we would certainly be covering about all the avenues.

(9) *Pseudo-rabies* - this has been considered rather important lately, more so in swine and particularly in cattle that are associated with swine. We do not have many of those producers anymore. It is ordinarily associated with the usual mad itch type sign but it can produce some of the very basic CNS signs that could be very readily confused with any of these other disorders. A non-suppurative encephalitis is seen on histopathology. Again the FA examination is a little more reliable. It can be done very readily on this other half that was not formalized and give us quick accurate diagnosis.

(10) *Intracranial abscesses* - these do occur and many times are in just a single individual animal that turns up with a very strange CNS disorder. When we split the skull, we find an abscess that pretty well explains it. Basically the same symptoms occur as in the others. Gross lesions could certainly be variable: they can be in the cerebral hemisphere, and I have seen a number of these down in the brain stem area. Histopathology would show the abscesses; many times they can be seen grossly and taking up a very large portion of the brain. And another one that fits along with that is *intracranial lymphoma* - everyone of these that I have seen exhibit some type of "pop-eye" symptom along with CNS signs and very often we see lymphoma cells on hispathology. The lesion can be variable in any place in the brain.

Briefly then, these are the ten conditions - Polio can be mistaken for many of these others. TEME would be associated with respiratory problems and knuckling, but not being blind like polio; nervous coccidiosis occurs in a type of outbreak - and so on down. Basically there are three things: get a good history, get the tissue, it is not too hard to do, it does take a little effort, but any kind of a meat saw can sure separate the skull (the animal does not need to be skinned). Split that skull, you do not even have to saw clear through, put one half in formalin and freeze the other half. Get a real good specimen and come up with a very diagnosis, at least a healthier doagnosis! Again, history, necropsy, and then submit the proper tissue.

Simplified Bacteriology for Veterinary Practice

Gilbert Ward, *D.V.M.*
St. Paul, Minnesota

This is the smartest group of veterinarians I have ever addressed. Normally speaking, up in Minnesota, this talk takes three days! I will show you pictures of the major equipment from a very small practice in Wisconsin such as the incubator, a little alcohol burner, some of the test tubes with some of the media, a microscope, and this practice has a nice little autoclave. They prepare their media in little bottles and store them in the refrigerator until they are ready to use them. Now the equipment that you see here is 90% of what you need to do microbiology. Just before they need the plates, they heat up the media that is in the bottles and pour their plates, blood agar plates and also mannitol media. Large plates are used for susceptibility testing. They have a API 20 E system. A lot of these systems are coming on the market, this is the one I would recommend most highly. It is a little system that allows you to identify bacteria with a great deal of accuracy and minimum amount of investment in reagents. This particular system will run ten biochemical tests and you get a code by giving numbers to these plusses and you get these numbers and then you look up in the little code book and identify the bacteria. Some strips have ten tests and others have 20. These sell for about a little less than $2.00 a strip. The reagents you need come with the API system when you buy it. This practice had just two days of work sitting there on the counter, very near the front of the building. It is where the farmers that come in can see them by looking around the corner and they mentioned to me how interested the farmers are in the results of the bacteriology. They come up and say, "Where is mine?" and they can show it to them.

If you are going to do microbiology in practice, the best thing to do is to limit your goals and use an organ system approach. The three you can use in bovine medicine are mastitis, pneumonia, and scours. If you can cover these three areas you are going to have some success and if you use your microbiology to govern your antibiotic usage, you are going to have something that is really going to help you in practice which is really what I am up here to tell you about. You are going to improve your therapeutic success, particularly when you have a lot of antibody resistance, you are going to know which antibiotic to use. As I looked over the records from this practice, they would have no idea how to treat many of these cases. Another thing you find by doing susceptibility testing is that it reduces your costs. You have a tendency in practice to go for rather expensive, heavy treatment when you do not know which drug to use. You can find yourself going back to some of the old drugs that are a little bit cheaper. You will reduce the development of resistance when you are working with large groups of animals, big herds. You use a lot of antibiotics and do not know what to use, you will use quite a bit of combinations and this will lead to the development of resistance.

The final point I would like to make is that when you do susceptibility testing, you put the animal health program in the hands of the veterinarian. There is no way they can get this service except through you when you can do this.

