Problem Solving Session II: Reproductive Management

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Question: We have seen a relationship between ***hemophilus somnus*** *and ureaplasma. When vaccinated with* ***hemophilus somnus*** *the incidence of ureaplasma seemed to decrease. Comments?*

Dr. Doig: The two organisms certainly like each other and they behave almost like twins. When we culture purulent cows with granular vulvitis from which we get ureaplasma, we also get, in out of five, hemophilus. We were never able to say that the cow that had hemophilus and ureaplasma was likely to be less fertile than the cow that just had ureaplasma. If you have seen a drop in the incidence of the effects of ureaplasma with hemophilus vaccination, I don't know how or why there would be any tie there. I caution you that ureaplasma, fairly characteristically, in a herd, will have its effect decreased with time. You can have a nightmare for 6 weeks or so. It is variable on how many susceptible cows are there and then all of a sudden things start to improve. It may not have been a real association. It might have been something that was going to happen. If there is an association I certainly cannot accept it.

Dr. Miller: Hemophilus does seem to grow better when there is an irritant in the inner tract and it is more aptly spread to other animals. We have shown that with IBR virus in the nasal passages that they are able to transmit infections by that route when the animal has been irritated using IBR virus. Certainly hemophilus would grow better when the immunity is compromised because of the ureaplasma. As Dr. Doig said, since they are residents of the same area they do seem to work together sometimes.

Question: Would you go over the differences in the vaginal-type lesions that you are seeing with ureaplasma and hemophilus and the treatment of each?

Dr. Doig: With hemophilus, I don't think you see the characteristic granules, certainly not as frequently as you do with ureaplasma. You have to eliminate that you don't have ureaplasma there at the same time. The lesion does become a mucopurulent exudate within about 24 hours after the infection. This gradually reduces and the redness decreases and you do have some roughness of the vulva area, but it is not characteristic inclusion-type that you get with the ureaplasma. You may get granules, but these are mostly lymphoid granules in response to probably any antigen, and not quite as characteristic as the ureaplasma. The treatment, you can use a furazolidone irrigation of that area and probably penicillin-streptomycin intramuscularly. The organism is sensitive to that. In the postparturient situation I have not had good luck getting rid of the organism, but it certainly has reduced numbers and it has been reduced to the extent where I wasn't able to culture it. However, a doctor in Alberta has used this similar treatment where he was having herd outbreaks that he considered were associated with *Hemophilus somnus* and he found this to be very beneficial. I would caution everybody that you want to make sure that your problem is due to *H. somnus* before you start treating for it and culturing for ureaplasma and other organisms that affect that area of the tract. Just growing it there without the signs is not enough. I think the animal may have some immunity. That may not be the source of your problem. Your problem may be nutritional or some other cause.

Dr. Miller: The lesion of granular vulvitis is just that, one that we saw associated with ureaplasma. Granular vulvitis associated with infertility has a very pronounced purulent discharge. So if you are seeing just a few granules around the clitoris or a few migrating around the lateral wall of the vulva or maybe even dorsal commisure, but it's not red or angry or it is not really a situation in the herd where he is

complaining about cloudy estral mucous, I would doubt if you could correlate that with infertility. So the lesion is quite striking and especially the purulent discharge associated with it. That is for the granular vulvitus strains. The abortion strain, the D48 strain, we have isolated from all cases of abortion that have been examined. I might just mention something about abortions. A laboratory worker in Ontario recovers a mycoplasma from 36% of aborted fetuses sent to her. You think in terms of about a 30% diagnostic rate right now for aborted fetuses, maybe it is time we started looking for these things. Half of those are ureas and the other half are mycoloplasma in Ontario. I think in other parts of the country it may well be a little bit different. The ureaplasmas associated with abortions will not cause any demonstrable signs except maybe a purulent discharge. You won't see the classical granular vulvitis syndrome. Treatment of granular vulvitis? It appears to remain localized in the vulval-vaginal area. It is a reservoir for the upper reproductive tract. It does not actively migrate forward to the upper reproductive tract like vibrio, so if you find it in the uterus, somebody put it there, either the bull or yourself, or the technician or gravity in the cow that is tipped badly. Because it remains in the vulva, the treatment is designed to minimize the potential transmission at the time of breeding or time of uterine infusions. In a full blown granular vulvitis outbreak due to ureaplasma, the worst thing you can do is go in there and indiscriminately infuse cows with penicillin. You'll just transmit it into the uterus. When there is a problem, and I'm assuming the nutrition of the herd has been looked into and there is no predisposing cause, the first treatment we go into is double rodding at the time of breeding. That alone in many herds will bring fertility almost back to normal as will a cleanup bull momentarily. The second thing, in a herd where the conception rate is down below 30%, and has been that way for 4 months and he is in serious trouble, you almost have to go exclusively to double rodding and post breeding infusions which are carried out 24 hours approx. after breeding. The drugs that are being used in Canada are a tetracycline by American Hoechst, which I understand are not available here. Other tetracyclines can be used but they do not appear to do as well and may be related to the vehicle and the retention of this peanut oil or sesame seed type oil product in the uterus. The other product which has been used is spectinomycin. It works very well and the dosages for both products is usually, with the tetracycline, one gram which is 20 ml. The dosage for spectinomycin would be one or 2 grams depending on the size of the uterus. The other technique that is used once things get under control is to simply allow the owner to douche the vagina and vulva and timing those flushes from the mid diestral period towards the next intended heat. In other words, you try to drop down the numbers of organisms just before the cow is going to be bred, but still institute the double rodding. The treatment of bulls, I have no idea how to do it. I have put everything I can think of into the prepuce of bulls. You can knock the numbers down, but 2 weeks later you come back and there they are again. So I have not had too much luck treating bulls. But you can control it long enough to get cows in calf.

