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1. What are the indicators in heifers that tell a producer the nutrition program is compromising heifer health?

Many producers focus on finding effective treatments, setting up elaborate vaccination protocols, or improving ventilation and sanitation when heifer health problems occur. Inadequate nutrition is a stress on growing heifers and another major underlying reason for heifer health problems that does not receive proper attention. It only seems logical that if the heifer is not fed enough to grow, that the immune system's growth would be retarded and would not protect the heifer. .

In the three respiratory disease herd problems, which I attended this past winter, there were many similarities. The farms followed acceptable vaccination protocols and the calves were reasonable clean. From my perspective as an objective outside observer, it was apparent that the calves were underconditioned. So the first indicator would be to **body condition score** calves with a goal of no calves under 2.75 BCS. In one case, the manger contained forage that resembled straw but was called "heifer hay." In another case, calves were fed with a coffee can that was assumed to deliver two pounds of grain, but we discovered the scoop only held one pound when measured with my scales. In the third case, the calves were encrusted with ringworm lesions and had a heavy louse infestation that led to an anemic, undersized condition. In all three herds, inadequate growth due to nutrition or parasitism weakened the immune status and allowed an expensive respiratory disease outbreak to affect the calves.

Another indicator used in these calves was to measure them with my measuring stick and the farmer's growth tape. The heights and weights were plotted on the **Penn State heifer growth chart** for further evidence that they were not growing at a normal rate. Two of the herds have adopted monthly measurements to detect if improvement occurs.

Adequate energy for growth is essential, but care must be taken to feed a balanced ration that will not cause acidosis in growing heifers. In our worse Salmonella herd outbreaks, cattle that are stressed by rumenitis/laminitis/acidosis syndrome suffer higher mortality/morbidity rates. In our best performing herds, it is becoming common to trim heifers' feet before they enter the milking string. **Laminitis cases should be recorded by the foot trimmer** as another indicator or improper heifer nutrition.

Poor heat expression, while not a direct indicator of poor health, can also be a sign of inadequate or improper nutrition in growing heifers. Limited supplemental mineral or vitamin feeding can suppress the immune system and cause health problems. Sometimes our first indicator that mineral/vitamin feeding is inadequate is when we investigate the causes of poor pregnancy rates in the heifers.

2. How do you feed heifers to ensure strong immune system development?

A good objective is to obtain a steady growth rate of around 1.7 lb/day to insure that the immune system is maturing at a normal pace. Our top producers are measuring heifers on a monthly or quarterly basis to pick up problems before they lead to health problems. We encourage growers to work with the farm's nutritionist/feed co. rep to balance proper energy and protein content with farm-raised forages.

When treating baby calf pneumonia, our most common finding is that the feeder is limiting milk replacer in an attempt to starve calves so they are forced to eat less expensive grain. We recommend that the amount of replacer be increased up to 3-4 quarts per feeding at that 2-4 week old stage when baby calves most commonly get pneumonia. The producer's money is better spent on extra calf feed that returns higher growth than putting the money in the drug company's till to pay for expensive antibiotic injections.

Speaking of antibiotics, we find calves perform better and have less scour problems if the milk replacer does not contain antibiotics. Oral antibiotics kill off helpful and harmful bacteria indiscriminately and can lead to digestive upset. Viruses and protozoa that do not respond to antibiotic therapy are common causes of calf scours and the feeding of antibiotics throw off the balance of gut flora in their favor.

Ionophores are a cost-effective additive for heifer rations because they have the health benefit of controlling Coccidia infestation. Coccidia and Crypto are common underlying causes that weaken the overall immune system and lead to respiratory disease in growing calves.

Major and Micro minerals should be balanced and included in all heifer rations. We feel that Calcium and Phosphorus have to be top-dressed to insure adequate skeletal growth. Significant microminerals for immune function are Selenium, Copper, and Manganese. We feel there is a growing body of evidence to justify the cost of feeding Chelated forms for proper absorption. Vitamin A, D, and E have to be supplemented to calves in the N. E. that are fed stored forages.

Guidelines for growing heifers on Dry Matter Basis

Minerals	milk replacer	calf starter	3-6mo	6-12 mo	>12mo
Calcium %:	0.70	0.60	0.52	0.41	0.29
Phosphorus%:	0.60	0.40	0.31	0.30	0.23
Magnesium%:	0.07	0.10	0.16	0.16	0.16
Iron%:	-----0.10-----				
Cobalt, ppm	-----10-----				
Copper, ppm	-----40-----				
Manganese.ppm	-----40-----				
Zinc, ppm	-----0.25-----				
Selenium, ppm	-----0.30-----				
Vitamins:					
A, IU/lb	1700	1000	1000	1000	1000
D, IU/lb	270	140	140	140	140

E, IU/lb	18	11	11	11	11
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