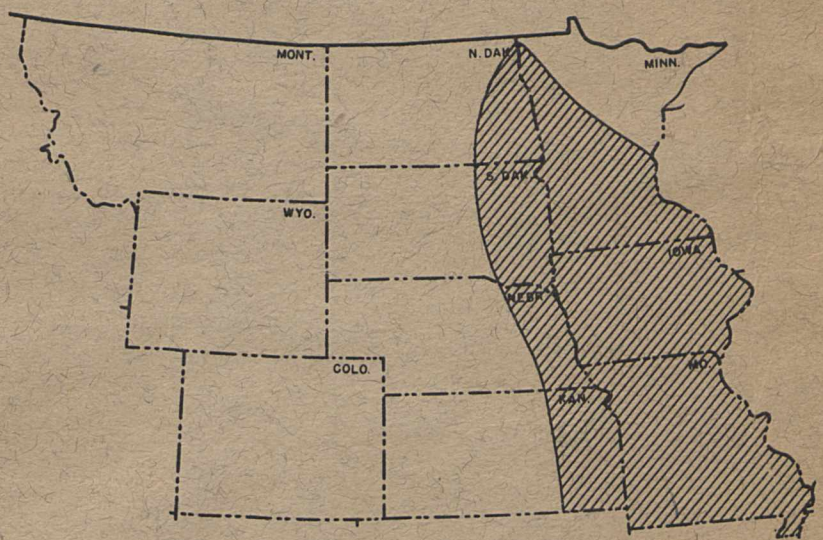
Midwestern - Northcentral REGIONAL RABIES CONFERENCE

OMAHA, NEBRASKA
MAY 21-22, 1951



FEDERAL SECURITY AGENCY
Public Health Service
Communicable Disease Center

Midwestern - Northcentral Regional Rabies Conference
Omaha, Nebraska
May 21-22, 1951

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FOREWORD

The Editor takes this opportunity to express his appreciation to all those whose efforts and contributions have made the Midwestern-Northcentral Regional Rabies Conference a success - to the State agriculture and conservation authorities of the participating States, the representatives of the Bureau of Animal Industry, the U. S. Department of Agriculture, the U. S. Fish and Wildlife Service, and in particular to the following individuals:

Dr. E. D. Lyman	City Health Officer, Omaha, Nebr.
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Dr. C. F. Blankenship	Regional Medical Director, Region VII, U. S. Public Health Service, Kansas City, Mo.
Mr. R. W. Hart	Senior Sanitary Engineer, Region VII, Kansas City, Mo.
Dr. L. B. Byington	Medical Officer in Charge, Kansas City Field Station, CDC, Kansas City, Kans.
Dr. E. S. Tierkel	Veterinarian, Communicable Disease Center, U. S. Public Health Service, Atlanta, Ga.
Dr. Frank M. Lee	Veterinarian, South Carolina State Board of Health, Columbia, S. C.

The Editor wishes also to thank all those who contributed to the conference notes. The unstinting efforts of Dr. Abercrombie and staff in preparing the notes and the stencils is acknowledged and appreciated.

James H. Steele
Veterinary Director
Communicable Disease Center
U. S. Public Health Service
Atlanta, Georgia

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Midwestern - Northcentral Regional Rabies Conference

Omaha, Nebr.

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MIDWESTERN - NORTHCENTRAL

REGIONAL RABIES CONFERENCE

Omaha, Nebr.

OPENING SESSION

Dr. Charles F. Blankenship, Temporary Chairman

DR. BLANKENSHIP: I would like to thank Dr. Rogers and Mr. Vose for making the arrangements for this meeting. I believe they were made through Dr. Lyman of the Omaha Health Department.

The program, as planned, is tentative. It was arranged by Dr. Tierkel after he talked with us in Kansas City, and with various other people. I think he has done a good job, but if there is any formal presentation that any of you would like to suggest, please feel free to do so and we will work it in.

The general plan is to have reports presented today and panel discussions tomorrow. Dr. Tierkel, representing the U. S. Public Health Service will report on the epidemiology and current status of rabies in the United States; Dr. Linduska and Mr. Buell of the U. S. Fish and Wildlife Service will report on rabies in wildlife; and Dr. Giltner of the U. S. Bureau of Animal Industry will report on rabies as a livestock problem in the United States. Then a representative from each of the six States represented will give a report for his area.

Dr. Tierkel, will you start the discussion with your report on the "Epidemiology and Current Status of Rabies in the United States"?

DR. TIERKEL: As a means of orientation, I would like to discuss some of the concepts of the disease, the history of the disease, and something of our present knowledge of its epidemiology and etiology. As you probably know, rabies is one of the oldest diseases known to mankind. It was first described by Democritus in the fifth century, B. C. He gave a very detailed account of the disease, describing it as an inflammation of the nerves and likening it to tetanus in its clinical picture. Then in 300 B. C. Aristotle gave an excellent account of the disease in dogs and other animals, as did Celsus in 100 A. D. Celsus was probably the first physician to practice the cautery of wounds in persons who were exposed to rabies by the bites of rabid dogs.

The disease spread over Europe in the eighteenth century, touching nearly every one of the countries on the continent and the British Isles as well. We all know that Norway, Denmark, Sweden, and England were able to eliminate the disease by very rigid police and control measures. England eliminated the disease for the first time in 1903, and stayed free of the disease until 1918 when a very vivid illustration was presented of what occurs when an infected animal is introduced into an area which contains highly susceptible animal populations. I am sure many of you have heard the story of the dog brought by airplane from France to England in 1918 by a returning British soldier. This animal was in the incubation period of the

disease and was responsible for a very serious outbreak of the disease in England. Luckily, it was limited to one area in the country and they were able to eliminate the disease by 1921. From 1921 until the present day, there has been no rabies whatsoever in England.

In the United States, the disease first appeared in the colonies about 1750. It moved westward with the western migration of the human population so that by 1840 it had reached the Mississippi River and the southwest territories of New Mexico and Arizona. By 1890 it had reached California and was endemic for the greater part of continental United States.

As I pointed out, the disease is characterized by moving with the spread of human population. The disease is ubiquitous in character. Climate and season have absolutely no influence on its occurrence. It is found in the tropics of the Old and New Worlds as well as in the frigid regions of the Canadian and Alaskan Yukon. The infection depends entirely on the bite of an animal whose saliva contains the virus.

As far as attack rates in humans are concerned we have considerable data from various sources. Perhaps the most famous is the McKendrick Report from the League of Nations which gives a figure of about 15 percent as the attack rate in humans who are exposed to rabid animals. Other figures vary from 3 percent to 35 percent; therefore, we do not have any accurate, well-controlled figures concerning attack rate in humans. The rate depends entirely upon the person who collected the data, the person who analyzed it, what part of the world it came from, and upon many other variable factors.

We do know, however, that there are certain factors which influence the attack rates. First of all, the site of the bite, or the location of the bite on the body, is an influencing factor. We know that bites around the head, the neck, and the face are the most dangerous. This is based on very well-analyzed and well-controlled statistics which are quite consistent wherever they are collected. The second important point is the multiplicity of the bites - the more bites there are, the more readily will infection take place. The third factor is the depth of the bite. The deeper the bite, the better the opportunity the virus will have of reaching some rich nerve supply, and of being able to multiply in the body. The fourth influencing factor is the possible interposition of clothing. We know that clothing will catch virus, and the danger will be lessened if the bite is inflicted through layers of clothing.

The causative agent of rabies was first found in the saliva of rabid dogs by Zinka in 1804. Then, two workers in France, Magendie and Bouchet, were able to infect dogs with the saliva of human cases. They took the saliva of human rabid cases, inoculated this material into dogs, and were able to produce classical furious rabies of these animals. That was the first laboratory demonstration that rabies in animals and hydrophobia in man were one and the same disease caused by one and the same etiological agent.

The modern concept of rabies was given to us by the classical work of Pasteur. Basic to our present-day knowledge of the immunity of the disease are his famous brain tissue studies, in which he was able to produce infection in all types of laboratory animals; the fact that he described the etiological agent as being invisible, calling it a virus, claiming that it was a biological agent; and his modification of street virus by serial passage in laboratory animals, creating what we understand as a fixed virus. His vaccine actually has not altered much to the present day with regard to usage. He produced

the vaccine from the spinal cord of infected rabbits. He removed the brain and cord and hung it up to dry to attenuate the organism so that it could be used safely as a vaccine. He began by using 14-day-dried cord, and then went on down from 14- to 13-, 12-, 11-, and all the way down to 1-day-dried cord, using each regressing day in a new dose of vaccine for persons who had been exposed to rabies.

Today, those areas of the world which still use the Pasteur vaccine have intensified the regime for producing the dried cord. Instead of starting with 14-day-dried cord, they start with either 8- or 5-day-dried cord and come down to 1-day. It was Calmette who first introduced the use of glycerine for vaccine. This was quite an important advance because workers thereby were enabled to make larger quantities of vaccine and to keep down the bacterial contamination over long periods of time. Then Ferran in Barcelona, and Hogyes in Hungary, worked out a dilution method for making vaccine which was just the ordinary infected material highly diluted and used as a vaccine. Perhaps the most recent advance with regard to human vaccine is the work of Fermi in Italy and of Semple in India, who developed phenol inactivated vaccine. The Semple-type vaccine is probably the one most universally used in the world today. It is the one used in practically every State in the United States with the possible exception of the St. Louis area, where Harris vaccine is used; Georgia, where the Sellers vaccine is used, this being a modification of the dilution method; and Michigan, where the Cumming vaccine is used.

With regard to the etiological agent, it is an ultramicroscopic filtrable virus approximately 125 millimicrons in diameter. Just to give you a comparative idea of the size of the virus in general, at the top of a scale is the largest known virus, the psittacosis-lymphogranuloma-venereum group, about 250 millimicrons in diameter. At the bottom of the scale we have the smallest known animal virus, the agent of foot-and-mouth disease, which is 10 millimicrons; and just above that we have the polio virus which is about 25 millimicrons. Above the polio virus we have the equine encephalomyelitis virus which is about 50 millimicrons. In about the middle of the scale we have the rabies virus which is about 125 millimicrons as determined by graded collodion membrane studies, particularly by the work of Dr. Ian Galloway in England.

One important characteristic of rabies virus that enters into the control angle is the fact that its virulence is lost quite rapidly when exposed to light, heat, and air. I think this is an important point, because very often health officers and rabies control authorities are asked questions like "How much do we have to worry about tree trunks, fence posts, and inanimate objects which have been contaminated by the saliva of rabid dogs?" According to the experience of most workers, there is very little to worry about in that regard. Anyone who bumps into such a post or tree trunk, or touches it in any way, is fairly sure of not becoming infected. There must be an open wound, and the virus must be introduced into it within a short time. Any film or smear of virus on inanimate objects such as porches, runways, fence posts, or tree trunks will very soon die when exposed to ordinary conditions of light, heat, and air. In the laboratory we have found that in 10 percent infected brain tissue suspensions the virus will die in 4 to 5 days or less at 37° C. It will become inactivated in about an hour when subjected to 50° C, and in 2 minutes or less when subjected to 100° C. I might point out the fact that rabies, as we know it in nature, is called street virus. One of

its most important characteristics is that it has a very long and very variable incubation period, which is probably one of the reasons for the difficulty encountered in controlling the disease. The long incubation period may also explain sporadic cases which appear in areas where the disease is seldom seen.

Before we take into the account the status of our current efforts in control, let us examine briefly our methods for measuring the geographical extent of rabies in this country. In order to study the distribution of rabies from a national level, it has been the practice to have each State report the number of cases occurring each year within its boundaries. When we examine this practice closely, it becomes obvious that this method does not provide an adequate basis for an honest comparative geomedical analysis of the disease in this country. Such an approach does not take into consideration the related factors of population density and animal concentration, and it falsely assumes that the artificial political boundaries of a State limit the spread of the infection in that area.

As most of you probably have heard through our regional offices, we have recently conducted a Nation-wide survey on a county-by-county basis in order to get as much information as possible on the rabies picture in your particular health-and-livestock sanitary jurisdictions. In order to have a more accurate yardstick by which to measure rabies incidence, we have arbitrarily established an index for 1949 based on these survey figures. We have taken the cases by counties in order to have smaller areas with which to work. The human cases were entered as reported, but in order to get the rate of infection in each area, we took the number of dog cases and divided that number by the human population, which gave us an approximate rate of infection. This rate is based on the human population in each area. We know that where we have a dense human population we will have a dense dog population. The rate of rabies incidence gives us some picture of how the disease moves about and where it goes, especially with regard to regional attacks across State lines. This method, of course, leaves a great deal to be desired, but it does serve as a measure of the probability of human exposure, and it does delineate the foci of infection on a truer regional basis. It can also be used to compare the prevalence of dog rabies among the regions, and between rural and urban areas in the country. Since geographical factors such as terrain, drainage basins, and natural barriers are taken into consideration, a more realistic approach can be achieved.

The question often comes up as to why rabies is enzootic in some areas, epizootic in others, and completely absent in still others. To answer this we must examine carefully the principal epidemiological factors of dog rabies such as the size of the dog population within a given area, the immunity level within the dog population, the frequency of contact between dogs, the extent of cohabitation of dogs with other susceptible species, and the importation of rabid animals into the area. Then the question comes up, is it possible for rabies in an area to shift from enzootic to epizootic proportions? This phenonemon has actually been experienced in many areas in the country. You have probably experienced it in your area. For one thing, we are dealing with a virus, as I said before, which has a long and variable incubation period. For another thing, the relative changing of the weights of the epidemiological factors which I just mentioned may cause this explosive shift, that is, changing of the weights of the dog population itself - that

may go down or may go up - with regard to its immunity level, and with regard to the amount of contact between cohabitative species in the same area. All of these factors may change in one direction to cause an explosive shift from enzootic to epizootic conditions. It is when this shift occurs, of course, that communities are moved to do something about initiating control.

We have come here today to try to get as much information as possible from the areas involved. We are particularly anxious to get information about rabies in wildlife, and I am glad to see the game and fish conservation representatives attend as they have. I think rabies in wildlife is one of the biggest problems with which we have to contend in all parts of the country; we know that there are many reservoirs of campestral rabies which should be investigated. We know that the fox, both the gray and the red, is probably one of the most important reservoirs of the disease in eastern United States, particularly in the area which extends from New York State southward down the Appalachian range as far as northern Florida, and westward across the southern tier of States to eastern Texas. Another fox rabies belt extends from western Pennsylvania to eastern Iowa.

The newest problem with regard to campestral, or sylvatic rabies apparently is the outbreak and spread of the disease in skunks. The States which are most heavily involved are those which are represented here today. According to the reports we have received and the contacts we have made, both the small spotted skunk (genus Spilogale) and the large striped skunk (genus Mephitis) are equally involved. It was of interest to me to learn that the Spilogale in this part of the country is often referred to as the "civet cat." We have been getting reports from many of the States in the Midwest and Northcentral region of skunk and civet cat rabies reported separately. I am told by my biologist friends that the true civet cat does not actually exist in the Western Hemisphere. It is an Old World animal.