Question: Do you recommend any certain time for milk pour-out on a lactating cow on some of those products?

Dr. Miller: We checked out most antibiotics, other than penicillins, we can't find any in milk at the dosages we use in the uterus, tetracyclines, spectinomycins and whatever else we checked. The dosage is fairly low and most of them are not absorbed very well from the uterus. But I think to be safe you should be throwing out the first milk after the infusion. I don't know of anyone who has had a problem doing that. If you're really concerned, go two milkings. But it depends on the antibiotics you are using. If you're putting it into a postpartum cow with a large uterus, then I think that might change the situation.

Dr. Ball: I don't believe oxytetracycline penetrates very well through the uterine wall in any event. However, large doses would be expected to get there and in the dosages you would need to use with clinical metritis I would be concerned and would recommend withholding milk for at least 96 hours.

Question: What carries would you see with a tetracycline-type product and how much tetracycline dosage-wise would you use on a large size uterus three weeks postpartum and three weeks postpartum on a moderate size uterus?

Dr. Ball: We have tried to divide the postpartum period into three sections. The first would be the period between the time the cow calves and the time the pituitary becomes sensitive to GNRH and this occurs usually about 8-14 days, 10 days would be sort of a round figure. The intermediate period we would like to define as that time between when they become sensitive to GNRH to the time they ovulate and that is quite variable because ovulation may occur as early as 13 to 14 days on up to 30 or 40 days after they calve. The last period would be the one after ovulation. The diseases that are present in the uterus at these times are different. During the first period you are going to get puerpural diseases, life threatening diseases of the uterus. The amount of oxytetracycline that you would give them is probably much larger than you would give later on. In those cases, we commonly use either boluses or oxytet. in povidone solution because it is less irritating. If we were infusing cows after 20-25 days, most of the organisms that would carry would have penicillinase in them and would prevent penicillin from being effective but are gone somewhere along that time. So the statistical likelihood of penicillin being effective is much better against those organisms that we are most concerned about. In that case the uterus is usually down pretty well. If you do use oxytet. you need to have the dosage of probably one or two grams. In this range, one gram did not seem to get into the milk in the involuted uterus in detectable levels, so I

think the recommendation here is you need to withhold the milk at least a milking or two to be safe. Penicillin, as long as it is infused in quantities less than about a million, two hundred thousand units, does not get into the milk in detectable levels. It is a good idea to withhold the milk for a day or so. In an empty or near empty uterus these lower dosages do give levels that are sufficiently high. For example, penicillin at 1,200,000 units in a relatively involuted uterus, according to California workers, will give you approximately 36 hours of bactericidal levels, so that should be enough.

Question: Do you recommend douching the vagina if you see cloudy estrus mucus?

Dr. Doig: I hate to make a blanket statement when not knowing more than just cloudy estral mucus. I don't think I would recommend that you just indiscriminately start flushing vaginas. What is the cause of the purulent discharge? Is there any other sign of disease associated with it? Has it evolved into vulvitis or not? Is it coming from the uterus, or is it vaginitis? Certainly in Ontario in the past few years if a herd had a high incidence of purulent material or cloudy estral mucus, there was a very high chance of it being the vulvitis syndrome. I don't think that holds true everywhere and I think you would have to do some more diagnosis before you institute a blanket treatment.

Question: Does vaccination for leptospirosis cause shedding and have you seen abortions after vaccination?