With the large antibiotic plates you can use a dozen discs. You can pick four colonies from your plate, original culture, and put them in broth and you let that incubate a few hours until you get a medium density - this technique is called the Kirby Bower technique. You would have to find this written up, I am just recommending it. After you get the right density of growth for a few hours of growth in the broth, you swab it on to these real large plates. The large plates allow you to put about a dozen discs on - if you use a small plate you can only put four discs on it to get really good results. So, you get your discs on and sometimes you have to push

them on a bit to make them stay and incubate this overnight and the next morning you must read the diameter of zone. Different antibiotics diffuse different widths and every antibiotic has a little different zone. This shows you why you must measure zones, the zone size diameter; the wide zone is indicative of an antibiotic that will reach therapeutic concentrations at between 8 and 16 microliters per milliliter and if you have a narrower zone than say in this case between 16 and 18, you are going to have resistance. If you are not using a system like this and just looking on a plate, eyeballing it, you are going to make mistakes because some antibiotics do not diffuse as well as others. For example, penicillin with *S. aureus* has a zone of 30 millimeters whereas polymixin has around 12 millimeters. There is a big difference. You will read them as resistant when they are sensitive and sensitive when they are resistant. Using this method you should use specified media and your results will then highly correlate with the clinical situation. I want to show you some media that we have developed in the last year and we are going to publish this in the Journal of American Veterinary Medical Association, but this is a media that we use for mastitis, rather quick in identifying organisms. This is *E. coli* showing a yellow growth that is rather a large colony. *Staph epididymis,* which is a non-pathogen, you will see a lot of this in mastitis, it is a white colony with red zone; *S. aureus,* a white colony with yellow zones around it. *Strep uberis* is a very tiny colony with yellow zones around it and *Strep. agalactial* are very tiny colonies, very translucent with red zones. You can make identification with this media very quickly.

Dr. Ward has submitted another paper for the 1980 Bovine Practitioner.

Autogenous Bacterins
Ned Brown, *D.V.M.*
Amarillo, Texas

I am supposed to talk about atuogenous bacterins and I can understand what an autogenous bacterin can be in a bunch of ten or 12 calves or a dairy herd of 100 or 150 cows, but I do not know where an autogenous bacterin begins and an autogenous bacterin ends in a feedlot with about 30,000 head. It is autogenous from one pen or autogenous this week, or autogenous next month or what does constitute a population from which an organism is isolated and becomes an autogenous bacterin.[1] The problem is already with definitions. Last week we had a call from a practitioner in a little town in northwest Texas because one of his clients was having difficulties. He had lost a couple of calves, the owner of the calves called the newspaper editor and the county sheriff to investigate the situation. It looked like the calves had been mutilated. They called the Texas Rangers and they called the people from the Air Force base in New Mexico and they came out and checked for radio-activity and looked for flying saucer imprints or triangular spaced and burns and so forth. They did not find any of the mysterious white powder which otherwise is known as buzzard feces in the area! But, after 18 calves had died, he finally got round to calling in his local veterinarian. This is unusual, this does not happen very frequently. But the point being that a simple diagnosis was made once an animal was approached by someone who knew what he was looking for! He diagnosed black leg on the basis of lesions and went ahead and initiated vaccination and antibiotic therapy and referred samples to the laboratory for histopathology and fluorescent antibody tests which did confirm his diagnosis and phoned it back the same day. He is out of trouble and he has not lost any more calves. The point of this study is that there are immunizing agents that are effective and there are immunizing agents that are necessary and they are bacterins and toxiod combinations that we know are useful and helpful and work well when we need them. But it has taken one commercial company about five years and too many dollars to come on the market with a bacterial antigen called *Hemophilus somnus* that is one of the last, new bacterial antigens commerically available and it is also one of the first new antigens available for use in the bovine for quite sometime or new class of antigens. We still do not know if it works or not. We think it might. There are some reasons to believe it should not. We look at other antigens that are available commercially in cattle, like pasteurella antigens. There are those who swear by them and those who swear at them. And there is most concern as to the value of using them. I am making these points only to say that there are good antigens and there are some that are questionable, perhaps or difficult to prove that they are effective and this is certainly true of any autogenous bacterin that we can brew up and produce quickly from an isolate from an individual herd and take back into that herd and demonstrate beyond a shadow of a doubt that we did any good. It is useful, is it helpful? We hope so; we do not know. One word of caution about autogenous bacterins in starting out. Certainly, if one is going to use an autogenous bacterin in the control or treatment of a disease condition, we ought to know what the disease condition is and we ought to know that it is caused by a bacterial organism and it should be the organism that we isolate. It should be in pure culture and it should be properly identified. It should be from the herd of origin that we are going to use it in. Let us take an example of a scouring calf in which we isolate *E coli.* Is *E. coli* the cause of the scouring or is it not? I do not know. I cannot tell from the laboratory as a bacteriologist whether I did any good or not by reporting back the isolation of *E. coli* and I certainly would hesitate to prepare an autogenous bacterin for a veterinarian on every *E. Coli* that I isolated from every case of calf scours. I think that in establishing a diagnosis and making a differential diagnosis that it certainly behooves us to look at management factors that might be related to the diarrhea in that calf. Is the calf getting good milk replacement or is it getting too big a dose of antibiotics?

I think some environmental factors and potential viral agents should be considered before we go out on a limb and