I think most of us will agree that it has been proved many times that overpopulation of a wildlife species is one of the factors contributing to rabies epizootics. A rabid animal in an overpopulated area sparks such a tinderbox, and rabies has been known to completely annihilate the susceptible wildlife in the area under such conditions. It not only decimates the sylvatic fauna and causes staggering losses to farmers in livestock, but if unchecked, the infection inevitably overflows into the susceptible dog population and increases the chances of human exposure.

When we examine our control activities from a national point of view, we see that we have taken a very important step forward in the standardization of laboratory diagnostic techniques in the matter of diagnosis methodology research. This has been accomplished by a wide reference service to laboratories throughout the country. You are all probably familiar with the fact that each year CDC holds two 1-week refresher courses in the laboratory diagnosis of rabies. When requested, we have gone out into the field and given the same course in health departments and veterinary or livestock laboratories.

Beginning in July 1949, rabies in animals was included in the weekly telegraphic reports of State health officers to the National Office of Vital Statistics, Public Health Service, in Washington. At that time we reported in Denver, Colo., that we were receiving reports from 22 States. Today there are 47 States, the District of Columbia, Puerto Rico, and the Territory of Alaska reporting this information on a weekly basis. This information is then

sent to all rabies control authorities throughout the country so that they may keep up with the rabies trends on a weekly basis. If you are not receiving this material please let us know and we will see that it is forwarded to you. We hope that you will use this material to keep your finger on what is happening all about you in order to coordinate your control activities with those of your neighbor better.

Fifteen States now have full-time public health veterinarians administering State-wide rabies control programs. In many States, of course, the livestock sanitary officials have begun well-organized, State-wide programs. During the past year we have had convincing demonstrations of successful local rabies campaigns. Many of you are familiar with some of them. We have assisted with some of the most successful ones, I am happy to say, in Memphis, Tenn., and Denver, Colo. Several entire States have shown very real progress in eliminating or depressing the prevalence of rabies by means of complete control programs. Wildlife conservation authorities have become more and more active, and have made excellent progress along that line. We would like to hear from them later in the day, of course. There has been increased activity in the preparation and distribution of educational materials such as motion pictures, pamphlets, and posters; and the newspapers have done a grand job of helping us to get these control programs under way.

I do not doubt that the greatest single contribution to rabies control practices in recent years has been canine vaccination. Its value and importance have been successfully demonstrated all over the country. But I want to point out that such demonstrations have shown that the usefulness of canine vaccination lies not only in its application, but in the manner of its application in a mass attack against a community disease problem such as rabies. In order to achieve any measure of success, it is essential that the swift reduction of susceptibles among animals in that area be accomplished by an intensified mass immunization program in which at least 70 percent of the dogs are vaccinated in the shortest possible period of time. I think that is the most important factor in regard to rabies control on a local level. The matter of just announcing the fact that rabies immunization is good and then expecting practicing veterinarians to carry it out in their everyday practice is very fine, but the only way to solve the rabies problem is by executing an intensified attack in a short time.

DR. BLANKENSHIP: In looking over the program I see that we do not have representatives from all of the States in this general area. There are only six States represented: Nebraska, Colorado, South Dakota, Iowa, Minnesota, and Missouri. Unless I have missed one, I do not see anyone from Kansas, North Dakota, Wyoming, or Montana.

You will note that next comes the U. S. Fish and Wildlife Service, and then the U. S. Bureau of Animal Industry, two other Federal agencies vitally interested in the problems of rabies control. We will now hear from the U. S. Fish and Wildlife Service, to be represented by Dr. Linduska and Mr. Buell on "Rabies in Wildlife in the United States."

DR. LINDUSKA: Chairman Blankenship, members of the conference. Very briefly I can outline for you the extent of Fish and Wildlife Service's participation in rabies control programs, and possibly inform you as to what our authorization is in such a situation. In 1915 there was quite a widespread outbreak of rabies in a number of our Western States involving Utah, Oregon, Nevada and, as I recall, Colorado. At that time it was in coyotes, and there

was a great deal of sentiment for control or depression of the coyote population in the hope that such a measure would bring some relief to the affected parties in the area. An emergency appropriation, I believe in February of 1916, made funds available in the amount of about $75,000; and in the beginning of the following fiscal year there was an amount in the neighborhood of $225,000 set up to combat predatory animals that might be involved in the spread and distribution of rabies. I believe that is the only situation of this type in which our Service was involved in what might be termed an active way, - that is, in actually carrying on operations and having sole responsibility for control.

A number of years later, about 1925, there was another outbreak in southern Colorado in which the Fish and Wildlife Service participated. At that time our function primarily was to serve as a leader by lending technical supervision and guidance to the program. As I recall the reports, the outbreak at that time led to the establishment of a rabies suppression unit and, presumably, in the following year or two it was effective in bringing considerable relief to the area. Since that time, through our predatory animal control program which is strictly cooperative in nature, we have possibly contributed to rabies suppression or rabies prevention.

Reports of rabies were received in the State of Georgia in 1939, and since then it has spread to many of the South Atlantic States. Dr. Tierkel undoubtedly is more familiar with that situation and probably has intimate knowledge of the distribution and intensity of the disease at the present time. In connection with that outbreak, the Service again participated to the extent that the facilities of the Fish and Wildlife Service were made available through their trained technical people, well-versed in technical procedures of control. In that case, however, as well as in all others, the request originated from local, State, and county governments.

The aid, as I mentioned, primarily concerns the directing of any justifiable control and the lending of technically trained personnel for supervision of the methods of dealing with unusual numbers of predatory animals. In the Georgia situation there were several requirements for such assistance. One requirement was that the funds for actual control be provided by one of the local governments in the community; and another was that a $2 bounty be placed upon foxes taken in connection with the program and that the bounty be paid from funds at the local level. It is not the policy of the Fish and Wildlife Service to attempt even local extermination of a species, but rather to bring unusually high populations to a level consistent with public health and livestock interests. Accordingly, when that is achieved in any local situation, it is the recommendation of the Fish and Wildlife Service that control operations cease. We are still active to the extent of lending supervisory assistance in that problem area.

In the early 1940's rabies appeared in the New England area and in New York State. That outbreak extended to adjoining States, and within recent years has brought about the formation of a tri-State group involving New York, New Jersey, and Pennsylvania. It is operating almost entirely on its own, and we have not been especially active in that program.

That, in a nutshell, is the extent of the participation of the Fish and Wildlife Service in the rabies programs in the past.

As I have mentioned, we have a regional organization, and within that regional framework we have such men as Mr. Noble Buell, District Supervisor

for this particular Region, and other men who are well acquainted with the habits and distribution of the animals involved in rabies control. They know the best and most economical methods for control of these animals. Such personnel is available to distressed areas on receipt of requests from local government groups. The burden of actual operational work rests with the community. There are no funds currently available for extensive control operations. I would like to emphasize again that the policy is not one of even local extermination of any species but rather of reduction to a degree that is consistent with other interests.

The research on rabies in wildlife that the Fish and Wildlife Service has done can be covered very quickly. We have done essentially none. There has been a limited amount of service work carried out but nothing of a very thoroughgoing nature. And that brings up one point that I would like to mention here. I feel that there has been inadequate research done on rabies in wildlife. I believe that it would be extremely profitable from the standpoint of suppression of the disease to know more about how it functions in wild populations. Of course one difficulty is that the incentive for work on rabies never originates until after the disease is well-advanced and livestock, and possibly humans, are involved. Up to that point there is litte public interest.

Nevertheless, I think that we could well afford to deal with some of our predator populations from the standpoint of following them through some of their population cycles and determining at about what population density diseases appear, the course of the epizootic through the population, and the effects of the epizootic, regardless of whether it is rabies or something else, on the decline and subsequent rebuilding of that population.

As Dr. Tierkel mentioned, it is axiomatic that wild animal populations are extremely dynamic; they are seldom static for any period of time. If it isn't the fox which is enjoying a period of unusual prosperity in populations, it is the raccoon, the skunk, or some other animal. However, those populations do not go on unrestricted. They reach a certain high point and rabies or some other disease or an unknown factor causes a reduction. For example, about 1939, when skunks increased out of all proportion to their usual numbers, reduction was effected by a not-very-clearly-identified encephalitis organism that was recovered consistently and appeared to be the agent responsible for the decrease in population.

The question of economics also enters into the picture of rabies control. When an epizootic is permitted to go unchecked in a wildlife population, it reduces the population to a near-zero point. But if by instituting control measures we reduce the wildlife population to a midpoint level which we assume to be adequate to eliminate the possibilities for frequent contact and, consequently, for the spread of the disease, then we have a healthy residual population which may quickly recover and rearrive at peak proportions. In a year or two we are again faced with an extremely dense population that is hazardous from the standpoint of another outbreak of rabies or something else.

With this possibility before us, would it be more economical, in some situations, to allow the epizootic to run its course and decimate the fox population and, if necessary, arrange for some form of indemnity to reimburse livestock owners and others for their losses, and forget about control? That has been offered as a suggestion; and while we don't have the answer, I dare say it is something that is going to have to be considered

from time to time in connection with operations of this type, because control doesn't come cheaply - it costs money! These are economic considerations that are going to have to be reconciled, and I think research on the dynamics of these wild populations is essential to provide the background necessary for sound interpretation.

I might say from the standpoint of the Fish and Wildlife Service that, in common with public health and livestock interests, we also find objections to overpopulation of many wild species. For instance, we recognize that foxes, when they are too numerous, represent a detriment to more beneficial, more desirable wild forms. However, we have not found means whereby we can safely, effectively, and economically control these too-abundant populations.

In some control operations incident to rabies suppression, the bounty system apparently has some merit. If there is a reductional procedure that is subject to more fraud than the bounty system, I don't know what it is. It has been tried repeatedly on a great many species, and in many States, and always it has become a racket very shortly. However, it has been reasonably effective in rabies programs in some areas primarily because it was conducted on a strictly local basis; it provided some incentive for intensified control operations; and it was removed before there was an opportunity for these well-known frauds to develop. Simple trapping and poisoning operations always are costly.

I don't know that there is any additional information I could offer you in connection with this program, but I do feel that there are two important facts that we should keep in mind. The first is that we need a type of program that will give immediate, temporary relief to acutely involved areas; and the second is that all wild animal forms are almost explosive in their tendency to reproduce and multiply when conditions are suitable to their basic needs. To ignore this would be to project into the future a continuous, long-time, costly program of rabies suppression through wild animal control. A long-term objective will have to recognize limitations in such reductional programs.

As an example of one factor that might well be reckoned with is the tendency to establish seasons and bag limits that are, in a considerable measure, unalterable. The permissible "take" of game and fur bearers frequently remains the same for an "x" population as it is for a "10x" population. There isn't always the flexibility within the framework of State hunting and trapping codes to take advantage of unusually prosperous populations.

The ring-necked pheasant, I think, is probably a reasonably good example. This is a species that through early 1940 and on up to 1941 and 1942 prospered tremendously over all of the United States ranges. Subsequently, in 1945 and 1946, it underwent a very appreciable decline. While there were variations in provisions for harvesting this pheasant, these provisions certainly were not commensurate with actual population changes. There is every reason to believe that during these periods of prosperity of one or another game species, we could liberalize the "take" tremendously and use to good advantage many of these species, some of which are prized as game, others as fur bearers. As many of you realize, even the fox has its staunch supporters among the sporting public, and encouraging hunting under liberalized regulations might well help to minimize the possibilities of such species reaching abnormally high population levels. I think, certainly, that such selective regulation is something to be sought. It is a long-time proposition, and I

appreciate that it does not provide the answers to the problems now under discussion. But it is logical from a great many standpoints, and is, I think, something for which we should strive. Mr. Buell, is there anything that you would like to contribute at this point?

MR. BUELL: I would like to mention that, in my opinion, one of the causes contributing to the high populations of certain animals, particularly of skunks and foxes, is the fact that fur prices have been extremely low for several years. Whether fur prices will rise I do not know. In the Dakotas bounties are paid on coyotes and foxes, and I believe that this is true in Nebraska as well. But as far as skunks are concerned, there has been no effort by farmers or others to take these animals for their pelts. They have not been worth trapping. I think low fur prices are a contributing factor to the dense population of skunks we now see over parts of the two Dakotas and Nebraska.

Rabies in skunks in parts of the Dakotas at least, apparently has almost run its course. There are areas, particularly in southeastern North Dakota, where the skunk population is very low, there being few dead or living skunks. As Dr. Linduska pointed out, control work to repress any predatory animal or undesirable wildlife species is an expensive proposition. Our control work is done almost entirely in units which are defined by county boundaries. The control work which we of the Fish and Wildlife Service do is done because of direct economic losses caused by the animals we are trying to control. I refer to coyotes and foxes in the Dakotas and Nebraska. In the counties in these States the cost of such control work is borne primarily by the local people, approximately 75 percent to 80 percent coming from local funds.

DR. BLANKENSHIP: We will now hear from the third of the Federal services particularly interested in rabies control. Dr. L. P. Giltner represents the U. S. Bureau of Animal Industry. Dr. Giltner.

DR. GILTNER: Dr. Schoening was asked to be present at this meeting, but at the eleventh hour he found that he could not do so and asked me to come in his stead.

The part the Bureau of Animal Industry plays in disease control work is largely one of cooperation - wherever we can, we cooperate with every agency which calls on us. Were we able to get into this work actively, to really try to stamp out rabies, we would work with all three of the groups mentioned by Dr. Tierkel - the Public Health Service, the Fish and Wildlife Service, and the States. In the case of States, we would work directly with the State veterinarian's office, or the chief livestock control official of the State. We would confer with the Fish and Wildlife Service personnel, since we do not understand how to eradicate diseases in wild animals. Unfortunately, we are not in the strong position of the Public Health Service and of the Fish and Wildlife Service who have authority to work at the control of a disease such as rabies.

The Public Health Service is trying to wipe out rabies in dogs and if, while they are doing that, the Fish and Wildlife Service wipes out rabies in the wildlife species, the job will be done once and for all unless someone brings in an infected dog by airplane or by some other means and reintroduces the disease. But it would not be very difficult to put down that small an outbreak. The position of the Bureau of Animal Industry is this - we do not have appropriate legislation to enable us to act in the control of rabies.

We have tried for a number of years to get legislation which would authorize us to do this work, although control work would not be done by our division, which is a research division very largely, but by our field offices. Our field offices would work with the State personnel and with workers of the Public Health Service to help put down rabies in dogs and in wildlife. We talked a week or more ago with the secretary of the U. S. Livestock Sanitary Association about the possibility of getting such legislation. Dr. Schoening is interested in control and thinks something should be done by the Bureau in control work.