Dr. Hanson: The first question comes from some other discussions and letters in the AVMA. One or two persons stated that vaccination would increase the number of silent infections and therefore, shedding. There is no evidence to indicate this. In fact vaccination decreases the shedding. It does not mean that silent infections may not occur, but it decreases the shedding considerably over the animals that have silent infections without vaccination. In fact in New Zealand they have decided that the primary approach to controlling leptospirosis in dairymen is vaccination of the cattle herd. They have tried other methods and they have not been as effective as far as protective clothing, and so on. There has been a high incidence of human leptospirosis. They also showed in one study in New Zealand that animals that were challenged after vaccination, eight shed organisms one time out of 82 cultures, while the control group, 42% of all the cultures were positive at all intervals tested.

The question was whether repeated vaccination is the cause of abortion, or may be related. *(Not necessarily repeated abortions, but have you heard of a series of abortions after a herd has been vaccinated for lepto.?)* Yes, I have heard this. The only herd where we have been able to follow this up carefully is a large herd in the State of Washington where they were vaccinated three times a year. There were abortions about ten days after the last vaccination, with retained fetuses and placentae from about eight abortions. They were all due to factors other than vaccination. They were due to bacterial infection of the lungs, pneumonia, one was a sarcocystis infection and the rest of them were IBR viral infections. I think the only way to answer the question is to obtain the placenta **and** the fetus and have a good pathologist examine them to see whether there is any possibility. Dr. McEntee, a pathologist, has been looking for changes in the placenta that might be associated with such a syndrome or allergy, but there was no evidence in that case.

Question: You talked about using pen-strep. in the dry period for treatment of lepto, for getting rid of the carrier state, then you said later that penicillin didn't normally work. Would you comment on that?

Dr. Hanson: I don't know if I said pen-strep., but streptomycin should be used. The rate they have recommended is 25 mg per kg. Penicillin has not been effective. Whether or not they use a penicillin-streptomycin combination, it doesn't make any difference as long as you have the adequate amount of streptomycin. Tetracyclines are effective in acute cases, but not as effective in the chronic.

Question: If I understand correctly, a cow gets pregnant on the side she ovulates from, and deposition of semen deeply, decreases conception rate. Consequently, your recommendation to breed on the left scarred horn would have little beneficial effect and might be detrimental if this research is right. Am I missing something?

Dr. Manspeaker: In endometritis or scarring I would recommend to breed on the other horn, waiting on ovulation from that ovary.

Question: Could you tell us how to do the phenyl red dye test?

Dr. Manspeaker: The phenyl red test has to be done 5-8 days after estrus by injecting approx. 40 ccs of phenyl red into the anterior chamber of the horn and if you want to check out one horn versus the other then you do one at a time, as close to the oviduct as possible with as much pressure going in toward the oviduct as possible. Before you inject, you would want to empty the bladder. If you have a patent oviduct you should be getting dye in the urine within a half hour. If you don't in 2-3 hours, you would probably be getting some diffusion through the tissues and the blood stream.

Question: What is the proper way to take samples for ureaplasma and hemophilus?

Dr. Miller: For hemophilus if you're taking them from the

vulva or vaginal area you can use a culturette which is made by American Scientific or you could use an ordinary cotton swab and break that into a charcoal transport medium. Keep it cool at 5 degrees; and then when they get to the lab. . . this can actually be kept a day or even two days, they should be cultured on chocolate agar with added unknown growth factors, they call it IsoVitalex . . . or we make up our own medium using brain-heart fusion blood yeast extract media. Actually for vaginal samples you can just swab just inside the vulva and you will get it. We've compared using pipettes to try to suck up mucus from the anterior vagina, and we were able to get just as good results by using swabs right at the vulva.

Dr. Doig: For ureaplasma is the same sort of thing—the culturette which contains a little ampoule of Stuart's transfer media. Don't use the charcoal if you're looking for ureaplasma, at least Mrs. Runke in our lab doesn't like it . . . I'm not sure whether it is a fact that it doesn't grow as well there, but she just doesn't like working with it. It is hard to read the plates . . . they're all black and you're looking for a little dark organism as it is. These samples must be kept cool, that is the essence. You just simply cannot have variability of temperature up and down and being cool means usually a transport mechanism with an ice pack. There is no need to freeze them if you are going to get them there quickly. Quickly means they do not come by mail! After 48 hours, some have still had successful cultures. The essence is to get them to the laboratory as fast as possible. It is a bad enough problem that you have to culture. If you can find a lab within a reasonable distance I think the owner or somebody should drive them. If you are looking at an aborted fetus then the fetus and placenta should go, kept chilled. If it has to go for any period of time the tissue should be frozen. These things will withstand freezing quite easily but they don't like dryness or heat.

