

The Role of Selenium in Retained Placentas

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Chairman: Dr. Julian and associates at Wooster did the work that has been referred to several times on selenium and retained placenta. Dr. Julian was with the US Feed Grain Council and is presently employed overseas and at the last minute was unable to attend. His associate, Dr. Russel Conrad who is still currently active at the Ohio Agricultural Research and Development Center in Wooster will present this talk on selenium and retained placenta.

Dr. Conrad: Thank you Dr. Weaver. Since I am the substitute today, I am also the chauffeur. That means that Dr. Weaver gets all the questions. At the outset I want to say that I am delighted to give this presentation for Dr. Julian. He did a great deal in this area while he was with us and I also want to mention some of the other people that have been concerned with it. One is a member of your organization, Dr. Jimmy Jones and also Al Masen who has been our chemist and kept us straight with the measurements all these years. I also want to be very careful today. Dr. Bierschwal has sounded that note, but I got specific directions before I came out here from Dr. Tharp who is our presently Associate Dean in veterinary medicine at Columbus. He said now be very careful because it takes these people a year to find out about how much they heard was misinformation. Good nutrition is probably the most important care that one can provide the preparturient cow. Sometimes we have difficulty in describing what this is in terms of the dairy cow but we are making some progress. We also have new tools. We saw some of those shown by Dr. Brit today. My remarks apply primarily to a very small aspect of the nutrition problem of the dairy cow and this is literally true. In the quantitative as well as the qualitative sense because the quantity of selenium required by the dairy cow is 2mg per day for a Holstein cow and this is such a very small amount you can represent that as 2/3 of a wet thumb print so that is the very small amount that is required. So selenium is the smallest of the nutrient requirements of all the known nutrients. The job of those who have been working in the area of selenium nutrition has been made easier by several of the recent discoveries in biochemistry. The most significant advance has been the discovery of the natural occurring cellano-proteins in the body and particularly this has been the discovery by the Wisconsin researchers of plutothyone peroxidase. This peroxidase is very important in the handling of the oxidative stress in the cell of the animal and I want to return to that just shortly by way of introduction,

Dr. Bierschwal has already mentioned vitamin A and calcium and phosphorus as being important items to consider in the occurrence of retained placenta. I would like to first discuss something about the deficiency, by and large it is east of the Mississippi. This deficiency representing a wide area of several states including New York, Pennsylvania, Kentucky, West Virginia, Ohio and a great deal of Indiana where most of the deficiency is concentrated. It is not that these areas fail to have selenium in the soil but for the most part it is not available. The chemistry of selenium therefore plays a very important role in livestock health. Corn silage is one of our important deficient feeds as well as alfalfa hay and much of the pasture land of these areas usually are quite low in selenium. Dr. Bierschwal has been through these items so I want to now turn to one of Dr. Julian's first experiments in outlining the effect of selenium on retained placenta. We had initiated a study to determine if selenium would help in the prevention of displaced abomasum in our herds where they were allowed to run with the total herd and the dry cows were eating large amounts of concentrate. We had very negative results in that case but where we had included selenium in the ration we did see a marked decrease in the occurrence of retained placenta. This lead us to establish what level of selenium would be required to prevent retained placenta and get the plasma level to a near normal level. The very early work is now about 10 years of age. That was done by Trinder in England and you may recall that he used 15mg of selenium. That treatment was tried in this country in many, many places, several of them had not reported that they did it, but at the 15 mg level of injected selenium they failed to have an effect. We found that we could establish a blood level that would be considered normal with 50 mg injection of selenium in 680 IU of vitamin E given 20 days ahead so that we then used that dose as well as an oral dose where we had to give 6 mg of selenium was not effective but 12 ½ for 5 days in a row then repeating it 12 ½ per week until the cattle freshened. The results of this kind of experiment lead us to know that we had the right answer. There weren't any retained placentas in this selenium treated group whereas there were as many as 38% in the untreated group. To point out another matter of considerable importance, that is when the dry cows were fed an 8% ration, one sees that the incidence is 50% in the 8% group compared to 20% in the 15% protein groups. Many proteins carry selenium as the amino acids selenomethianine and seleno cystine so that usually if protein is higher, a larger amount of selenium enters the animal through the natural means.