The only division of our Bureau which does have legal authority for control is our Virus Serum Control Division, the function of which is the control of biological products. This Division must see that any product which is intended for interstate transportation is produced by a reputable pharmaceutical house which has a license to make, manufacture, and distribute veterinary biological products. In respect to rabies biological products, it determines that each manufacturing house comes up to a certain standard. The three things that the house must do are to produce a safe product, to produce one that contains no contamination of any sort, and to produce a vaccine that is potent. We are able to evaluate the potency of rabies vaccine. We have done that with the older vaccines, the ones that are in active use; and recently we have accomplished it with a vaccine that is prepared from a virus so modified biologically that its virulence is reduced to such a point that it does not infect and invade the creature we are trying to protect, but does build up a strong immunity.

In effect, that is about what is done by the Virus Serum Control Division of the Bureau of Animal Industry. All the licensed pharmaceutical houses cooperate with the program and we have little trouble. That's about the extent of the Department of Agriculture's authorized control.

I think I can speak for Dr. Schoening that he, and I know the Bureau, wants very sincerely to help wipe out rabies and to get all the information available about our statistics. I have made many notes from the reports we publish annually. Dr. Schoening, I believe, was the father of these reports some 13 or 14 years ago. As Chairman of the Rabies Committee of the United States Livestock Sanitary Association, he saw the value of collecting these data through the cooperation of the State public health workers, the State veterinary personnel, and to some extent through cooperation of our own personnel who are working in the field. Although I do not have these data with me, I will be glad to send a copy to you.

Briefly, this is the picture as I saw it. Since 1938, when we started gathering statistics, the incidence of rabies in all livestock including cattle, sheep, goats, horses, dogs, and cats, was found to be a litte below 10,000 cases a year. Then we began to get more and more reports on rabies in wildlife which raised the total incidence for the country. But this increase was subsequently balanced by the decrease in dog rabies due to mass vaccination, and for the last 3 or 4 years the incidence has been about 3,000 below the former 10,000 mark, a fact which seems significant. By mass vaccination, urban areas have set up barriers which prevent the successful introduction of rabies.

In the District of Columbia there is a human population of close to a million and a dog population of more than 30,000 licensed dogs. Prior to 1943, there had been very little rabies for a number of years. Then in 1943

and during the following 2 years we had too high an incidence, something over a hundred cases each year in the city. We began mass vaccination of dogs in the city and the incidence dropped to zero. For the last 4 or 5 years our incidence has been very low, giving a graphic example of the results of mass vaccination. Of course, we used another control measure, too, that of keeping the dog on a leash for 30 days after vaccination. Within that time the animal had ample time to become immune. The suburban districts and the county areas surrounding the large centers have taken up vaccination. In the State of Maryland the two big counties, Montgomery and George, have practiced yearly vaccination, which has done a great deal toward reducing incidence of rabies.

In the last few years the incidence of rabies in cattle has risen due, we believe, to foxes. The decrease in the population of horses from 10,000,000 in 1945, to 4,700,000 in 1950 has contributed to the decrease in rabies in this species. In sheep, goats, and pigs rabies is not particularly important.

I think that we now have enough information, at least with regard to livestock, for rabies control; and I believe that the Wildlife Service personnel know how to control rabies in wild animals. Naturally we would all work together to put down the disease.

REPORTS FROM THE PARTICIPATING STATES

We come now to that part of the program where we have reports from delegates representing the individual States. There are six States, and I have listed them alphabetically. The six States represented here are: Colorado, Iowa, Minnesota, Missouri, Nebraska, and South Dakota.

First, we will hear Dr. Riemenschneider, State Veterinarian for Colorado.

DR. RIEMENSCHNEIDER: We have a split plan of control for rabies in Colorado. Some of you are acquainted with this plan. We cooperate with the State Public Health Department in the control of rabies. During 1950 we had very little rabies in livestock. Our troubles were primarily in the city and county of Denver, and the tri-county area.

Now I will turn the floor over to Dr. Ashcraft who will present the balance of Colorado's report.

DR. ASHCRAFT: As Dr. Riemenschneider said, we in Denver were the hot spot of the State. In October, November, and December of 1949 we began to get reports and to conduct investigations of rabies in domestic animals, primarily the dog and cat, in the city and county of Denver. During 1950, the city and county of Denver reported a total of 57 positive cases of rabies in animals. This area has had no cases reported thus far this year (1951).

Reports of dog bites in the city and county of Denver have been numerous. There was a large amount of work involved in carrying out the reporting and quarantining procedures. We had 1,330 dog bites reported in 1950. For the first quarter of 1951 we have had 230. Perhaps this is not a large number in comparison with other cities of like size, but at times it tends to overwhelm us. The total number of humans who received the Pasteur treatment during 1950 has been reported as approximately 50.

We were faced with a rather extensive and immediate problem during the first 2 months of 1950 because of the large number of cases and exposures during the latter part of 1949. It became increasingly apparent that we were going to have to institute a rather far-reaching program of dog vaccination. Through the fine cooperation of the Denver City Council, an ordinance was passed providing for compulsory rabies vaccination in addition to the dog licensing ordinance already in effect. Because of the epidemic a meeting was held of the Denver Area Veterinary Medical Society membership which included veterinarians from the tri-county area of Arapahoe, Jefferson, and Adams Counties. The State Veterinarian, U.S. Public Health Service veterinarians, and veterinarians from the Denver Department of Health and Hospitals met with this group.

We set up mass vaccination clinics in all of the junior high schools in the city of Denver and in strategically placed spots throughout the tri-county area. The practicing veterinarians voted to cooperate in this program of vaccination which was to be accomplished at a cost of $1 per animal with the exception of the pets of needy people. These latter were to be given the service free. The program was handled by the Society with the Society purchasing the vaccine, the U.S. Public Health Service and cooperating agencies supplying the equipment necessary for the clinics, and the various health departments furnishing personnel to serve such functions as clerks and handlers. We

vaccinated a total of 25,000 dogs throughout the year 1950 within the city of Denver alone, including approximately 15,000 in the clinics and approximately 10,000 in the private veterinarians' offices.

A new program was inaugurated under the supervision of the Department of Health and Hospitals. This program called for rebuilding of the pound and the employment of four dog catchers in addition to a poundmaster and an assistant poundmaster. Four trucks were assigned to the program, three of which were equipped with two-way radios. During the last 9 months of 1950 there were twice as many dogs collected as during the previous year; and less than 25 percent of them were redeemed, indicating that 75 percent of the dogs collected actually were strays in the sense that there were no responsible owners.

Up to the present we have had no wildlife problem in the city and county of Denver; however, we endeavor to investigate all bites inflicted by wild animals insofar as is possible.

In November 1950 an ordinance was passed by the city council repealing the dog tax and providing for compulsory, yearly rabies vaccination and registration. Under this authority, rabies tags and certificates are furnished to the veterinarian who properly executes them and returns portions of the certificate to this Department for registration purposes. These certificates are filed both by tag number and by owner's name. The veterinarian vaccinates the dogs as in a regular office call and issues the tags. Provision is made for the replacement of lost tags at a small service charge. All vaccination is carried on by the private practitioner and all vaccinations are treated as private office calls. Welfare vaccinations are performed by the city at the municipal dog pound, recipients being screened by welfare service. It is estimated that we will vaccinate between 25,000 and 30,000 dogs in the first half of 1951. It is hoped that this number will give us adequate protection against another rabies epidemic.

We are coordinating a public health education program through our Health Education Division. The person-to-person educational part of the program is carried on by the dog catchers during the course of their daily contacts with the public.

DR. BLANKENSHIP: Thank you for a very precise report on a campaign which was well planned and energetically conducted. Are there any questions?

DR. RIEMENSCHNEIDER: I might add that we tried to build a biological barrier around the tri-county area. There were some 15 counties which put on vaccination programs, in the form of clinics like those held in Denver, that were quite successful and were very satisfactory from the standpoint of rabies control. They did a good job in an entire block of counties composed of Larimer, Logan, Weld, and Sedgwick. These counties lie along the northern border of Colorado, the Wyoming border. All dogs there were vaccinated. In an effort to protect our neighbors as best we could, as well as to rid our own State of the disease, we checked with Dr. Anderson, of Nebraska because of the presence of infected dogs in Yuma County, Colorado, a county bordering Nebraska. To the west of us we have the natural barrier of the Continental Divide. Of course, I would like to inject here that we inherited this problem from a nice little tourist dog, apparently, the source from which the disease came to us.

MR. SPEAKER: I have a question concerning the 57 rabies cases reported. Were the diagnoses from positive heads or by clinical findings?

DR. ASHCRAFT: These were by both positive heads and clinical findings.

MR. SPEAKER: Positive and clinical?

DR. ASHCRAFT: Yes, most of those were quarantined at the dog pound or at the veterinary hospitals and tentatively were clinically diagnosed. These tentative diagnoses subsequently were confirmed by the diagnostic laboratory.

I might also inject here that the total number of diagnoses was 105 on dogs, and that practically all of these were verified by the State Laboratory and also by the regional Bureau of Animal Industry's Pathological Laboratory.

DR. BLANKENSHIP: We are very glad to hear that report concerning the work in Denver. The work did spread to other parts of the State. I don't believe you mentioned the State Health Department. That Department cooperated in this work, did it not?

DR. ASHCRAFT: Definitely.

DR. BLANKENSHIP: Following the alphabetical schedule, Iowa is the next State to report. We have a large delegation here from Iowa. Dr. Hendricks has been designated to represent the Iowa group.

DR. HENDRICKS: In preparation for this conference a meeting of representatives of interested agencies was held in Des Moines on May 14 for the discussion of the rabies problem in Iowa. In attendance at this meeting were the State Veterinarian, the U.S. Bureau of Animal Industry Veterinarian in Charge in Iowa, three representatives from the State Conservation Commission, a representative from the U.S. Fish and Wildlife Service, a representative from the Veterinary Division of Iowa State College, and two representatives from the State Department of Health. Your speaker was selected to present this report to the conference.

I shall attempt to present a consolidated report incorporating the points discussed at the meeting. However, I shall accept full responsibility for any statements that are in error, inasmuch as the other persons who attended our meeting have not had an opportunity to revise this report. However, some of these persons are present and I hope they will feel free to take part in the discussion and correct any errors that I make.

The recorded history of rabies in Iowa dates back to 1905. In that year a case of rabies in a dog was reported. That case was confirmed by the laboratory, as were all the other cases to which I will refer. Since 1905, cases have been reported every year with the exception of 1906, 1910, and 1914. The figures to which I refer in this report include the cases found by laboratory diagnosis by the State Hygienic Laboratory for the period 1905 through 1950, and by the Iowa Veterinary Diagnostic Laboratory for the period 1928 through 1950.

The first case of rabies reported in a wild animal was in a skunk in 1916. This is interesting because, according to Seton, skunks were first reported in Iowa in 1902. That was in the Marshalltown area and they were said to be "new in the country" but increasing. This report from the Marshalltown area referred to the small spotted skunk which in Iowa is commonly called the civet cat. In the records showing distribution of cases by species, the small spotted skunk and the large striped skunk have been placed in one group.

During the 11-year period 1916 through 1926, there was a total of 12 reported cases in wild animals. Since that time cases in wild animals have been reported every year with the exception of 1934 and 1937, with a marked rise in cases during the last 2 years. Examination of the total number of reported cases for this 46-year period indicates a cyclic nature of the disease. During the late twenties and early thirties, there was an apparent increase of the disease. This was followed by a period of 12 years during which the number of reported cases was low. Then in 1944 the number started to increase and in

1949 and 1950 there was a very marked increase.

The summaries for the 46-year period are based on available records of the two laboratories. Prior to 1928 the cases are from records of the State Hygienic Laboratory alone. Beginning in 1928, the figures represent the total from the Iowa Veterinary Diagnostic Laboratory and the State Hygienic Laboratory. The frequency with which suspected cases are sent to the laboratory, of course, may influence the total positive cases reported. Both of the laboratories routinely make mouse inoculations of brain suspensions from all suspected cases that are Negri negative.

A few more words relative to reporting may be in order at this time. As stated earlier, case reports have been received from two laboratories in the State that make examinations for rabies. Thus all reported cases have had laboratory confirmation. Heads of animals suspected of having rabies have been submitted to the laboratory, primarily by veterinarians and physicians. A smaller number of the heads have been submitted by conservation officers and other interested persons.

We know, of course, that not all cases of rabies receive laboratory examination. In Polk County, where the disease reached epizootic proportions, the State Veterinarian requested that heads of all suspected cases be submitted to the laboratory. The cooperation of all the practicing veterinarians in the country in sending such heads to the laboratory was excellent. If the State Veterinarian had not made such a request, without a doubt many diagnoses would have been made on a clinical basis alone when the disease reached such a high incidence.

During the 46-year period infection has been found in 20 species of animals, the reports show.

During 1950 there were, by far, more cases reported among dogs than in any other species. Other species with high numbers of reported cases were skunks, cattle, cats, hogs, foxes, and racoons in that order. Cases in other species were rather rare. However, if we remove the 123 Polk County cases, which were almost all in dogs, the picture changes. Then we have only 50 cases in dogs for the remainder of the State in comparison with 79 in skunks and 63 in cattle. Thus it appears that in the State outside of Polk County the disease in wild animals is of more significance.

The reported cases show that the disease is widely distributed geographically in Iowa. During 1950 cases were reported from 72 of the 99 counties in the State. During 1949 the distribution of cases was similar to that of 1950, following very much the same geographical pattern.

The laws of Iowa do not mention rabies specifically. However, various sections of the laws and regulations do apply to the disease. The regulations of the Division of Animal Industry of the Iowa Department of Agriculture state that "all dogs entering the state of Iowa for any purpose except performing dogs to be within the state for a limited period, must be accompanied by a certificate of health, issued by an approved veterinarian stating that they have not been exposed to rabies and are free from symptoms of any communicable disease, and that they have been vaccinated with rabies vaccine not over six months prior to the date of entry." As with other infectious diseases of animals, the State Veterinarian has authority to issue quarantine orders relative to rabies.

The State law requires all persons who own or harbor a dog to obtain a county license. If dog owners fail to obtain the county license, the fee is collected as ordinary taxes, in accordance with the assessor's records as to dog owners. The money thus collected from county dog licenses constitutes the Domestic Animal Fund. This fund is used to pay for damages caused by the killing or injuring of any domestic animal or fowl by wolves or dogs. Some

counties have used this fund to pay for domestic animals that have died as a result of rabies.

The State law also provides that cities and towns may license dogs in addition to the county license. Some cities and towns require annual anti-rabies vaccination of dogs before licenses are issued. Cities and towns have the power to restrain dogs from running at large.

A provision of the Iowa law states that it is lawful for any person, and it is the duty of a peace officer, to kill any dog for which a license is required, when such a dog is not wearing a collar with license tag attached.

In general the wild animal population in Iowa is high. The fox population has started on a downward trend. The raccoon population has reached a plateau. The number of striped skunks is not as high as it has been. The spotted skunk population also appears to have reached a plateau. The population of both striped and spotted skunks is very unstable and subject to violent fluctuations in any given area. The value of skunks in destroying rats and insects is recognized.