Question: Would you comment on the labs that are doing ureaplasma identification or at least isolation?

Dr. Doig: I am in a bit of difficulty in the United States; certainly Cornell is very actively involved and has good expertise in isolating these organisms. Michigan is underway in setting up. I think in some of the states with a lot of swine production, generally those state labs are fairly adept at isolating ureaplasmas. Other than that, I can't . . . The problem with the organism as you well know is that most laboratories are not set up to recover the agent. It is a very difficult agent to work with. You've got to have some degree of expertise and it is a problem I know in many areas of the country where to send samples.

Moderator: Keith said he had sent some samples over to the NADL and they had been diagnosed negatively, so apparently they will do it for you. I would mention in the Texas area that Dr. Charlie Livingston at the Texas Agricultural Experiment Station in San Angelo has done some. Dr. Stahlheim at Ames is also very adept.

Question: In a presuckled calf born of a non-hemophilus dam, what is the significance of 1:32 titre to ***Hemophilus somnus?***

Dr. Miller: I have no idea. I know there are certain natural antibodies against certain organisms like campobacter that do fluctuate. There are many organisms that will produce titers to other gram negative organisms. If you are wondering whether this animal had an intrauterine infection with *H. somnus,* that is a possibility. Any of the ones we injected produced death very quickly in contrast to the ureaplasms.

Dr. Hanson: A comment on the phenyl red dye test for seeing if the oviducts are patent or not, it is a real nice test for one of these repeat breeders where you are just scratching your head and you don't know what else it is, but we found we couldn't see the dye in the urine at all and what we did was to add bicarb. to the urine and you could see the red color change. It is fairly subtle and we did a couple of normal cows first just to make sure what we were doing, but we did find out it was necessary to have the bicarb. I forget how much we added.

Dr. Miller: Some of the available vaccines do increase resistance to certain forms and inoculation of organisms intravenously will help prevent that disease in a certain percentage of animals. But as far as I am aware, I have not read a publication where the vaccine has been used in a controlled instance to control this disease in the reproductive tract. Campilobacterin vaccine of course does eliminate infection with normal numbers and does eliminate the carrier state in both cows and bulls, but there are many vaccines that are used that do not do this and I would have to see some good evidence for that.

Question: Has anyone seen a relationship between a chronic high BVD titer and infertility associated with transiently high hemophilus titers?

Answer: We just concluded a study wherein we tried to measure the effect of hemophilus vaccination on reproductive performance. We blood tested about 200 cows and about 30 percent of them have titers of from 1:256 or higher. So we formed two groups, vaccinated one group and hyperimmunized a group and compared their performance against controls, namely those that had a natural infection or a negative. The results as far as services per conception are concerned were essentially identical. Also the estrus intervals were essentially the same. Therefore, we concluded that there is no benefit from vaccination. One of the veterinarians that was from the company that cooperated with us suggested maybe the vaccine responded differently in

the face of an outbreak and so presently we are vaccinating young calves at the time we vaccinate for brucellosis on a controlled basis and checking their titers and hyperimmunizing them. It takes a couple of years to find out if there is a different response from vaccination before we had the outbreak.

Question: Dr. Manspeaker, could you tell us the place we could get the uterine biopsy instrument?

Dr. Manspeaker: The uterine biopsy instrument that I use is from the Lawton Instrument Company at Fayette, Alabama. They just moved from Connecticut to Fayette, Alabama.

Question: Dr. Manspeaker, do you recommend routine culturing of all uterine biopsy samples?

Dr. Manspeaker: No, unless on a biopsy you had neutrophils which would indicate an acute endometritis or you had a purulent discharge or an indication of some type of infection. But to do tissue culture, routinely, no.

Dr. Ball: We have been doing some uterine biopsies in relation to pyometria work. The people in the Netherlands have a biopsy instrument that is sort of a double-sleeved affair with an opening that is similar to the vaginal spay instrument. The first two cows we tried it on developed parametritis and we had quite a bit of trouble. We were about ready to give it up and we decided that perhaps the edges of that instrument were a little bit too rough and we filed those off. We got away from the problem entirely and it has been a pretty decent instrument. It was several years ago, but at any rate this instrument is made here in the United States - if you want to contact somebody who knows about it you can check with the people at the University of Missouri. They don't manufacture it, but they can tell you who makes it.

I wanted to comment in addition briefly on the deep insemination we talked about. There are a couple of papers on that. There was one from Canada and another from Australia. Both of these show decreased fertility by doing deep insemination or going into the horns of the uterus rather than in the body of the uterus. Consequently I would have to take a little exception to deep insemination. There are actually several studies on this and my suggestion would be to go deep into the horn of the uterus rather than just through the cervix.

