

# The Role of Blood Profiles in Cattle Health Problems

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Rapid advances in dairy production technology have made profound changes in the dairy cattle health situation in Pennsylvania. In the past twenty years, production per cow has increased almost 50%; herd size has doubled. Forage production has radically changed from the traditional four to six year crop rotation scheme to production of one or two forage crops for the typical dairy enterprise. Alfalfa and corn silage are usually used for forages produced on most farms, but many dairymen attempt to feed their herds solely on one of these two forms of stored forage. Permanent pastures if they are used at all are provided for yearling and bred heifers. Chemical weed control, repeated planting of the same forage crop in the same field, increased soil testing and increased use of relatively cheap fertilizers have had a profound influence on the composition of forage. In addition, increased herd size and often a large poultry operation on the same farm have provided huge quantities of manure which is too often spread on the same land in close proximity to cattle and poultry housing.

At least fifteen years ago, Penn State extension and diagnostic laboratory veterinarians became aware of the fact that problems were developing which must be related to the new agronomic practices used on Pennsylvania farms.

Grass tetany was the first problem to significantly increase in incidence. We found the problem occurring on beef cattle farms where pasture renovation had taken place. True grass tetany had previously been rare in the state, and what was called tetany then was really the beef cow starvation syndrome. In dairy herds where alfalfa was the major forage fed, incidence of milk fever approached 90% in some herds. About ten years ago we encountered the first anemia-anestrus herds. These were high producing well fed herds, primarily on excellent corn silage. Cows producing up to 100 pounds daily were showing no ovarian activity; they were extremely anemic and few of them conceived before the fifth month of lactation.

In 1969 we called together a group of university people who were interested in soil science, plant breeding, agronomy, nutrition and veterinary science. The group conceived Research Project 1870 which is still being pursued. We determined that our first goal should be the in-depth study of normal high

producing dairy cows.

## Procedure Used

We carefully selected 15 herds located on the major soil types in the state. Twenty-five percent of the cows in each herd were blood sampled four times annually for two years. At the same time blood was taken from the cows, forage, grain and water samples were taken. Soil samples were collected from all of the forage-producing fields. The blood parameters found appear on Table 1 and a comparison is made with findings of several others who have published on this subject. The model parameters found have been used as a basis for comparison with abnormal problem herds.

## Conclusions

We found that our herds which were having severe milk fever situations were in two categories: Some were fed largely alfalfa during the dry preparturient period and others were fed largely on corn silage during that time. The alfalfa fed herds had serum calcium values exceeding 10 mg/percent and low serum phosphorus values usually under 5 mg percent. Corn silage-fed dry cows which later experienced milk fever were inadequately fed both calcium and phosphorus and values for these were low. Our grass tetany herds routinely showed under 2 mg percent in spite of efforts in many cases to supplement the diet of beef cows with magnesium oxide supplements. Grass tetany herds are under further scrutiny.

The anemic anestrus problem herds revealed hemoglobin levels of 5.5g to 7.0g and packed cell volumes from 25 to 30 percent. These herds have responded to feed supplement therapy using a specially prepared "anemia mix" (Table 2), iron dextran injections and copper glycinate given intramuscularly. Some veterinarians have been using large doses of vitamin B<sub>12</sub> in addition.

Water was the one common feed ingredient found to be of excellent quality on the farms where the normal high producing herds were studied. At present, an effort is being made to get blood, feed, forage, water and soil parameters on problem herds and to improve herd situations by feed supplement changes, changes in forage feeding practices, fertilization changes and, in many cases, improving the water supply for the cows.

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Table 1  
Dairy Cow Blood Parameters - 2280 Samples  
Penn State University Project 1870

	Hemoglobin	PCV%	RBC Millions	WBC Thousands	Total serum protein g%	Serum albumin g%	Serum globulin g%
PSU Means	10.8	32.3	6.2	9.4	7.56	2.74	4.82
Range over 2 yrs.	10.8-10.8	31.7-32.9	6.1-6.3	9.4-9.4	7.44-7.67	2.73-2.76	4.71-4.92
Range over 4 seasons	10.5-11.1	31.6-32.8	6.2-6.3	9.1-9.7	7.32-7.83	2.69-2.81	4.59-5.02
Range over 15 farms	10.3-11.5	31.1-33.9	5.9-6.5	8.1-10.6	7.28-8.06	2.58-2.89	4.58-5.30
Schalm	11.3	33.6	5.97	8.0	6.0-8.0	-----	-----
Payne-Underwood	12.2	28.9	7.0	8.0	7.1	3.3	3.8
Compton - 7/73	12.0	32.5	-----	-----	-----	-----	-----

  

	Ca mg%	P mg%	K meq/liter	Mg mg%	Fe ppm	Cu ppm
PSU Means	9.3	6.02	5.12	2.2	1.72	0.85
Range over 2 yrs.	9.26-9.36	5.89-6.17	5.09-5.14	2.19-2.21	1.71-1.72	0.85-0.86
Range over 4 seasons	9.15-9.49	5.91-6.15	4.97-5.35	2.18-2.23	1.63-1.81	0.83-0.87
Range over 15 farms	9.08-9.67	5.62-6.36	4.93-5.38	2.03-2.3	1.60-1.80	0.78-0.92
Payne-Underwood	9.3	5.4	4.8	2.6	1.46	0.8
Compton - 7/73	9.5	6.0	5.0	2.5	-----	0.7
Kaneko & Cornelius	-----	-----	-----	-----	1.62	-----

Table 2  
Anemia Mineral Mix For Dairy Cows

	lbs/cwt
Dicalcium phosphate <sup>1</sup>	86.056
Anhydrous ferrous sulfate	12.474
Copper sulfate	1.385
Cobalt sulfate	0.085

<sup>1</sup>Serving mainly as a filler. Thus other suitable carriers may be used and certain ingredients used to enhance palatability when necessary.

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### Discussion

There were some interesting "spin offs" from the project.

One of the observations made by a Penn State plant breeder alone may make all our efforts to study the normal herds worthwhile. He found that the calcium-phosphorus ratio in varieties of alfalfa grown in Pennsylvania varies from as high as 14:1 to as low as 3.0:1, and the wide range of values has nothing to do with the productivity or health of the alfalfa varieties. It may be possible to develop good varieties of alfalfa with calcium-phosphorus content more nearly meeting the requirements of dairy cows.

Penn State plant breeders are studying silage corn varieties to see whether or not improving calcium + phosphorus content can be a practical possibility.

**One of the most worthwhile observations the author has made, and is happy to report, is a great improvement in communications and interest among all of the scientists involved in the other scientists' areas of expertise. It is gratifying to see agronomists interested in animal health as it relates to agronomic practices, plant breeders concerned with animal health implications of their work, and veterinarians and nutritionists interested in solutions to herd problems by other means than medication and feed supplementation.**