The various agencies mentioned earlier have cooperated in dealing with the rabies problem in Iowa. Dr. H. U. Garrett, the State Veterinarian, has done much to bring to the attention of local authorities the seriousness of the rabies problem and the need for action to control the disease. The nine district State veterinarians aid the local practicing veterinarians on rabies problems throughout the State and assist in the organization of control programs. Twelve U. S. Bureau of Animal Industry veterinarians located throughout the State are also available to aid when needed. The State Conservation Commission has requested its 54 officers located in all parts of the State to be on the alert for rabies in wild animals and to send heads of suspected cases to the laboratory. The representative of the U. S. Fish and Wildlife Service works with the State Conservation Officer in this regard. Iowa State College aids in the educational aspects of rabies control, as do all the other agencies. It is believed that the educational activities are a very important part of any rabies control program. The State Health Department, through its public health veterinarian, aids in preparation of educational material and helps local health officials organize rabies control programs within the State.

County-wide coordinated rabies control programs have been started in Iowa. In January the Webster County Board of Health, in cooperation with the State District Veterinarian in that area, the boards of health of the cities and towns in the county, and the township trustees, initiated a control program. It consisted primarily of an 80-day modified quarantine of all dogs in the area (i.e., all dogs were required to be on a leash or confined on the owner's premises), elimination of all stray and ownerless dogs, and vaccination of all dogs. To accomplish the vaccination part of the program, and with the cooperation of all the practicing veterinarians in the county, a series of emergency antirabies vaccination clinics was set up throughout the county. Also during this period the practicing veterinarians carried the rabies vaccine with them and vaccinated many dogs while in the county on routine calls. The success achieved in this program would not have been obtained if it had not been for the full cooperation of the practicing veterinarians in the area and the unceasing efforts of the district State veterinarians in organizing the program. During this period over 3,100 dogs, of an estimated dog population of 4,500, were vaccinated. While it is too early to evaluate the results of the program, the reported cases have markedly decreased. All cases in this county were among dogs; none were reported among other domestic animals or wild

animals. At the present time a similar control program is in progress in Polk County. In addition, many smaller communities in the State have initiated control programs. There appears to be an increased interest in rabies in Iowa and an increasing desire among the people to take action to control the disease. As an illustration of that point, I would like to call your attention to an editorial which appeared in the Des Moines Register this morning, Monday, May 21. It says, "We better take rabies seriously." It's a coincidence that it should appear just today.

DR. BLANKENSHIP: Dr. Hendricks, that was a very nice report, and I think Iowa's people are to be commended for the way they have coordinated their efforts on their rabies control program, and in preparation for this meeting. Are there any other men from Iowa who would like to say something? There are none, so we will move along to the third State on the scheduled list, Minnesota.

DR. JENKINS: I am taking Dr. West's place here today because he couldn't attend. In Minnesota our big problem is rabies in wildlife. We were free from rabies from 1942 to 1947. Then it seemed to break out in the southern part of the State next to the Iowa border. In 1947 we had two cats with positive diagnoses of rabies, and at that time we issued a quarantine proclamation in the townships in which those cases occurred. In 1948 we had four rabid cats and one civet cat from the southern part of the State. In 1949 we had three rabid cattle, one cat, and two skunks. In 1950 when rabies became more prevalent in the wild animal life, we had two rabid dogs, seven cattle, two cats, four skunks, and one squirrel. In 1951 since January 1, we have had 9 rabid dogs, 10 cattle, 2 cats, 1 civet cat, 9 skunks, and 1 raccoon. Our problem is what to do to keep this disease from going further north into the country harboring the deer, the wolves, and the bears. The disease has not been reported in dogs in the northern portion of the State practically all of the rabid dogs being in the southern part of the State. There is no rabies at present in any municipality or city. We are down here to find out some way to combat the disease in Minnesota, in conjunction with the Game and Fish Commission.

DR. TIERKEL: I'd like to know, doctor, just how far north infected skunks have been found in Minnesota?

DR. JENKINS: They have been found just a little bit above the center line, about as far north as Brown Valley and Ortonville, and Mora is the eastern limit.

DR. TIERKEL: How do Minnesota people feel concerning the way the disease got into the State? Is there any question in anybody's mind that it probably came up in the skunk population from northern Iowa?

DR. JENKINS: We don't like to incriminate our neighbors. We are all afraid to lay it on somebody else.

DR. TIERKEL: There is no evidence that there has been an importation of infected animals of any kind, and the interesting thing to me, as you pointed out, is the fact that the infection started in 1948 in domestic cats and in civet cats, and apparently has continued to build up. We agree with you that the infection is spreading, not only going northward, but apparently going into the plains regions of the West. One of the things we like to have from you folks in the States is your own idea of the movement of the infection based on your own observations.

DR. JENKINS: I think Dr. Erickson here can give you the wildlife population figures they have for Minnesota showing the increase in skunks and in other wildlife. We have not had rabies in foxes. We have had some reports of rabies in rabbits, or claims that children were bitten by them, but we have

never been able to find the rabbit afterward.

DR. HENDRICKS: We have a little statement that we would like to present, but we thought that perhaps it might more fittingly go into the panel discussion on wildlife tomorrow.

DR. BLANKENSHIP: What are the wishes of the group? Would you like to hear it now, or would you like to save it for the panel?

DR. TIERKEL: If it is in reference to the problem in Iowa or Minnesota, I think we might like to hear it now and then we can have a more general discussion on the subject tomorrow.

DR. HENDRICKS: As I said before, I thought perhaps this should be held in abeyance until tomorrow, but we will present it at this time. The brief article was prepared by Dr. Kozicky, Paul Leaverton, and myself, and concerns wildlife. The Iowa State Conservation Commission has been cognizant of the rabies problem for some time, and has cooperated fully with the State Department of Health and other agencies concerned with the abatement of the disease. For several years, wild animals showing distress have been collected and sent to the diagnostic laboratories, and in August 1950, all of our men were alerted to the problem and were asked to pick up all questionable animals possible and send them in to these diagnostic laboratories.

The personnel of the Fish and Game Division and the biologists were charged with this responsibility from our department. No reports are available on the number of animals sent to Iowa City. Of the 15 specimens submitted to the Iowa State College Veterinary Diagnostic Laboratory through Dr. Kozicky, leader of the Iowa Cooperative Wildlife Unit, 9 of them - 2 red foxes, 3 striped skunks, and 4 raccoons - were diagnosed as positive for rabies. In addition to collecting rabid animals, the Commission has cooperated through the State Department of Health, advising farmers to contact the local conservation officer in their district in the event the disease in wildlife was found in animals. This information was distributed by the Health Department through the medium of a brochure on the disease.

At least one specific instance has been reported to our office of cooperation on a fairly large scale by a conservation officer. A township in Humboldt County was placed under quarantine and the local conservation officer cooperated with the State health authorities, local veterinarians, and farmers. All dogs in the area were tied up for a period of time and the officers assisted the farmer in trapping infected animals and destroying the dens. In a few instances our State trapper has been called into areas to assist in major problems. Personnel of the Game and Fish Department are also available to assist local conservation officers should a major outbreak necessitate it.

Trapping schools, primarily designed to assist farmers in controlling foxes and coyotes, have been held in 24 counties in the State. A total of 35 demonstrations has been held and over 750 farmers instructed on how to trap these animals. Requests for these performances have come largely from the Extension Service and the Iowa Sheep Grower's Association. The program has been enthusiastically received and will be continued. It would, of course, be beneficial in a rabies control program as the farmers could assist in any trapping control program on their farms if the necessity should arise.

From the reports on wild animals in Iowa, issued by the State Health Department, it is evident the disease is most prevalent in skunks, with a few reported cases in foxes and raccoons. While the exact population status of these animals is not known, some indication of their abundance can be derived from our surveys and from reports of the fur dealers. In 1936, 193,000 skunks

were harvested by Iowa trappers. There has been a general decline in the striped skunk population since that time. The civet cat, or spotted skunk, increased or maintained its level from 1936, but the harvest has decreased rapidly since that time. All evidence points to an actual decline in the population of the striped skunk in the past 15 years, but in the case of the spotted skunk, the decline in numbers taken by trappers may be due in part to the extremely low price of the long-haired fur. The raccoon, on the other hand, shows an increase starting at 15,000 in 1936 and reaching a peak of 61,000 in 1946, then dropping to 56,000 in 1950. While the data are not complete, we believe that the raccoon has perhaps reached its peak of population and is leveling off at this time in our State. The fox population is more difficult to appraise. In 1936 about 9,000 pelts were sold, only 6,500 in 1950, and a high of over 14,000 in 1946. Most foxes, however, are taken by hunters rather than by trappers and it is likely many pelts do not reach the regular commercial channels. If these data, however, can be used as a criterion, it would appear that the fox, too, has reached the peak of its abundance in our State and is now on the decline. This apparent decline was further substantiated at a meeting of game management officials at the Midwest Wildlife Conference in December 1950.

While it is true that the prices paid for long-haired furs will have considerable influence on the harvest, the monetary value cannot be used entirely as a population criterion. In other words, the price per skin of the striped skunk was practically the same in 1939 as it was in 1946, yet in 1939, nearly 92,000 were harvested while in 1946 only 32,000 were taken in the State. At this writing we have no definite information on an overpopulation phenomenon that has a direct bearing on the epizootiology of the disease. Certainly we would be remiss if we did not make some effort to stress the importance of caution in any widespread control campaign involving wildlife species. Inasmuch as we do not have specific knowledge of the exact population status of the animals involved, we must use restraint in wholesale control of any wildlife species.

One cannot help but recall the clamor that existed during the mid-1930's concerning the ring-necked pheasant as a source, or reservoir, of infection for the Eastern equine encephalomyelitis in the east. Farmers became alarmed and were skeptical about encouraging the species on their property. In fact, they took many steps to reduce the numbers. If groups such as this had been overzealous in appraising the findings to provide a scapegoat for the farmers, we would have lost a valuable natural resource. As you know, research proved that the reservoir for the disease was a bird mite, probably existing as a parasite on the farmer's chickens.

Needless to say, before any animal is condemned we need facts on how rabies is maintained from year to year. In this connection we urge the continuation and expansion of research along these lines. Based on our limited reports the indices of rabies in wildlife are generally localized, that is, we have received as many as four positive specimens from one locality. On this basis it would not be fair to condemn all the species, even within the county; rather, it would be more economical and practical to control a specific population involved. In Iowa this is being done, as previously stated, through the mutual cooperation of the Conservation Commission and the State Health Department. Another factor that should be stressed is that the public health agencies make every effort to identify the exact species of wildlife involved. This information would be essential in analyzing the problem or formulating a control campaign.

Our personal belief is that the control of rabies must be initiated with

a positive control of the disease in dogs. Laws can be made and enforced to compel dog owners to inoculate and quarantine their pets. Such action, it has been pointed out here, has eliminated rabies in some of our own States as well as in England, Ireland, Norway, Denmark, and other countries. Model dog laws for the control of rabies were outlined in 1940 by the Rabies Committee of the U. S. Livestock Sanitary Association, and if the commonwealths within our respective States desire such action, these regulations could be enforced. In conclusion we may state that it behooves us all to work together as a team in analyzing, controlling, and solving the rabies problem.

DR. BLANKENSHIP: Thank you very much, doctor. Are there any other comments from Iowa or Minnesota? Dr. Tierkel has asked if Dr. Erickson from Minnesota has anything to say.

DR. ERICKSON: As far as the Minnesota Division of Game and Fish is concerned, it is only in the last week or 10 days that it has become cognizant of the rabies problem. The State Livestock Sanitary Board has called the seriousness of the problem to the attention of the Division. The bounty system is the chief control that the Game and Fish Division is able to exert at the present on predatory species which might be carrying rabies. There is no control over skunk populations other than trapping. Skunks can be taken any time, anywhere. Unfortunately, few people bother to trap them now. In Minnesota it is illegal to poison skunks.

DR. BLANKENSHIP: If there are no other comments from Iowa or Minnesota, we will hear from the State that is next in alphabetical order - Missouri.

MR. TWICHELL: I imagine someone here from the Public Health Service knows more about rabies in Missouri than I do. Dr. Price from our State Health Department is now working in St. Louis on a rabies problem. Apparently, there is a rabies outbreak in the St. Louis area. We have not been aware of any more rabies in wildlife species than we have had in other years. We have a few reports of the disease every year, mostly in foxes and skunks. I presume that dogs, and possibly squirrels, are spreading the disease in the St. Louis area.

While it was mentioned that a high wildlife population tends to bring on an epidemic, it is not necessarily an epidemic of rabies. In 1938 or 1940 our skunk population was many times as high as it is now, both the striped skunks and spotted skunks. Then it dropped, due to an epidemic which apparently was not rabies, at least not all rabies, but an encephalitic type of disease. Our skunk population is quite low now.

At present, raccoons are at a population level as high as we can remember during the past 15 or 20 years. There is some evidence that a few are dying off now, due to a form of distemper. Some veterinarians have told us that this distemper is identical to that found in dogs. They have reinoculated dogs and raccoons from each other, and it is the same organism that carries the disease in both species. However, it may sometimes be rabies that will build up when a wildlife population gets too high.

We are interested in keeping wildlife populations down below a high level for various reasons besides rabies control. We can do this partly by regulating open seasons. Our department has that power without additional legislation, so that in an emergency we could change the open seasons almost over night.

I imagine trapping would be the best way to control wildlife species in areas as populated as Missouri and most of the Midwestern States. We have an extension trapping program, such as Mr. Speaker mentioned, in which we train farmers to trap coyotes and foxes. We train about a thousand men a year who are

very successful trappers. In an emergency we can depend on this reservoir of trained personnel. Many of these men have purchased traps better than the average trap found in the hardware stores. We use a 3N Victor steel trap. About 5,000 of those traps now are in the hands of trained trappers throughout the State. In order for a trapping program to be successful, the trappers must really believe that the fox, or whatever animal they are trapping, is causing the trouble. Farmers are now losing stock - which, of course, is important to them. Yet they don't take the trouble, or work very hard, to lower the numbers of this predator until the losses become really serious. I think that in a serious epidemic you could get the trappers to lower your wildlife population.

Perhaps someone else here knows more about what is going on in the St. Louis area.

DR. HOLDEN: All I know is that 118 cases of rabies were reported in Missouri during the week ending April 28.

DR. TIERKEL: This report was checked, and it was found that Missouri is just beginning to construct its reporting pattern and that many laboratories included in their report for the 1 week cases which had been on their books for months. Apparently diagnoses were being made, as in many States, both at the Health Department Laboratories and at the State Livestock Sanitary Board Laboratory, as well as in various cities which have their own diagnostic facilities. Many laboratories had not reported to the one central reporting agency, which has recently been set up at the State Health Department since Dr. Price has taken over the activities of rabies control in that State. That accounts for most of the 118 cases. The remainder of the cases were due to a current epizootic which is raging through St. Louis at the present time. The week after April 28 there were 63 cases. That was last week, and that, too, probably reflects both a backlog of the last few weeks and the current outbreak in St. Louis.

DR. BLANKENSHIP: Any comments from Missouri? If not, the next on our list is our host State, Nebraska.