Dr. Manspeaker: As far as inseminating the animal, I do not advocate deep insemination at all. I mean if I have a horn that has either scarring or endometritis and the other horn is either normal or to a lesser degree than the other horn, you have to wait until the animal is in estrus, and if she is in heat on that ovary with that good horn then try and breed her, but if not you will have to wait for it.

Question: Would anyone like to comment on the use of betadine as an infusion agent?

Dr. Ball: I have become very concerned that we are over infusing these cows. If we are going to deviate from what is known to be all right, then we probably should run a test by splitting groups and checking it out. I don't know of any such program that has been accomplished with betadine solution. So I don't want to make a recommendation on that until somebody does some work on it. I really believe all of us ought to be concerned about this business. Just because we can do something does not mean it is good for the cow and I think we have been part of the problem in many instances instead of part of the solution. I think we should be pretty careful what we put in the uterus. The data seem to indicate maybe we are not doing as much good with these infusions as we thought.

Dr. Manspeaker: I would like to comment on a personal experience. Of course I had the university herd at my disposal, which was great. In practice I had the problem of infusing everything that I possibly could that looked bad. With my biopsy sampling we also took cultures and of course at 30 or 37 days we had quite a few infected animals. The whole situation in the University herd at the time was not in the best shape. The clinical veterinarian had left and I took over the herd health work before a clinical veterinarian came and so we were infusing quite a bit and we were getting very poor response. Over the last couple of years we infused very, very little and we are definitely getting a much better response. They clear up much faster. Iodine is an irritant. The same with tetracycline. You can use either one to erode the mucous membrane. If that is what you want to do, fine! But before you do too much drastic stuff, I would suggest a biopsy.

Question: Dr. Hanson, would you repeat the dose for streptomycin one more time?

Dr. Hanson: The dosage that is recommended is 25 mg/kilo of body weight. That is a one time dosage. Now if it is a case where it is repeated, it would be at the same levels a couple of days apart, but generally that's a single dosage.

Question: Would you comment on the role of raccoons in the spread of Lepto. grippotyphosa?

Dr. Hanson: Well, raccoons are very capable of spreading it and many of them are infected. They become infected. They apparently do go through a bacteremia and become sick which you can't observe if you inject them. Many of them have gone through this and shed the organism for a long period. The problem is that they are very active in barns and facilities. One brought to my attention was a silo in Virginia where they went up there after they found *grippotyphosum* in the cows and there were some raccoons

living there even though they had the silo going every day. So apparently that was their recreation area!

Question: If we vaccinate cows and we follow the titers and we see them drop down fairly quickly, I wonder if you would comment on how long we can expect protection from vaccination?

Dr. Hanson: Vaccine titer is an IgM response which is fairly short term and does not indicate the degree necessarily of protection. We have checked many animals after vaccination and they do have an IgM response that can be measured by several ways, either growth inhibition or a hamster protection test. A number of years ago with pomona vaccine we vaccinated quite a number of cattle and bled them periodically and every two months supplied this to the APHIS laboratory at Ames and they ran hamster protection tests on them. They showed a good protection up to about 8 months, even though they had no response that was detectable. Then it started dropping off and at 12 months it was down to about 40 percent. If they were vaccinated more than once it was at a higher level, but the level of protective or neutralizing antibodies dropped to between 8 and 12 after a single vaccination.

Question: Could someone make a comment on the treatment of choice for retained placenta?

Dr. Ball: To start with, there is no specific treatment that may be the best. I think when we are looking at retained fetal membranes wherein that period a cow's life may be threatened, the program that we are using now is that if the cow has a temperature, we try to treat her systemically with penicillin in fairly high dosages, because we feel that some of the organisms may be there. I talked with veterinarians who say they have tried similar treatments without success. What you have to do is find the thing that works for you, but in our case the systemic disease that is associated with retained placenta should be treated systemically with penicillin and not oxytet. because with oxytet. you can get the levels of the antibiotic high enough to hit the *corynebacterium pyogenes* that might be circulating but you can't hit the fusal bacteria and some others. So my feeling is if you use oxytetracycline in the uterus, five gram doses or similar amounts, at least you'll inhibit quite a bit of the growth in there, and treat the cow systemically. We've been doing this in cows with retained placentas at Colorado State University for some time because we have lost a couple of them with septic and, in fact, gangrenous metritis, but we have had no problems since we did that. This is not a controlled test, but based on what we know about the MICs I think that this is as good a place to start as any. We have not advocated for many years at CSU that the membranes be removed unless they come away very easily. I know that is up for discussion, but that is the way we do it.