The results of Dr. Julian's experiments led us to report these. As a result of that we had several reports indicating that they had no effect and we began then a series of studies

to try to sort out why this might not be or why this was true, that some people could get a magic result and others couldn't, so we have been looking at the various results since that time. We repeated our study in 1978 and you will notice that we had 21 cows. This is at the Research Center in Wooster and again with selenium treatment no incidence in 25 cows or 24% in the controlled group so with that kind of repetition we feel that under our circumstances and particular local conditions that this is a possible treatment when selenium is low in the plasma of these cows. This assembles all the information that I have been able to obtain from published data. I have other information from Indiana which did look very much like the Maryland data. With our research center at Ohio, we have a good effect of selenium complete control there. We also did 5 farms in Ohio and these farms are at epidemic levels. You will notice that over 50% of the cattle were retaining so this is a very large number of retentions that we selected for this experiment because we thought that this was where the selenium deficiency occurred when we had very large numbers of these cows retaining. There is also a Kentucky experiment which shows that there is a reduction in selenium. Now we come to the Maryland work and certainly no effect there and in South Dakota it is exactly the same. Now I want to show you some of the percent or some of the levels of selenium in these cows. You will notice that the Ohio group where we had an effect at .07 parts per million of selenium. A cow under maximum amounts of selenium in the ration will tend to level off at about 0.1. .026 in the controls, again in the Ohio farm we were up to .060 and the controls there 0.022 parts per million. In the Maryland group they just didn't make it; 0.034, 0.021. In South Dakota where selenium is in excess of 0.103, 0.101, we would not expect an effect at that kind of a level. We begin to see now some of the reasons for the differences in reports. All places have not had blood information and much of this we did ourselves asking the people to send us the blood samples so that we could know just about what the situation is. We extrapolated our incidence data, our plasma selenium levels that would indicate a possibility of zero retained placenta from just the Ohio data where we had complete control with selenium and this comes out at about

a .05 part per million. This is something under the normal, natural level for dairy cows which would be about 0.1 part per million but it does indicate that if we fall much below 0.05 parts per million we can suspect that selenium is a major factor in the incidence of retained placenta.

For treatment of cows during the last 3 weeks, we have continued work on that because in a producer situation they were on all fermented rations. We wanted to find out if alfalfa silage would help or hinder this. In fact we thought that because it would contribute more selenium, it might indeed help the situation but we compared that with our pasture cows and the control with the MU-SE product, 50 mg of selenium and 680 I.U. of intramuscularly. The result of that showed that we indeed raised the level of selenium in the plasma but we raised it less with the alfalfa treatment and we begin to see an inconsequential result; the 11.1 is almost on Dr. Bierschwal's 10 percent so we really don't know whether alfalfa silage had an adverse effect in this experiment or not. We do know that, in many of the cases, ensiling the product or the feed, seems to make it worse than it would be in terms of both the plasma selenium and also the incidence of retained placenta.

Another case that we have run into is where lead feeding occurs that it is much more difficult to retain a high level of selenium after a single injection so we have a problem with our interaction of our feeding system with the treatment. The one question in the metabolism of selenium is that it is known that the presence of sulfate ions will cause increased excretion of selenium. This we thought might be a problem in this experiment but examination of the plasma indicated that sulfates were the same in all of these conditions and therefore we suspect that alfalfa does not contribute more sulfate to the animals but rather it has to do with the chemistry of selenium in the digestive tract.

I would indicate to you that I think, in particular, that we have indicated the situations in which selenium may be used in the treatment of retained placenta specifically when there is a very high incidence, more specifically if you will have the animals bled so that you can tell whether their selenium is low or not then we think it is indicated where selenium is low in the plasma of these cows.