DR. ROGERS: We, also, had a preliminary conference in the office of the State Director of Health as soon as we got Dr. Blankenship's letter announcing the plan for the conference. Represented there were the State Game Forestation and Parks Commission, by their Secretary, Mr. Gilbert; the Bureau of Animal Industry by Dr. Anderson, who is present; and Mr. Vose, our Director of the Division of Laboratories from the State Health Department. I was selected to give Nebraska's contribution to this conference. Mr. Mohler is here today from the State Game, Forestation and Parks Commission instead of Mr. Gilbert.

It was brought out at our preliminary conference that there is an apparent increase in the populations of the wild animals with long fur, particularly raccoons and skunks, in the State of Nebraska. Mr. Gilbert suggested that if only we could get the fashion to change so that women would go back to wearing coats of the long-haired furs, it would take care of the situation. It was also suggested, I think facetiously, that we might follow the custom of one of our little towns in Nebraska - Crete, which is just a short way below Lincoln - and have an annual "coon feed." In preparation for this annual event raccoons are hunted intensively in that area. These are prepared by a local individual who has the reputation for being able to cook raccoon so that it is really tasty.

Such an annual event might help to take care of some of our wild animals, too, if we would spread the idea.

I do not have any statistical information about the wild animal population in Nebraska. A survey conducted just a short time ago by Mr. Mohler and some of the other men in the Game, Forrestation and Parks Commission did not seem to indicate any unusual incidence of dead animals along the highways - if that is a good way of determining what the animal population is. We have not had any confirmed laboratory reports of rabies in wild animals in recent months. However, since January 1 of this year, we have had six confirmed cases in domestic animals. That represents a rather high incidence for the State of Nebraska, for although our incidence varies from year to year, it is never much more for the entire year than the number that already has been reported for 1951. Some years it goes down to zero; last year it was only 1 animal - 1 positive animal; and the highest record in recent years was some 21 in 1947, which was attributed to the outbreak right here in Omaha.

The cases that have been reported since January 1 in Nebraska have been widely separated, and that gives us some concern. They are from five different parts of the State. One area is near the Wyoming border, in Scottsbluff County, where there were two positive dog heads reported. I think we can blame this on Wyoming, because it seems quite definite that the infection was imported across the border from Terrington, Wyo. As is usual in all these cases, as soon as we heard of rabies or suspected rabies in an area, Dr. Anderson contacted the local cooperating veterinarian of the area who made an immediate and thorough investigation of the local situation.

We had a case from Greeley County of rabies in a cat, and evidence indicates that there were other cats in the area which had rabies, but there was no confirmation. Those cats had wandered away and died. It was suspected that they might have been infected from skunks in the area. We have had a positive calf's head and a positive cow's head recently from other widely separated areas in the State, and just recently one positive report from Gage County, which is the next county south of Lincoln, Lancaster County. We are getting excellent cooperation, as we always have, from Dr. Anderson's office; and he is prepared, if the local situation warrants and the local officials cannot or will not act, to control local situations. He is prepared to quarantine and to set up whatever other control measures he deems advisable in any portion of the State or in the entire State. At present I think he is working toward getting the local people to take necessary action.

Mr. Vose prepared a complete report for me which I will not read. I will just scan it. He went into the law quite completely and, again, although we have no specific mention of rabies in our statutes, we have many health laws that give us the power to act both on the State and on the local level if necessary. The State Health Department has laboratory facilities for diagnosis of rabies; and there is an animal laboratory at the College of Agriculture in Lincoln. Those cases which have no relation to a human case or exposure are sent to the College of Agriculture, and those in which there is a human bite, or suspected exposure of a human, are sent to the State Health Department Laboratory; but both agencies report positive heads to all the other interested parties.

The State Health Department has prepared a release on rabies, a little educational leaflet, like that prepared by the State of Iowa, which is sent out upon request. The Department also has prepared sample resolutions and ordinances that may be enacted by counties or municipalities if they wish to set up rabies

control programs in their areas. Looking at it from a long-term standpoint, we suspect that in addition to the influence the wild animal population may have had on rabies in Nebraska, there may be some connection between tourist travel and rabies. The disease was practically nonexistent in the State as far as we know during the depression years when people did not travel and during the war years when travel was restricted. But after people started traveling again, and the tourists came through our State on the transcontinental highways, there has been an upswing in rabies. As a result, we have been thinking that perhaps some measures to control interstate shipment of dogs might be a good subject for consideration here, similar to that for the interstate shipment of psittacine birds.

DR. BLANKENSHIP: Thank you, Dr. Rogers. Mr. Vose, would you like to comment or add anything to what has been presented?

MR. VOSE: I can report two more positive cases since figures were furnished Dr. Rogers, one cat and one dog. The cat was from the Greeley area where the first positive cat was found, and the dog was from an area a little farther north in the State.

A word as to the resolution that Dr. Anderson mentioned for county control by health department authorities. Years ago, prior to about 1930, we did have a great deal of rabies in the State, and at that time such regulations were used successfully. County commissioners and other county officials got together with the health department, passed the resolutions mentioned, and then the people of the county, headed by the sheriff, took action. They did so successfully. One instance of use of this approach was in Buffalo County, the other county I have forgotten. Two counties used these regulations in the 1920's and were enabled thereby to handle the problem locally.

DR. BLANKENSHIP: I am just wondering where we are going to be when we find out that no one of the States has a problem of its own. Every State seems to get the problem from other States. I wonder if we are going to locate the State that is actually furnishing this rabies. Dr. Anderson, were you starting to say something?

DR. ANDERSON: Yes. Perhaps this story will help to clear up the point. Not too long ago I was privileged to attend a meeting in the southern part of the United States where I presented a paper. The president of the Association lives in the largest State in the Union and, after talking about rabies I turned to him and said, "I don't suppose you have any diseases of this kind in your state," and went on with my speech. When I finished, he complimented me on my paper and added, "And for your information, I want you to know that we have all the diseases in our State that you have in Nebraska, and more of them!"

I'm not going to admit it if we have - but I do want to point out something the doctor was saying a minute ago concerning the origin of rabies. About 6 weeks ago we found our first case of the year in a cat at Spalding, Nebr. With the work we did there we found cases on five other farms, although they were not diagnosed as such; we have reason to believe it was on these five farms that the outbreak started.

The next case reported came from Lyons, Nebr. It was in a 3-month-old calf which had lived in an enclosure all its life with two other calves. There was no chance of dogs or anything else getting in with it.

The third case was that of a cow at Central City, a town in the central part of the State. Another report came from Scottsbluff, in the western part of Nebraska. A report came from Lincoln, in the eastern part of the State, of rabies in a cat. What I am trying to do is connect these cases but it just isn't possible.

Maybe a tourist caused them, but if a tourist got up to Spalding, Nebr., he was lost. So something else scattered the disease.

The case of the dog at Greeley, Nebr., a town near Spalding, was revealing. The owner told us that 3 weeks prior to the time he first noticed the dog acting peculiarly, the animal had been in a fight with a raccoon. Evidently, this is how the dog acquired the disease. Also the game warden tells us that he saw four raccoons rolling around and fighting one another in a pasture in this same area. A raccoon or a skunk roaming around in the daytime must be sick; they just don't roam in the daytime.

We talked with the county sheriff, and he in turn enlisted the help of the marshals and constables in starting a campaign against stray dogs and cats in this area. They have been doing an excellent job. The veterinarians are doing their part. The one at Spalding held a clinic, and on Wednesday following the Monday that I was there, he vaccinated 87 dogs and 10 cats. The following day at Greeley, Nebr., he vaccinated 70 dogs and cats. Most of the rest do not need vaccinating.

If we are going to control this disease I think it should be controlled from a local level, if at all possible, with full cooperation of all interested parties, not only the law enforcement, the Fish and Game Commission, the Public Health Service, and my Department, but also all owners of animals. Definitely we must have the cooperation of these owners if we are to control rabies.

The only reason I am talking now is that an assignment further west makes it impossible for me to be here tomorrow. But I am vitally interested in this, and believe that with the cooperation of all interested parties, and the application of the knowledge we already have and the knowledge we are going to get here today, we will definitely solve the problem of controlling rabies.

DR. BLANKENSHIP: Thank you, Dr. Anderson. Dr. Rogers, was it not you who said that during the depression people did not travel? While you were talking I was reminded of something which may be pertinent. Do those of you who remember the depression also remember the Federal transient program? The Federal government felt sorry for those people who were homeless and were seeking to better themselves financially by moving. As I recall it, the government actually set up transient shelters to which anyone could go who did not belong in the area. I believe that local residents were not eligible to use these shelters. According to Dr. Leake of the Public Health Service, that Federal transient program put a hump in the meningitis curve that has never been equalled since. It probably was the result of the congregate shelter where people were sleeping too close together. I don't know if Dr. Leake has ever published that, but it was his opinion.

We have one State left among those represented here, South Dakota. At this time there is some rabies in wild animals in South Dakota, is there not?

MR. BUELL: There is, particularly in skunks of the eastern part of the State. At its last session, the State Legislature took skunks off the protected list.

DR. GILTNER: Would it be out of place for me to speak about a letter I have received from an old friend in South Dakota?

DR. BLANKENSHIP: I was just going to suggest that those of us who have any information about rabies in South Dakota and in North Dakota should present it now.

DR. GILTNER: About a month or two ago I received a letter from Dr. Weaver requesting information on rabies and asking that we send him literature,

which we did. A couple of weeks ago we got a very nice letter from him in which he reported an outbreak of about 27 cases of rabies. As I recall, most of these were in skunks. Of the 27 cases, 10 or more were in skunks or civet cats. There were only a few cases in dogs, some in cattle and certain other animal. I was impressed by the fact that the dogs were greatly outnumbered by the wildlife, mostly skunks.

DR. BLANKENSHIP: There must be a number of people present who have information on that.

MR. BUELL: I can add a little to it. Both in eastern South Dakota and southeastern North Dakota the papers have had a great deal to say about rabies, particularly about cases that have been reported. I think that some of these cases are not verified, but still they are news stories, and usually refer to a skunk chasing a farmer onto his porch, or some similar occurrence.

In North Dakota Dr. Brandenburg has been very active. The Game Department has opened the season on skunks east of the Missouri River and south of Highway No. 10, which means a line through Fargo, Jamestown, and Bismarck, south. I happen to know of a case a year ago of a horse chasing a boy into a pick-up truck and then proceeded to kick the pick-up to pieces. I do not know whether that case was ever verified as rabies. I read a news item a few days ago of a fox attacking a man in North Dakota.

The North Dakota Game Department has assigned four wardens in the southern tier of counties across the State to report on rabies and to take any action that is deemed necessary in spot areas. The Fish and Wildlife Service has one trapper in the Sargent-Lamoure-Ransom County area who is taking that as a district. There is a question I want to bring up. In rabies control, should there be spot control, county-wide control, or State-wide control of carrier species?

DR. BLANKENSHIP: Mr. Hart, from the telephone calls we have had, and the letters and the conferences that have been held, we know that the people in North Dakota and South Dakota are concerned about their rabies problem. Do you have anything to add to what has been said?

MR. HART: I don't think I have anything to add other than what has already been said, that is, that rabies is on the increase in those areas, and the public seems to be getting more concerned about it all the time. I am sure the people of those two States are interested in what is developed at this particular conference.

DR. BLANKENSHIP: Dr. Holden, do you know any more about it?

DR. HOLDEN: I have received a letter from Dr. Blandenburg in which he reports that the U. S. Fish and Wildlife Service and the State Fish and Game Department were very active in carrying out control procedures in the southern tier of counties in North Dakota. In addition, restrictions on the movement of dogs have been put into effect.

DR. TIERKEL: I have a letter from Dr. Weaver, and it must be the same kind of letter that you received, Dr. Giltner. I will read it for the information of the group here.

"This is to acknowledge, and thank you for, your letter of April 10th which furnished me a lot of information about rabies and its control. We had written because of the problem which has arisen in recent months in South Dakota." And from his first letter it sounded as if it were a problem which had arisen from the wildlife in the area. "I was able to formulate sample ordinances from your information and this is to be used to answer the

many requests that we have received. It is true that we had only two isolated cases of rabies in South Dakota, to my knowledge, previous to 1949. Since January 1, 1951, we have had ten cases in skunks, nine in cattle, three in civet cats, one in a household cat, and four in dogs that have been diagnosed at our own laboratory. I haven't any doubt that there have been numerous cases in skunks about which we have heard nothing. However, veterinarians are very cooperative and have sent every specimen which was under suspicion and came to their attention.

"We have enlisted the cooperation of our State Fish and Game Commission and they now have two game wardens working on the skunk situation. All cases are reported as to name and location to the Livestock Sanitary Board at Pierre, South Dakota. They are in close contact with the Public Health Service which is also at the State Capitol. (I suppose he refers to the State Health Department.) While I cannot promise you as to attendance, I certainly would appreciate being notified as to time and place of your regional meeting. While I have no definite information, I am sure there is more difficulty in both Minnesota and Iowa than there is in South Dakota. Again thanking you for your interest, I remain."

I think that's just about the picture. I think, probably, that Dr. Weaver has a better finger on the situation than anyone else there. Of course, I answered him giving him the information about the conference. I am sorry that he was not able to attend.

DR. BLANKENSHIP: That sums up the 27 cases that Dr. Giltner mentioned.

DR. TIERKEL: Yes, that's the same information. So, just to reiterate, there are 10 cases in skunks and 3 in civet cats, which, of course, may all be grouped as skunks. The 9 in cattle, I am sure, can be attributed to bites from rabid skunks, or we can at least visualize that. One case in a household cat, and 4 cases in dogs represent quite a sizeable problem compared with past experience in South Dakota. And there again we have evidence, apparently, of a westward move of this wildlife rabies center.

DR. BLANKENSHIP: Are there any other questions or comments from the other States? If not, we will proceed to the next subject.

The CDC has made available to us today Dr. Lee, from South Carolina. Dr. Lee is the Public Health Veterinarian of the South Carolina State Board of Health, and he is here as a consultant to the Public Health Service. He was brought here I believe, because of the very intensive and successful rabies campaign he has just conducted in South Carolina. Dr. Lee.

DR. LEE: Before we go into more detail, it might be well for you to be reminded of some pertinent facts about South Carolina. We are bordered on the east by the Atlantic Ocean, on the north by North Carolina, and on the west by Georgia. The ocean is our one natural barrier, we hope. The Savannah river isn't a barrier, as we get rabid dogs from Georgia, and animals with rabies go over from South Carolina into Georgia. We have one big port at Charleston where a pretty good control is maintained over incoming wildlife, snakes, and dogs. Many acres of the State are in hunting preserves and large plantations of northern owners. The southern part of the State is a good farming section. In the Smokey Mountains of the nortwest section there is good fishing, and in the northwest and central sections there are mill districts - mostly rayon and cotton mills.

The State Board of Health consists of the executive committee, the State health officers, and the county health officers. The State is divided into four sanitary districts, and there are four local veterinary associations.