Dr. Manspeaker: We use the same technique at the University of Maryland. We are using 3-5 grams of oxytet., in the uterus, daily for three days and just leave them.

Dr. Ball: I realize therapeutically that we are using two kinds of drugs that are not supposed to be used together. In the case of oxytet. you have a drug that is not absorbed from the uterus very well at all so it does not get out into the system. If you use penicillin on the other hand, it does penetrate the uterine wall quite well but it also takes care of the septicemia that might exist and the two from a clinical viewpoint, empirically anyway, are working very well.

Question: If we're going to infuse a cow after she's bred, how soon can we infuse her without causing any effect on the semen?

Dr. Manspeaker: The easiest practice is a cow that is bred today and infuse her tomorrow. Then you are not worried, but a cow that is bred early in the morning can be infused later that day. At 6 to 8 hours plus you probably would be all right, but I would not push it too close because if you are using tetracyclines they are lethal to sperm and so are most antibiotics.

Dr. Ball: The way we are handling most of the infusions is that we recommend that they be infused in the late post partum period with penicillin as suggested by Dr. Kendrick and the people in California. So certainly we feel the same way about it. A cow should not be infused too soon after she has been bred. Six or 8 hours is probably all right. But the other day I checked a cow that was pregnant and she had been infused three days in a row at the beginning about 8 hours after breeding, and then the next day and the next day. She was still pregnant! I assume penicillin must not be too lethal to the egg or the sperm, at least there was not very much of it there when the egg got down into the uterus.

*Question: Dr. Miller, what is your interpretation of endemic **H. somnus** titers within a herd of moderate exposure levels, that is 1:64 to 1:256, currently associated with an increase in early embryonic loss and late gestation abortion with absence of other pathogens on serology?*

Dr. Miller: I am not, as you know, in favor of interpreting the titers that are developing in these animals with *H. somnus* as a means of detecting infection, just because of our experimental evidence that titers may go up or they may stay the same or may go down, regardless of what seems to be happening to these animals. As you know, with campilobacter titers there are certain natural antibodies and these two fluctuate and go up and down. This has not been shown in hemophilus but this should be eliminated first. If you can't culture the organism, you cannot say you have an active infection.

Question: Dr. Hanson, do cows that clinically have embryonic death show a serological change to leptospirosis?

Dr. Hanson: Yes, these cows would show a serological response, but of course other cows in the same herd at the time would also. But they do develop a titer following that infection, due to leptospirosis.

Question: You mentioned a long-acting drug this morning. Would you repeat that?

Dr. Hanson: In human medicine I mentioned doxycycline which is also known as vibromyocin. It keeps a therapeutic level for about four days and it has been shown to be effective in the studies the U.S. Army did down in Panama. This will be published in the *New England Journal of Medicine (210:497. 1984) and (Ann. Int. Med. 100:696, 1984)* shortly. They also use it for therapeutic purposes. Another drug which has not been published but I have been told by a man that has done considerable work a few years back, is ampicillin, and it has been shown to be effective. I don't know what the dosage level was. Doxycycline dosage was 100 mg. twice a day if a person was ill. Another thing that should be brought to your attention if you are involved in any human case, is that if the person goes into kidney failure, which is usually the reason for death in man and in many animals, peritoneal dialysis is probably the only approach that is effective at that time and certainly should be resorted to. They hesitate to put them on the kidney machine; peritoneal dialysis is less severe procedure, so it has been the procedure of choice and certainly should be used any time a person goes into renal failure.

Question: What is the etiology and treatment for excessive production of thin, yellow mucus vaginal discharge?

Dr. Manspeaker: I have no idea. I have not seen a yellowish thin mucus discharge. I certainly see piles of what looked like estral mucus from cows with moderate to severe granular vulvitis. One of the effects it has on a herd is that it will make an owner almost go out of his mind trying to tell which is in heat, because when these cows come through the purulent stage they will enter a stage where you have a slightly swollen vulva and clear mucus. I certainly have not seen any yellowness to it.

Dr. Ball: I wonder if it's possible that this is a combination of urine retention along with the estrus. This is the type of thing you would see with that. I would suggest that the cow be examined with a speculum to see if that is the case and that she is not pooling urine back toward the cervix.

Dr. Winn: I have seen several cows that have this same type of thing. In the ones I saw I felt it was due to urine pooling and they are usually hard breeders. Do you have any ideas on how to handle this situation?

