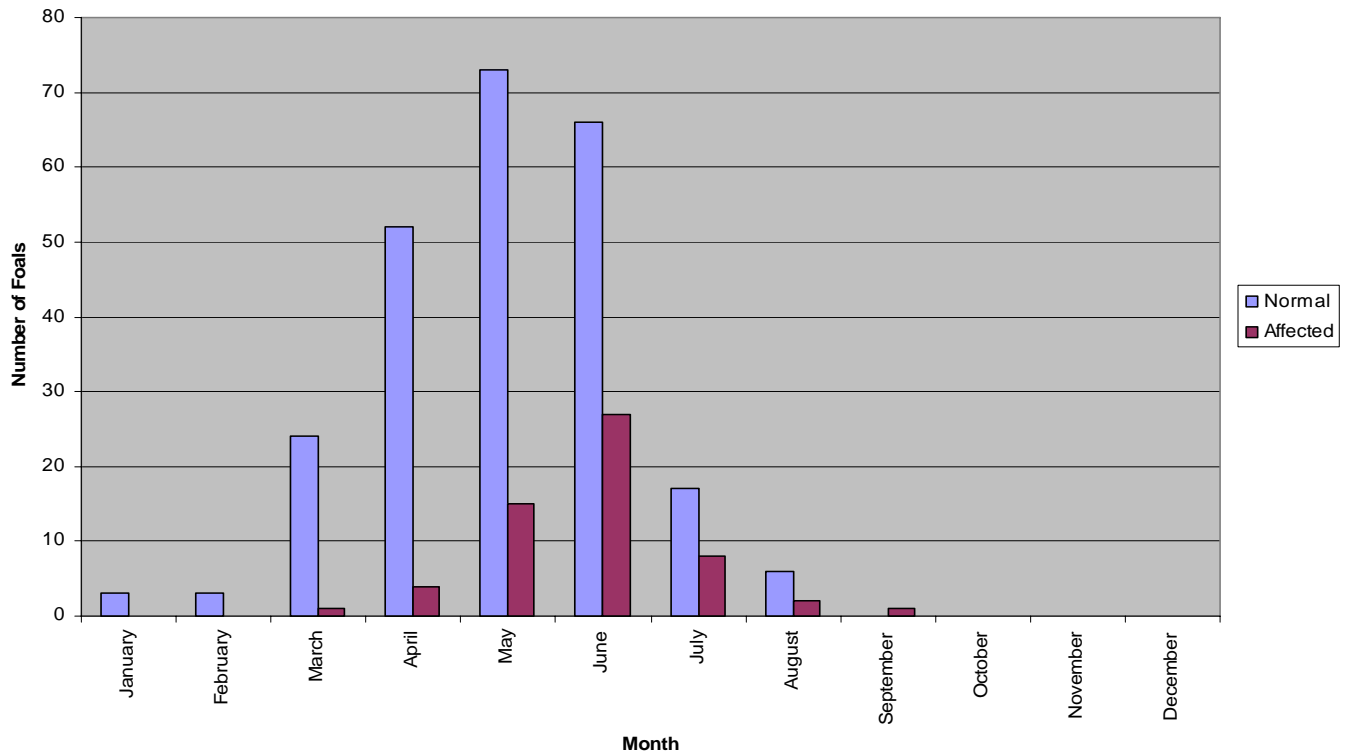
Our recommendations to owners are to make sure that the source of their hay is secure and to keep late pregnant mares off exercise areas and weedy pastures until they have foaled. It is surprising that many horse folk believe that horses graze nothing off these exercise areas in the early spring, but fence line comparisons suggest that there is a considerable growth that is consumed. If the

mares are kept outside all winter then all weeds (to be safe) should be eliminated from the feeding areas. This could be by spraying or possibly continued harrowing. Your county agent

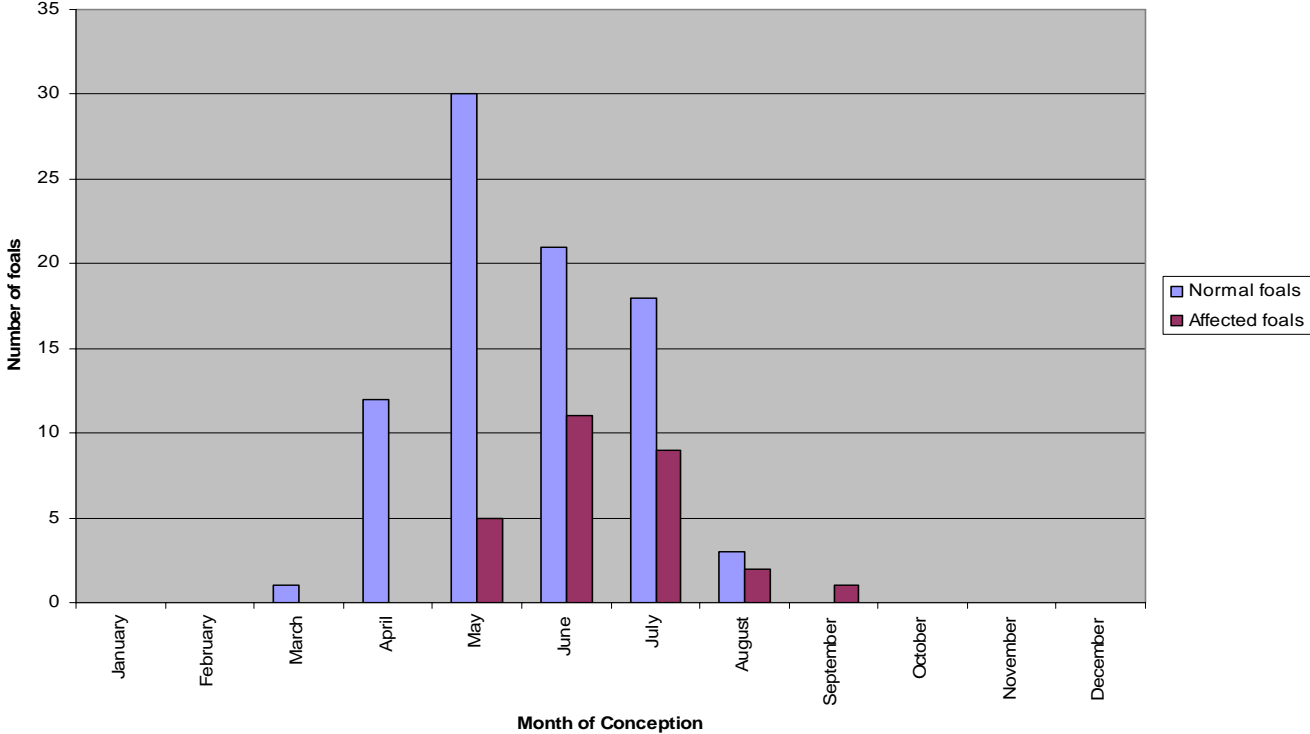
Mares who have had an affected foal are particularly at risk and definitely should be kept inside on secure hay. I have suggested to horse breeders that they should inspect the alfalfa or other hay fields that they intend to buy from prior to it being cut. It is not easy to detect the presence of mustard species once they are incorporated in hay. Grain could be a possible source if the grain field had mustards growing in it but we have not found mustard seed contamination in the grains fed to the problem herds that we have visited.

To my knowledge, herds that we have visited and that have followed these recommendations have not had further cases.

**Birth month of foals in problem year in 26 herds affected with the congenital hypothyroid dysmaturity syndrome.**



**Breed Month of Mares in Five Herds Wintering Mares in Paddocks and Fate of Foals**



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