There are some 28 doctors serving 38 countries as full-time public health officers. Some of the smaller counties have no public health officer but have a clinic held by part-time practitioners on a paid basis from the State board of health. Each county has one or more sanitarians. Charleston County has 1 health officer, 1 county veterinarian, and 26 sanitarions. The other counties have one or more sanitarians, one or more nurses, and two or more clerks in an office. I am giving you this break-down to show you the personnel that are involved in a mass inoculation program.

The human population of the State is 2,107,432, and I figure the dog population to be 245,820. There are those who say 250,000 dogs, but we won't quibble over a few thousand dogs down in South Carolina. Everybody in the State has dogs. There are many plantations in the State where cotton, peanuts, and soya beans are grown, with a high population of colored people having large families; and every child has a dog, generally a hound of some kind. That gives you an idea of the break-down on the State, as a State, and the way it is set up into a public health organization.

On June 17, 1950, the General Assembly of South Carolina passed a rabies control act. I am not going to talk much about it. In fact, in writing up the plan for control of the disease, the act was not mentioned. We thought it would probably be best to put the mass vaccination program on a voluntary basis and say nothing about the law. On the first of September I was given the task of eradicating rabies in South Carolina; and I started out to learn the rabies incidence. I found that the only records that had been kept on rabies were the laboratory reports on suspected cases, so I requested the Veterinary Medical Association of South Carolina to have their members send us reports on the number of cases they had seen. These we broke down into two reports, one covering the period from January 1, 1950, to September 1, 1950, and the other from September 1, 1950, to December 31, 1950. They reported 796 clinical cases of animal rabies seen in the State during 1950. When a South Carolina veterinarian tells me he saw a case of rabies, I have no reason to doubt it. He has lived with rabies for 15 years - there is no argument about his diagnostic ability. The number of positive heads that had been received in the State laboratory during the same period was 328. Knowing the policy of the practicing profession of South Carolina veterinarians, you might just as well add the 328 to the 796, and you will get the total of 1,124 rabies cases in 1950. Veterinarians do not send clinical heads to the laboratory.

The gathering of statistical data took from the first of September to the sixteenth of January. I talked at least twice to each sectional veterinary group, a total of 77 practitioners, trying to bring them into the program and keeping them up to date as the plan was being written. It had not become a plan yet, it was only a tentative plan to which had been added notes and suggestions from many people, suggestions which would be incorporated into the plan when it was finally written. On the sixteenth of January I went before the South Carolina veterinarians and explained the plan to them and asked them point-blank, "Will you go along with this 100 percent? Now is the time to say." They voted a resolution and sent it to us in writing that they would go along 100 percent per man on the plan, which they did. And they did a beautiful job.

That started a series of speaking engagements for me in the four sanitary areas in South Carolina: from Charleston, to Myrtle Beach, to Chester, to Saluda. In 6 days I talked to every sanitarian, every county health officer, and a good share of the nurses and clerks in the health

departments in the State. When the plan was written it was submitted to the executive committee of the State Board of Health for approval. Then we really started to work on the publicity. We wrote news releases, radio spot announcements, and all kinds of feature articles. We made a record of everything that happened in the State in connection with a rabies case. We stressed human interest stories such as dogs chasing a fox and then the fox chasing the dogs. We had one story of a little colored boy about 4 years old who was playing out in the yard when an old sick fox, thin, hungry, and full of rabies, came wandering out of the woods. The fox saw this little boy and grabbed his little old blue jeans, the child lost his balance, fell over across the fox and held him down while he yelled for his mother. She came out of the back door, grabbed a hoe, and killed the fox. By testing its head, we proved the fox to be rabied. We had all kinds of funny things to report - if you want to call those things funny. We were really ambitious, starting on a public education program, but I can warn you right now that if you start a large mass vaccination program, and I'm speaking of rabies, the first thing you have to do is to get the public behind you. If you don't have wholehearted public support you might as well save your time. You have to educate the public in order to get people to bring their dogs to the clinics for vaccination.

Everyone on the State Board of Health in South Carolina had something to do with the program. The Executive Committee approved the State rabies plan; the State Health Officer, Dr. Wyman, talked on the radio and before medical groups. Dr. Wyman read five or six papers before medical groups stressing the effect of rabies on the medical profession. We quoted him in news releases, and worked him incessantly on spot announcements. We made wire recordings, and transferred them to records which were sent to the broadcasting stations for publicity concerning the campaign. We sent 20 records on a release date basis to 20 broadcasting companies in the State, reaching out as far as Savannah and Augusta, Ga., and up into Charlotte, N. C. We sent 17 more records out over the State, spot announcements which lasted only 49 seconds, just something about the rabies program to be played four or five times a day.

The Division of Preventable Diseases furnished the veterinarians, processed the necessary supplies, supplied the clerical and stenographic help, and furnished the services of a draftsman for the drawings and charts; and the director of the Division furnished information and kept me busy most of the time. We spent the last 3 weeks before the start of the program spot checking doubtful places and enlisting their support by last-minute conversations.

I think the people who did the grandest job for us were those of the Department of Public Health Education. They assigned to us a feature writer for news releases, radio scripts, and spot announcements. All we did was to give her the technical information and she did an excellent job of writing it up. We had a State photographer who was on the job most of the time looking for dogs to photograph. The Department of Public Health Education has educators throughout the counties whom we used to supply articles to the local newspapers and who in turn, furnished us with news items from the counties, items that we could use on a general State-wide basis. The nurses of the Division of Maternal Child Welfare distributed pamphlets and talked about rabies while they were bathing the children and treating the sores. The Division of Dental Health, which has charge of all publication of pamphlets and printed material, printed 250,000 pamphlets and 3,000 clinic posters announcing clinic locations, times, and dates, and the names of the persons who would accomplish the vaccinating. We indoctrinated the nurses of the Division of Industrial Health with

information on rabies and with the importance of the program; and they passed on this information as they worked in the mills treating the people who had the various occupational diseases that occur in the cotton and rayon mills. The Division of Laboratories did our laboratory analyses and gave us up-to-the-minute news stories as they came into the laboratory. The Bureau of Vital Statistics set up a system of morbidity reporting for us, and furnished us with information from their files on human rabies deaths in the State. The Finance Division paid the bills and handled all the travel money.

Now we get down to the county health organizations, the people who handled most of the operational part of the program. We had 28 doctors covering 38 counties, and part-time practicing physicians who covered the clinics in counties which did not have doctors; we had one sanitarian and at least one nurse in each county. These were the basis of our organization. Each of the 125 county sanitarians located the clinics in his county, spot-checked them on a county map, and sent us a copy. We knew where every clinic was located and we knew where every available veterinarian was going to be in operation. The counties that did not have veterinarians were served by veterinarians from adjoining counties.

The county clinics were set up by the county sanitarian for that county in cooperation with the veterinarians. In most instances they followed our suggestion and used the veterinarians we had tentatively assigned to that county; so the sanitarian and the veterinarian knew where the clinics were and knew what time the veterinarian was to be there. The sanitarian enlisted public interest by talks to the civic organizations, Girl Scouts, Boy Scouts, the PTA, mothers' clubs, and the county agents, and from these sources he was able to get personnel to operate his clinics. Each sanitarian had a "publicity kit" containing news releases, feature articles, spot radio announcements, and similar material, with instructions on when each was to be released. We started 30 days prior to the week of April 16 on the publicity campaign. The first thing that came out in the newspaper under an Associated Press heading was an announcement by the State health officer that a rabies control program was being set up for mass vaccination of all dogs in the State of South Carolina to begin the week of April 16. After a few days we had another such article, and then we provided the newspapers with feature articles. The publicity campaign was scheduled in such a way that by the week before April 16 we had some startling information going into the papers. You could not pick up a paper anywhere in the State without seeing at least one to five articles about rabies. These articles were released under the names of people prominent in the veterinarian profession, or in other walks of life; but they all had been written by the one girl, the feature writer assigned to us by the Department of Public Health Education, who did such a grand job of the publicity. It worked - and public interest grew.

The sanitarian in charge of the clinic enlisted the help of the PTA mothers to write out the inoculation certificates. Since the law provides that only the certificates that were signed by a duly authorized veterinarian would be accepted in lieu of the $1 dog tax, and since we had the only authorized certificates and veterinarians, we got most of the dogs. The dog owner paid the inoculation fee, and then presented the duly authorized certificate to the tax auditor.

Once public interest was aroused in a section of the State, there was plenty of help available. In the mill sections, some of the mill owners would send colored boys to the clinics to help, and those in turn would enlist others on a voluntary basis. The veterinarians worked with a team of from one to

three clerks and several colored boys - usually voluntary help.

The State Division of Preventable Diseases helped get the necessary supplies. We did not know how many dogs we were going to vaccinate, so we had to have a backlog of supplies available at different points in the State. Each veterinarian was supplied with 1,000 doses at the beginning of Rabies Control Week, and before we were through they were asking for more biologics. We had two biologic houses in Columbia, one with a backlog of 50,000 doses, and the other with a backlog of 25,000 doses. In Sumter, S. C., which is a bit further over in the eastern part of the State, we had another backlog of 25,000 doses. In addition to the transportation available in the field, we had standing by three malaria control cars in Columbia to take vaccine to one place, or certificates to another, or to pick up one of the five State veterinarians we had standing by to serve in any of the clinics, if needed. I am glad to say that every veterinarian showed up in every clinic on time except one, and I haven't the heart to ask why he didn't. The North Carolina Veterinary Medical Association sent a letter to the president of the South Carolina Association, after they heard about the program and said that they were standing by to help in any way they could.

I have given you the break-down of what it takes to put such a program across. We flooded the mails for at least 15 days with pamphlets; we distributed books of certificates (2,670 books of 50 certificates each); we sent out 506 news releases, feature articles and announcements, pertiment information about rabies, and articles and stories about Dr. Rogers, President of the South Carolina Veterinary Medical Association, all written by our journalist. We had 92 radio scripts, and 60 spot announcements on records. In fact, we had very good coverage. The results? As yet we don't know what they are, but we have some idea. One of the best results was public education and a public demand, which is being felt right now in South Carolina, that the Board of Health set up more clinics. And the county sanitarians are setting up clinics, two and three a week, in the various parts of the State where the residents didn't get an opportunity to have their dogs vaccinated. The number of dogs vaccinated during the 1 week in 1,009 clinics was around 76,000, and I know of 12,000 more that were not included in this figure. Some of the county reports show that about 47 percent of the veterinarians are vaccinating about 100 dogs a week in their hospitals. If we have 50 veterinarians vaccinating 100 dogs a week, I'm satisfied - they will keep it up. We are going to let the people alone out in the counties. We know they are holding clinics, and we know that people are bringing in the dogs. We have had inquiries on how much it costs to hire a control officer to be paid out of county funds, and the cost of housing dogs after they are picked up. Interest is aroused, and we expect more inquiries from different counties. Maybe in a year, 18 months, or 2 years, we will have control officers in each county, we will have a dog pound in which to keep dogs, and we will have most of the dogs vaccinated. I can look with a great deal of satisfaction at the progress we have made, but I did not do it. The counties did it. I think I can say that by the middle of June we will have more than 100,000 dogs vaccinated. We have discovered that we have a very workable State organization; we have discovered that we have brought together a veterinary profession in the State of South Carolina and a State board of health. The personnel now know each other and know that they can call on each other for mutual assistance. We could use the organization we have for any type of emergency program. Our reporting system is not perfect yet; the unit assembling vital statistics has not received the reporting cards from New York, but the substitute, a plain penny post card mimeographed on the back, is being returned to my office reporting to us the number

of clinical cases seen during a certain period, the number of dogs vaccinated, and other pertinent information. This information comes in every week. I am not going to say what our final results will be, but I do know that we have our reporting system started and that we have educated at least half of the people of South Carolina about rabies.

The foxes are helping us out in one way or another. We have had two bad fox outbreaks. I was rather interested to learn what the Wildlife Service would tell me to do about fox rabies, information resulting from a Federal program. We already have one county quarantined, with 22 cases verified by positive heads, and all from an area right below Columbia. We thought we had a natural barrier in the Cooper River and the Cooper Dam. We now have six positive fox heads and three positive dog heads in Sumter County. We thought once that perhaps the disease was coming from Florence County but now we feel that it is coming from Orangeburg County. We now have a bounty program established in that county. The delegation from Orangeburg County set up the bounty system in such a way that the bounties are paid by the county health officer; therefore he knows how many foxes are being taken and the incidence of rabies among them. He pays the $3, and gives us our statistics right from the source. What will happen to our fox outbreak remains to be seen.

Personally, I am not satisfied that control programs put on by individual States are the best way to handle the rabies problem. I think a control program should be instituted covering a section of the United States. It is just as easy to carry out a big program as a small one, and it will go over a lot better. If you can keep the workers happy, satisfied with what they are doing, and proud of the job, you will have a successful program no matter how big it gets. I would recommend that only members of the veterinary medical profession perform the actual vaccinations so that they can observe any postvaccinal sequelae that might develop. The profession knows rabies, they know rabies symptoms, and they know how to control rabies. I'll venture to say that any one of the veterinarians in South Carolina could go in and do the same thing we have done because he has worked at it.

I would be very much amiss if I did not pay tribute to everyone in the State of South Carolina who worked on this program. Starting with the Executive Committee of the State Board of Health, which went all out, and the State Public Health Officer, who has approved all of the recommendations we suggested to him, I want to pay tribute to all of the people of all of the Divisions of the State Health Department. They talked rabies around the State House, they talked rabies everywhere they went - everybody talked rabies. The nurses, going through the counties and into the mills, talked rabies and distributed pamphlets. And last but not least, the people in the counties who actually did the work did a beautiful job. They worked night and day. We had 2 days of rain, the first 2 days of the program which ran only 6 days. After 6 days, they were absolutely on their own, as far as clinics were concerned. And the clinics are still going on. I hope some day to report to you exactly what has happened.

DR. ASHCRAFT: We have a question. How did you arrive at your dog census?

DR. LEE: I conferred with Dr. Steele, Dr. Tierkel, Dr. Starr, and Mr. Lewis, in Atlanta, and they suggested that we take the figures of 10 men to 1 dog in the rural areas, and 7 men to 1 dog in the city areas. I went back home and checked against the 1950 census by counties in South Carolina, and arrived at 245,820 as the dog population for the State. The AVMA says there are 250,000 dogs, and Gaines Dog Food Company says 250,000 dogs. But the exact number of dogs in South Carolina isn't important as long as the people in the State are

alerted to the dangers of rabies and are working to control it.

DR. BLANKENSHIP: Are there any questions? I want to ask a couple myself if there are no others. I received the impression that you were glad you got the rabies control law, but I believe you said that you referred to it only one time. One question is: Could you have put on this campaign without the law? And the second question is: Is it true that everybody worked on this program regardless of whether he was paid under a county appropriation, State appropriation, general health service funds, V.D., T.B., MCH, or Industrial Hygiene funds?