Dr. Ball: Some of them get well and some of them don't. The literature describes a surgical operation in which they develop a transverse fold just behind the urethral opening with the idea that the urine will be prevented from going in. I don't do that operation. But that's the only treatment that I know for it. The cows that I have seen with it that were not treated usually get a cervix that is partly open and a very large uterus, and go to town after a while!

Dr. Doig: One thing that has worked for me if they are not bad is to do a caslick operation on them. You would be surprised in how many of them the urine pooling goes away, but if they are severe as in the mare where they have to actually move the urethral opening, it would have to be a good cow to attempt that, I would think.

Question: Dr. Doig, would you comment on what techniques are available to determine the pathogenesis of different types of ureaplasma. In other words, if we sent a sample to the lab then they tell us it is ureaplasma, are there laboratory techniques available to determine it?

Dr. Doig: That's a good question and right now there are no ways. When we get an isolate we can say that it is pathogenic, except possibly D48, if we get it out of a dead fetus. We are going to have some problems determining what is happening until we can do that. Right now the only way to check pathogenicity is to put it into a virgin heifer. We are working very hard on sero-typing and hopefully document what serotypes the isolates we have stored fall into. At this point that is only being able to put them into sera clusters A, B, and C. But hopefully within the next few years one may come up with a method of determining pathogenicity whether it is an *in-vivo* test in some other animal or an *in vitro*.

Question: Dr. Hanson, do cats carry and shed lepto. and is control of barn cats recommended in lepto. problem herds?

Dr. Hanson: Cats seldom become infected. We have isolated pomona from ferel cat. Cats can become infected. I think it's the feeding habits. You would expect cats to be loaded with lepto. because they eat rats and mice that have endemic infections of either icterohemorrhagiae or ballum. But they tend to tear their food up in very small bits and as it goes through the digestive tract it is killed by the acid in the stomach. Also they can be careful walking in water where most of the transmission occurs. They can be infected and I suppose could be a source, but the percent of cats that are infected are very low compared to other animals.

Question: What is the current incidence of positive semen samples in commercial semen vials or straws?

Dr. Doig: That varies with the AI stud. It varies with the laboratory doing the testing. It may almost be irrelevant as

how many are actually positive. The question is, do they contain a pathogen?, which we can't tell yet, and the second big question is, even if they contain a pathogen, how many are there? There is no question that this is dose related and we have to determine some day the minimum infective dose. Right now, as just a rule of thumb, you can expect to find a positive ureaplasma isolation from 30-40% of semen sold in North America. Most of those are very low levels, 5-10 colony-forming units, that type of thing. But maybe one or two out of a hundred will be loaded and that is a sort of Russian roulette type of situation, if indeed it is a pathogen, and we have never established that in a bull. So if you are sampling semen, I would caution you not to get too excited about finding it in a vial unless you know how many are there and hopefully we will be able to say yes, that is a pathogen, it can't be there. But I don't think we are ever going to sell sterile semen for ureas or bacteria.

Question: Dr. Hanson, would you comment as to whether or not deer pose a problem as carriers and spreaders of lepto.?

Dr. Hanson: This is a question that has been asked a lot and most people would like to blame the deer. As far as we can tell, they are the recipients usually rather than spreaders, because deer seem to have a much lower number of organisms. We have conducted studies for about 2 years at a deer kill in Illinois. We were not able to show that they were really the carriers. Whenever there was a serious outbreak in wildlife of grippotyphosa or sudden outbreak in cattle where there were a number of cases, then you would see larger numbers of deer infected. The rate in the deer population is quite low. It is usually less than 5% in any one year.

Question: Dr. Hanson, would you comment on the quality of immunity following lepto. vaccination with a polyvalent type of vaccine as compared with a single valent?

Dr. Hanson: We were told by a number of people that they felt they had less protection with three serovar than five. So we have been studying some cattle we have in a herd at the State Experiment Station for three years now. The analysis so far is that the five does a better job than the three. I kind of expected it, along with one of the comments from the field, to be the other way around. We are going to continue this for another year or two and maybe we will get a different result. At the present time the five seems to be better than the three.

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Question: Dr. Ball, when you are looking for trichomonas, do you use a stain or do you just identify them by their motion?

Dr. Ball: We put them under 100x magnifications and try to cut the light down so that it is very low and then the organisms are visible, swimming all over. They have a typical erratic, jerky motion and if you put them on a 1000x magnification then you can see, especially if you get it slowed down somewhat, the undulating membrane and probably identify them fairly accurately that way. If I found them in the field, I would like to take them in to one of our laboratory people and get him to try to make sure they are not something else. Generally speaking, if you reculture this organism that lives in the gut that is similar to it, it does not reculture very well; whereas trichomonads continue to reculture in diamond media for a considerable period of time. We don't stain them.