DR. LEE: The finances of this program have never come up as a question. I could not tell you actually how much money was spent and what it was spent for. The only voucher I signed for a rabies control program expense was one for $1,000 for 250,000 of the pamphlets we circulated. I have not said anything about the 3,000 clinic cards announcing the clinics. They were big posters which were sent to the sanitarians to mark the location of their clinics for the benefit of the public. The paper for them was supplied by the State Board of Health, and the printing was done by the State Board of Health printer.

If I wanted any supplies - and we used very little that had to be purchased outside - we put in a requisition for it and it was bought through the Finance Division. The only voucher I know of that was signed on the rabies program was the one sent to pay for those rabies pamphlets. The people who worked on this project were all being paid out of State funds, or some Federal funds, but the money question was never raised. Nobody thought about money. I did not mention it. The veterinarians furnished their own vaccine. They get the $1 back and they furnished the tag. We furnished the certificate. The certificates would have had to be printed by the State to comply with the State law. Time was donated by the public. I do not know how many people throughout the State lent assistance - how many PTA people, Boy Scouts, Girl Scouts, and other outsiders were involved. After the program is completed and all the dogs have been vaccinated in the State of South Carolina, I am going to ask the sanitarians to write a running account of what has happened, and from that I will learn a lot more than I know now.

I said that I mentioned the law once in the plan - I did. It comes under the heading of the follow-up program. The plan, as written and approved, first states the objectives - what we were trying to do and the reason for the plan - then goes on to the procedures needed to accomplish the objectives, and finally outlines the follow-up program. We say in the plan that the follow-up program "should continue use of clinics and quarantine for those areas which do not show a marked decrease in the number of cases of rabies." Now remember, this is a follow-up program. It has nothing to do with the program of April 16. The second paragraph says: "invoke the processes of law as legally required in rabies control act passed by the South Carolina General Assembly June 16, 1950, in those areas wherein the public response is lacking." In other words, if a county falls down, go in and find the rabies cases, quarantine them, and enforce the law.

DR. BLANKENSHIP: So you could have put on the program without this law.

DR. LEE: We could have put on the program without the law.

DR. BLANKENSHIP: I want to make that point clear. Up in this part of the country, as well as in some other sections, we sometimes tend to sit back and say that if we could just get a big appropriation for it, we could do the task. I think Dr. Lee did it without legislation or big appropriations.

DR. LEE: Maybe you lost track of something I said at the start. I said that the law was no better than the control which you have, and we knew when we started that we had no control; we had absolutely no control. We had to depend on building up public information, and getting the public to want control. We apparently have succeeded in doing this, because the public still is demanding clinics. That is the best part of the program, as far as I am concerned. I don't care how many dogs are vaccinated, as long as we can keep rabies on the minds of the people and keep them wanting their dogs vaccinated. They must be willing to keep the clinics up on their own accord for a reasonable length of time, and this I think they will do. If they are interested enough, and they are asking the State to put on more clinics, they are interested in doing almost anything you recommend for the control of dogs.

DR. HOLDEN: Did you suggest any lower age limit for the vaccination of dogs?

DR. LEE: Yes, if I owned a litter of pups I would vaccinate them when they were about a month old.

DR. HOLDEN: I mean, when the questions came up - my dog is a 2-month-old, or my dog is 3 months old.

DR. LEE: We vaccinate them. All the people had to do was to bring the dog - we didn't care how old he was. We even vaccinated a goat, two spotted ponies, and various other animals.

DR. HOLDEN: Do you know how many dogs were vaccinated in previous years?

DR. LEE: In the year 1950 there were 51,193 dogs vaccinated.

DR. ASHCRAFT: In those cases where you recommended vaccination at 1 month, do you recommend a revaccination, and if so, at what time?

DR. LEE: If you were in South Carolina, I would vaccinate your dog when he was 1 month old, again when he was 4 months old, and again when he was 6 months old.

DR. ASHCRAFT: Approximately 90 days, then.

DR. LEE: That's right.

DR. ASHCRAFT: Then after 6 months old, once each year.

DR. LEE: It's too bad we can't use the Army system of three injections. We didn't know what rabies was in the Army. Of course we had people under control, too.

DR. BLANKENSHIP: Those of us in the Public Health Service are very proud of Dr. Lee and the fine work he is doing. As a matter of fact, we have to admit that he has not been with us too long.

MR. HART: I would like to inject a thought here, if I may. I think Colonel Lee was quite fortunate in having a very highly developed organization in South Carolina with which to work. I am sure that many of the States up in this area are not as fortunate in having health services developed to the point that they have them in South Carolina. In casting around for some organization whose resources might be utilized in such an endeavor as this, the thought came to my mind that perhaps when the Civil Defense organization has become a little better developed, we might be able to get them interested in this type of project. It would help them to keep their organization alive, and would enable them to do something that would be of benefit to the community and to the State. I would like to ask Colonel Lee what he thinks about that type of organization for doing something similar to what he did in South Carolina.

DR. LEE: Well, I think you can take any program, whether it is for the control of rabies or of any other disease, and put it under the same organization. Mr. Hart, you are absolutely right. I was just as lucky as could be

to have a State health department set up as it is in South Carolina. They have a beautiful set-up. The sanitarians in the counties know the country people, they know the roads, they know the area. If you want to get something done there, all you need do is to go to one of these sanitarians. For example let's go down to Beaufort County which has some of the most beautiful swamps and islands you ever saw, and say to the sanitarian, "I've go to go over there to Adesto Island." You do not know how to get there; but he will take you down to the wharf, get a boat, and take you there. He knows everybody on the island. These people have been down there and have been on the job quite some time. They know the people.

As to Civil Defense - where could you get a better group? What is Civil Defense? It is designed to protect the population in your State.

DR. BLANKENSHIP: Are there any other questions? We now come to that period in which we select a permanent chairman. I will act as chairman and will entertain nominations from the floor for chairman of this particular group.

MR. HART: In deference to the State of Nebraska being the host State for this particular meeting, and in tribute to their genial health officer, I would like to place in nomination the name of Dr. Rogers as the permanent chairman for this meeting.

AUDIENCE: Second.

DR. TIERKEL: I move that the nominations be closed.

DR. ROGERS: Gentlemen, out of deference to my position as really being Acting Director of Health, I'd like to decline. Actually, I'm Director of the Tuberculosis Control Division of the State Health Department.

DR. BLANKENSHIP: We have a motion before the house that nominations be closed. All in favor make it known by the usual sign of "Aye." I believe I heard that I am to cast an unanimous ballot for you, Dr. Rogers. You are hereby elected as permanent chairman. Meeting is now adjourned. We will be back here in the morning at 9:00 o'clock.

SECOND SESSION

Dr. E. A. Rogers, Permanent Chairman

DR. ROGERS: What is your pleasure on the matter of limiting our panel discussions this morning? I see that item 2 on the agenda is "Organization of Panels." Does anyone have any suggestions on organizing our panels?

DR. TIERKEL: I think we ought to hear from North Dakota.

DR. ROGERS: All right. Before we get into our panel discussion, let's see what North Dakota can add to the discussion that we carried on yesterday. For the benefit of our North Dakota representatives, yesterday we finished the consolidated reports from each State in the order listed on the first page of our program here. Mr. Lobb is the representative for North Dakota.

MR. LOBB: In North Dakota, the U. S. Fish and Wildlife Service Predatory Control Division, the State Livestock Sanitary Board, and the State Department of Health are aware of the rabies problem. Right now in the southeastern corner of the State a program to eradicate skunks is being carried out by the U. S. Fish and Wildlife Service Predatory Control Division.

The question with which we are concerned at the present is this: "Does rabies in North Dakota constitute a serious public health problem since rabies in humans has never been demonstrated in our State?" We have come here seeking an answer.

DR. TIERKEL: Who is carrying out the control program on skunks?

MR. LOBB: The representative of the U. S. Fish and Wildlife Service Predatory Control Division in our State, and his fieldmen.

DR. TIERKEL: Trapping?

MR. LOBB: Some trapping, but mostly through the use of calcium cyanide gas.

DR. ROGERS: Dr. Tierkel, would you care to summarize the remarks of the conference yesterday for the benefit of our North Dakota delegation which is at a disadvantage in not having heard what the problem is in other States. It will be a good method of starting today's panel discussion.

DR. TIERKEL: The Colorado report concerned itself almost entirely with the outbreak which occurred in the city of Denver and the tri-county area, and the excellent control program which was instituted there, about a year ago, wasn't it, Dr. Ashcraft? As a result that area is fairly free of rabies now. There have been one or two sporadic cases elsewhere in the State.

DR. ASHCRAFT: Yes, we have had some other sporadic cases in the State, but nothing of an epizootic nature.

DR. TIERKEL: There the wildlife problem does not seem to be too important. Apparently it is a problem entirely in domestic animals, in dogs and cats.

Iowa, which, I think, we have been forced to consider as the focal point of the skunk rabies problem in this area, had a very excellent report presented by Dr. Hendricks, and an auxiliary report on wildlife given by Mr. Speaker. In 1950 there were cases in 164 dogs for the year, 80 in skunks, 64 in cattle, 30 in cats, 9 in foxes, and 14 in other species including hogs, squirrels, ground hogs, rabbits, and others. My impression is that the epizootic which Iowa has been experiencing, particularly in its wild fauna, has spread northward, first of all into southern Minnesota, creating a very real problem there. It seems to have gone westward as well as into the Dakotas and Nebraska.

The report from Minnesota was presented by Dr. Jenkins who told us about the 1949 picture in which rabies in two cats and a civet cat were reported in that area for the first time in many years. Minnesota had also been one of the rabies-free areas. But in the southern part of the State these first cases appeared in 1948 and were diagnosed, I believe, at the Veterinary Diagnostic Laboratory at the University of Minnesota. Then in 1949 they had a case in a cow, three more in domestic cats, and two in skunks. Apparently the disease was moving into the wildlife of that area. This year so far, Minnesota has a sizeable problem. Not only is rabies present in the skunks, and in civet cats which for our purposes we might call skunks, but also in quite a few cattle that have developed the disease, probably as the result of bites by rabid skunks. The disease has spilled over to some extent into the domestic dog population. Nine cases of canine rabies have been reported so far this year.

Missouri reported a fairly substantial level of endemicity throughout the State and a very serious epizootic going on currently in the city of St. Louis. It is because of that epizootic that Missouri did not send more representatives. Dr. E. H. Price, who is Public Health Veterinarian for Missouri, is in St. Louis now helping to carry out a control program for that city.

Nebraska formerly has not been plagued with the disease, but now it seems to be appearing at points throughout the State. One of the puzzling parts about the Nebraska story is the fact that rabies is being reported from such widely divergent parts of the State. It is reported from nearly all parts of the State. I do not recall just what the Nebraska representatives said about skunks.

MR. VOSE: No direct information on skunks. They were suspected because of their unnatural daytime activity, but there is no proof.

DR. TIERKEL: Most of the cases have been in domestic farm animals.

MR. VOSE: Cats, dogs, and cattle.

DR. TIERKEL: With some epidemiological evidence that these exposures have taken place from -

MR. VOSE: Skunks and raccoons.

DR. TIERKEL: That about covers the subject, Dr. Rogers, as far as I can recall with the aid of Colonel Lee's notes.

DR. ROGERS: If I were to summarize the reason for the conference in what was brought out yesterday, I would say there is a real increase of rabies in this region, and what is worrying us even more than rabies in domestic animals is that apparently there is an increase in rabies in wildlife - possibly because the wildlife population has increased to abnormal numbers.

ORGANIZATION OF PANELS

DR. ROGERS: Now, let's get back to the item of panel discussion. The first panel is on "Diagnosis and Reporting." Who would like to lead off on this first topic? I turn this over to the laboratorians and the veterinarians, and to others who are qualified to speak on the subject of diagnosis and reporting of rabies.

PANEL ON DIAGNOSIS AND REPORTING

DR. TIERKEL: I can appreciate the fact, Dr. Rogers, that the men who are assembled here, even the veterinarians, come from areas where there has been very little experience with rabies, and I can understand their hesitancy to describe the symptoms of rabies in dogs. I think that many of you veterinarians will be able to remember the classical textbook description of rabies in dogs, and the fact that one of the most characteristic features of the disease in dogs is the fact that there are two types of clinical disease; one is the so-called "furious" type of rabies, and the other is the so-called "dumb", or paralytic, type of rabies.

First we will consider briefly the furious type of rabies in which the dog, in the early symptoms of the disease, may undergo some very subtle changes in personality. These may actually escape the notice of the owner unless he is a person who watches his animal very closely and knows him well. The dog actually becomes more affectionate than usual, in the early stages of the disease. Then, as the disease progresses, within the next day or so, possibly it will be noticed that the animal becomes hyperexcitable, hyperesthetic. Just touching the animal will make him jump and any loud noise like the slamming of a door or the dropping of a book will just about scare him out of his wits. He may show a little lethargy in the early stages; he may hide under the chairs and under the bed, and stay out of the way. As the disease progresses he develops photophobia. Light seems to bother him; he wants to keep away from everyone. Then he becomes more and more restless; he does not want to be confined at all. He seeks large rooms, and will leave the house entirely. By the third or fourth day, sometime the fifth day, in furious rabies, he will leave the household completely and "hit the road," wandering more or less aimlessly in one direction or the other, very rarely deviating from a straight-line path.

This is the stage in which he becomes more and more furious. He will begin to snap and bite at various things that go by - at flies, at chickens, or at anything that happens to be around. As he progresses along the countryside he may bite at inanimate objects if they happen to come in his way. He will bite at automobile tires and fence posts. His travels may vary, he may go on and on and not come back, or he may circle around and come back to the house. He stops eating and becomes weaker and weaker as the hours and the days wear on. Shortly after these furious symptoms begin to diminish, he begins to develop paralytic symptoms. His hind legs become weaker and weaker. Dysphagia will overtake him because of the paralysis of the muscles of deglutition. There may be paralysis of the jaw at that point, and he will not be able to close his mouth. The paralysis soon affects all of his locomotor

functions and he falls prostrate. He may be in that position for about a day or two until the paralysis reaches his vital centers and he finally expires. I might add that the furious type of rabies may last as long as 8 days from the beginning of the symptoms.

With regard to the dumb or paralytic type of rabies: the only real difference between it and the furious type is that the period of hyper-excitability and viciousness is completely deleted. In other words, the dog may have the change of personality; be sleepy and melancholy; hide under desks, tables, and beds; and the disease will completely overwhelm him within a matter of a few days. Paralysis will immediately begin to overtake the muscles of locomotion and the muscles of deglutition. His jaw will stay open, which is characteristic of dumb rabies, and within a period of 3 to 4 days he will completely succumb to the paralytic syndromes. Large animals usually have the furious type of rabies; cattle and horses show extraordinary, agitating, neurological symptoms when they come down with rabies.

DR. ROGERS: How about cats? Is there any difference in the symptoms that domestic cats have?

DR. TIERKEL: Cats may exhibit either the dumb or the furious type.

DR. ROGERS: How about wildlife rabies? How does it affect the wild animals we have been talking about - skunks, raccoons, foxes, coyotes, and the like?