Question: Would you discuss the differential diagonsis of embryonic death following 30-35 days?

Dr. Doig: There are numerous infectious agents that can do that. We have seen tremendous incidence of embryonic death in some herds and it is fairly classically sometime down the road after an acute granular vulvitis syndrome has appeared. The fellows will get these cows in calf and they are in calf at 40-45 days and they are open at 80-90, in many of them with a purulent discharge. We have cultured the organism from the uterus. We have done biopsies and seen an imflammatory response. Although we have not reproduced that entity, it certainly was associated and was one of the syndromes that occurred with ureaplasma. We have not yet serotyped those to know whether they are D48 or some other serotype but that can be a prominent syndrome with this organism and of course many others, hemophilus and certainly lepto.

Dr. Hanson: I talked to Dr McEntee about this recently. He says any organism that will kill a fetus late will kill it early. Keep that in mind. They don't always fit into categories. In lepto. it is more common with hardjo than with the other serovars.

Dr. Manspeaker: If these abortions occur in the same cow a couple of times you might want to check the biopsy as Dr. Doig said to see if there is a possibility. Also check the horn on which the abortion occurred and if the animal comes into heat at a later time, examine very thoroughly both horns of the uterus. If one appears to be thicker than the other this is

rather indicative clinically of endometritis and you would definitely want to attempt to breed in the other horn and wait for the ovary to be active in that horn. I have done this several times and they have maintained a full pregnancy. They don't always have to be infected in order to have an embryonic mortality.

Dr. Winn: Early embryonic death has been reproduced. There is a trial going on now at Guelph. Dr. Miller's graduate student is carrying out uterine inoculations at the time of breeding and monitoring what happens. I believe she has indicated she has had one or two that have made 45 days on blood progesterone analysis and then the fetus was kicked out. There was an indication of early embryonic death.

Dr. Ball: I hit another aspect of this that we have had some experience, namely iatrogenic abortion. I think that the veterinarian can sometimes cause abortion by being too rough. I think that we can't be too careful about that. The other thing one should be sure of is being certain that the cow is pregnant. Perhaps re-examination at, say, two weeks later might be indicated. As far as iatrogenic abortion is concerned, I know our group was receiving some criticism for doing that. In our work on palpation we used three palpaters and three methods. We essentially palpated membrane slip plus fluctuation and amnion palpation plus flucuation and then fluctuation alone and there were significant differences between palpaters and between methods. In general the more gentle methods seemed to result in more cows calving. Now it has not been published but since that time there have been many reports, several of them in retrospective studies, which are a concern to me because retrospective studies do not take into consideration the cows somebody might send to slaughter because they found them open at six months following palpation and just did not tell the veterinarian about it. But at any rate Minnesota did duplicate the experiment that we did and got very similar results with the exception of one palpater that they had in California who was palpating a large number of cows early in the 35-40 day range and in this instance he had about 4%, it was significant at the .005 level. They had about 4% higher attrition rates in the cows which he palpated the amnion and slipped membranes. Our work was the opposite of that in that the cows we slipped membranes on had a slightly higher attrition rate. I could not advocate palpation for fluctuation alone in cows that have not been palpated before. The likelihood, apparently, of causing abortion is great enough that one is better off not to take chances on that. I think we all need to be aware that we can be causes of embryonic loss and we should palpate just as gently as we can and try to use methods that are the least traumatic to the fetus and the membranes.

Question: There has been a lot of controversy about douching, and I agree with your answer earlier. If you do any douching, what do you use, like a 2% lysol, how much, and when would you do it? Not necessarily if you absolutely diagnose ureaplasma, what would you use?

Dr. Doig: Is it coming from the uterus on a scope? *(No, from the vagina.)* Was it vaginitis? *(Yes.)* In the herds that have had a very high incidence of early embryonic death, in many cases over 10%, those herds went on post-breeding infusions. Well, we may have used douches and got away with it, but when we are treating granular vulvitis we used the same products that go in the uterus in the vulva, or into the vagina, and usually in amounts of 10-20 ml. Now, if you are treating a non-specific vaginitis, use anything that is non-irritating that has an anti-bacterial effect, and I think again you are as far ahead using an antibiotic as many of the chemicals, because often betadines are not really as non-irritating as we think, although they are a lot safer to put in the vagina than they are in the uterus. So in answer to the question, I treat the vagina as though it were the uterus, with the same products and generally speaking with about the same volume. I am assuming the milk withholding time would be about the same as if you put it in the uterus and a little bit safer even, because most of it is going to come back out pretty quickly.

Editor's Note: The above discussion was transcribed from a tape recording of the meeting.