DR. BLANKENSHIP: I was thinking particularly about the reporting phase of this disease. I was thinking of human beings. When human beings have rabies they usually receive medical attention, are probably diagnosed, and probably reported. Dogs in the cities, it seems to me, among the upper economic classes, come to the attention of veterinarians, are diagnosed, and are probably reported. I doubt if reporting is quite as good for dogs in rural areas. In the case of cattle, certainly if they are worth a lot of money as in the case of blooded stock, they come to the attention of veterinarians and will be diagnosed and reported. When we leave the domestic animal scene and get into wild animals, I wonder.

Dr. Tierkel read us a list of what was reported here yesterday - so many dog cases, so many cattle cases, so many skunks and raccoons. I wonder what proportion of sick raccoons ever come to human attention. I just want to warn the group - let's don't get into the fallacy of adding up so many dogs, so many skunks, and so many civet cats, and so many raccoons. These figures are not comparable since the greatest number of rabid wild animals never are seen by man. I'd like to ask one of the wildlife men what proportions of sick raccoons ever comes to human attention, much less to veterinary attention? What factor can we use in multiplying known numbers of rabid skunks to obtain a logical total? Do we multiply them by 50? Does one sick skunk out of 50 come to human attention? Fifty seems to me like a good figure but maybe it's 100; I don't know. So, if we know that 10 skunks have been called rabid in a particular State, how many do you suppose there really are in the State? It is not the same as saying a certain number of dogs.

DR. LINDUSKA: I think you have certainly called to mind a situation that might be confused by shallow thinking. It is decidedly true that a very small proportion of wild animals suffering from any illness comes to the attention of human beings. But in trying to eliminate one fallacy in thinking you have inserted, or suggested, an even bigger one. Suppose that only 1 of 50 skunks does come to the attention of humans. For any factor by which you

might multiply to obtain the true incidence in wildlife, you also have to determine some similar factor to divide by to indicate that much reduced opportunity that wild animals have for contact with human habitation and domestic life. Certainly in the case of dogs, cats, or other domestic forms, while the incidence might actually be considerably lower than it would be in wildlife, the opportunities for contact with humans and livestock, and the hazard to humans and livestock that are involved, are proportionately far greater than they would be in the case of rabid skunks or rabid coyotes. So I think that, for present purposes at least, it accomplishes little to try to project reported cases into estimates of the actual incidence of the disease in wildlife, because the hazard that exists there, from the standpoint of human and domestic contact, is proportionately far less than in the case of domestic animals.

DR. BELL: Dr. Blankenship, I think that there is also an automatic correction being carried on for this discrepancy. I think if someone happens to see a skunk, sick with any kind of symptoms, he will just automatically think, "Now, what are my chances of seeing a sick skunk? I don't very often see skunks at all. Therefore, there must be a lot of skunks sick because I have seen one, or because I have seen two." Well, perhaps I should speak only for myself that way, because I know that is my tendency when I see a sick animal in the field. Perhaps from experience I know that my chances are slight of seeing a sick animal. So when I do see a sick one, I say to myself that there may be many of them here.

DR. LEE: I had an interesting experience in Orangeburg County, South Carolina, in connection with an outbreak of rabies in foxes. We watched this outbreak build up from one proved head. Three days later we got the second head for testing; 4 days later we got the third head; this continued for about 7 days during which time we had received five positive fox heads, accompanied by all kinds of stories. Concerning the stories - you know our colored people can magnify incidents and really make a good story out of almost anything; so you must discount some of the information you receive from that source.

After quarantining the county and placing a $3 bounty on each fox, everybody who had a shotgun and a dog (and everybody down there has a shotgun and a dog) started out hunting foxes. Colored women and men, professional hunters, some fox hunters - not the hunter that hunts for sport but the fellow that gets out to run his hounds - started out through the swamps and the woods. As a result, we took a spot check on all destroyed foxes and found that 43 percent of the destroyed foxes proved positive for rabies by the heads sent to the laboratory. At the same time, hunters reported that they had seen 17 dead foxes in the woods. (This is the report of three white hunters.)

DR. ROGERS: Well, we are getting a bit afield. We started out to discuss symptoms and diagnosis but have digressed considerably. However we are glad to have these contributions.

DR. TIERKEL: I would like to throw in a suggestion for the consideration of the group at this point. I was wondering if we should consider carrying over our panel discussions into the afternoon session, and make our recommendations dovetail with our panel discussions in both sessions. In other words, after we have aired out some of our differences, and possibly come to some conclusion after the discussions on each of the items, should we consider recommendations after each item? How does the group feel about that?

DR. ROGERS: Any comments from the group?

DR. BLANKENSHIP: I was thinking about the same thing that Dr. Tierkel suggests, but my experience has been that it is extremely difficult for 37 people to write a recommendation. Could I offer, as a counter-suggestion, that Dr. Rogers appoint a committee, perhaps now, of several people representing different fields of interest, and that perhaps at luncheon time they could meet and try to write some conclusions, or recommendations, on which they thought the entire group could agree, and bring them back this afternoon. Does that sound all right? They will have a better chance if the committee is limited to not more than six men, two of whom are phrase makers.

DR. ROGERS: Any other suggestions? Does Dr. Blankenship's proposal meet with your approval? Dr. Blankenship, you had in mind, then, that we would continue with our discussions on the panel subjects in this group, but that the committees would meet at some time prior to our adjournment to formulate their recommendations, based on their own opinions and on the discussions? Does that meet with the approval of the group? I will need a little time to select my committee. I will try to do that during the discussion. Let's continue, then, with the discussion on Diagnosis and Reporting. Mr. Vose, would you care to comment on microscopic examination, animal inoculation, or any other phase of the laboratory diagnosis of rabies?

MR. VOSE: I have no objections to going over the subject in a brief manner. I have the feeling, however, that there are some here who know more than I do about it. From the laboratory point of view, the first problem is to get a good specimen. That is true in all kinds of laboratory work. It is our experience that there are many animals - especially dogs but sometimes cats - suspected of having rabies, which are killed by being shot through the head, thus destroying the brain. Sometime we can pick out a few fragments, but sometimes even that chance is lost. The second hazard in securing a good specimen is the manner in which the head is handled. The question of time and bacterial decomposition also enter in.

Once the laboratory does get a good head, it is a simple job to open the head, either with a saw or a chisel. In our laboratory we get along better with a good wood chisel and a hammer than with anything else. We open the brain and remove Ammon's horn by a longitudinal cut. With a glove on the hand, we make a series of impressions on the slide, or put a little piece of the material on a cork and use the same technique. The slides are immediately stained. In our laboratory, and I think quite generally, Seller's stain is used, which is a modification of the old Van Giesen stain, a mixture of fuchsin and methylene blue. Miscroscopic study follows.

In animal inoculation, at the time of brain dissection a few brain fragments are placed in a neutral glycerin. The fact of neutrality is rather important, in my opinion, because if the glycerin is off in reaction, the virus will not have the chance of surviving. These brain fragments are stored until time to prepare them for animal inoculation. The microscopic study is done first. If Negri bodies are found, that completes the diagnosis. If they are not found, animal inoculation is made. In preparing the tissue for that purpose, it is ground in sterile sand, using mortar and pestle, as a rule, and a suspension is made. We have been inoculating four to six mice intracerebrally, keeping them until 20 days before they are called negative; usually, of course, positives will show up within 6 days. In the past year we have used other animals, but the mouse seems to be best for our purposes. The mice are white Swiss mice, but I am not sure about the particular strain.

Those we have come from the Carworth Farms - that's a New York farm that makes a specialty of animals for various laboratory purposes - and that, presumably, is a strain that works out quite well for this particular job.

I believe that briefly covers the laboratory story.

DR. ROGERS: Does anyone else have any comments?

DR. GILTNER: We have found that it is a very good idea to make histopathological examinations of the brains of animals that come in. In that way we get a better picture, probably, of the anatomic changes in the brain than by impression specimens such as you mentioned. This is particularly true in the case of the horse. During the epizootic period of encephalomyelitis we get specimens that come from different parts of the country and we fail, very often, to find virus. But on histopathological examination we do find an encephalitis and in a number of cases we find true rabies, the Negri bodies, that is. In the case of cattle, we encounter rabies, of course, quite frequently. The diagnosis can be made by section preparation but the histopathology often will reveal evidence of another encephalitis, the etiology of which we do not know. In some instances we find the picture of listerellosis. Then if we have saved fresh material, we can not only isolate the causative organism, but also we can see the typical picture of the disease histopathologically. In both the horse and cattle we find cases which are diagnosed as possible rabies but which turn out to be histopathologically, a toxic encephalitis. There is no virus, no evidence of rabies, but, in the case of the horse, a leuko-encephalitis. In other cases, there will be no pathology in the brain, but there will be a cirrhosis of the liver. The common causes are the ingestion of the rattleweed and other plants of that type. Therefore, it is of some importance to go further than the central nervous system in diagnosing these cases. I think that all who have worked with rabies have taken into consideration the other conditions that you may find that are not rabies.

MR. VOSE: I might add that our laboratory is strictly a public health laboratory, and that I am inclined to agree with everything Dr. Giltner has said as being important. But ours - and I know a number of other laboratories of which this is true - has very many jobs to do and very little time in which to do them. We must confine ourselves to the things that we think are most essential for our particular purposes.

In Nebraska there are two laboratories that accept heads. If it is veterinary medicine, if the illness concerns only the horse, the cow, or some other animal - in other words, if humans are not involved - then the veterinary laboratory will take it. We are happy to have them get all they will take, of course. If a human aspect is paramount, if the animal has bitten a human, they give the head to us. I have sometimes been surprised at the variety of animals that bite humans - calves, rabbits, and other animals. It seems that most of them have bitten some human being, at least according to the story, and we get them. On the other hand, if rabies is not found, we cannot attempt a complete diagnosis in veterinary medicine. We realize the importance, especially from that point of view, of more complete work.

DR. TIERKEL: I would like to add just a few words here in regard to diagnosis. I think Mr. Vose has a good point, and Dr. Giltner certainly has, too. We veterinarians in the Public Health Service who are assigned to rabies and its control, found, when we went into it, that throughout the country diagnosis was probably one of the weakest points in the control program. Our primary task at the laboratory at Montgomery, Ala., was to do methodology research in

diagnostic techniques. We felt that we should find the simplest, easiest, cheapest, and most accurate way of diagnosing rabies. Of course there have been many, many different techniques used with varying degrees of success in many laboratories throughout the country. But we felt that a certain amount of standardization should be established on the basis of some of the survey work which we undertook. One of the things which we undertook was to evaluate the matter of doing simple tissue applications as compared to the much more cumbersome technique of going through histopathological sections. We found in surveying our own laboratory and various others, particularly in the Southern States, that there was less than 1 percent difference, with regard to accuracy, in the results that we got comparing one method with the other.

Therefore, although it is nicer to get a histopathological section where you get a beautiful picture, as Dr. Giltner points out, we feel that, for all practical purposes, in public health diagnostic laboratories the simple tissue application method is far more practical and is just as accurate. It is much easier, much quicker, and is a method which a technician can easily be trained to do. I want to point out the importance of following up with animal inoculation in all of these cases, because a substantial number of surveys which were done throughout the country have pointed out consistently that we do miss from 10 to 15 percent of the positive rabies cases by microscopic examination alone. That is, 10 to 15 percent of the cases which are negative on microscopic examination prove to be positive on subsequent animal inoculation. I think this is a very important point. The animal inoculation test not only aids the physician who is handling the exposure case to decide on the advisability of human antirabic treatment, but it also lends to rabies control the important measurement of the problem. We do not know the size of the problem unless we get good laboratory diagnosis, and one of the shortcomings of many of the laboratories in the country is that they have not yet instituted the mouse inoculation test. It is quite simple, it is inexpensive, and it is easily carried out. Within a period of 5 to 6 days positive symptoms will begin to show in most strains of susceptible mice. Mr. Vose talked about the Swiss mice from Carworth. You may take any of the breeds which have been coming out of the commercial houses and get consistent results with them.

With regard to the tissue application techniques: there are three accepted methods, as we see it, that work very well. One is the simple impression method; another is the smear method in which we place a piece of the tissue on one slide and slide it across another slide in much the same manner as a malaria blood smear is made; and the other is the so-called rolling technique, which was developed by Dr. Damon, in which a piece of tissue is rolled gently over the slide, getting a certain amount of tissue to adhere to the slide. This material, when subjected to Sellers' stain, gives us best results.

We have found that the best stain to use is Sellers' stain. It is easy to keep, readily prepared, and requires no preliminary fixation. Using it is merely a matter of completely dousing the slide with the working stain, and it gives you a very clear differentiation of color with regard to all the tissure elements with which we are concerned. A Negri body cannot be confused with the red blood cell, because with Sellers' stain it shows a characteristic heliotrope or magenta pinkish purple color. The red blood cell

takes the copper or brickish color. The neuron itself takes a light color. The nucleus of the neuron takes a darker blue color. If present, one can always see the characteristic interstaining granules of the Negri body which appear dark blue or black with Sellers' stain.

DR. HOLDEN: In any discussion on the symptomatology of rabies, I like to recall a couple of observations made by Dr. Leisure, Dean of the Veterinary School of Kansas State College. One of these observations is that the only typical feature of rabies in animals is that all cases are different; and another is that the odor of skunk about a dog dying of symptoms suggestive of rabies is almost as diagnostic as the demonstration of Negri bodies in brain smears.

DR ROGERS: Does anyone have any questions he would like to address to the speaker?

MR. BUELL: What danger is there, if any, of pelting an animal which has died of rabies?

DR. TIERKEL: As far as we know, the only way you can get rabies is to have a wound inflicted somewhere on your body and have the rabid saliva enter the wound. Simple pelting, I am sure, can be done safely, but of course we do have those rare occasions where people do come down with bizarre types of exposure. Many of them are very often questioned. I think it is possible for a person to be bitten by a rabid animal, forget the incident, and then go on pelting an animal, perhaps several weeks later, and blame contraction of the disease on the pelting rather than on the fact that he was bitten several weeks before. That has been our experience in tracking down many of the supposedly bizarre exposures. Now, in posting an animal it is quite a different story. If you actually open the animal, it is possible to find the virus in certain other parts of the body, as we have found in virus distribution studies. We have found, on rare occasions, virus in the adrenal glands, in the kidneys, and in the mammary tissue. However, the virus in these places is usually quite dilute and there is generally no virus multiplication in these tissues. The important places to beware of are the brain, the saliva, and the salivary glands.

MR. BUELL: Then feeding on an animal which has died of the disease might be dangerous. If a cow were to die up in the sand hills and a coyote fed on it, would the coyote pick up the infection?

DR. TIERKEL: The chances are that he would not. Ingestion studies, which Dr. Giltner might be able to tell us about, were carried on by Dr. Schoening and his group at Beltville some years ago. They tried to infect laboratory animals, I understand, by feeding infected milk and other types of infected food. The results were always consistently negative. As far as we know, we cannot get the infection by ingestion, provided there are no frank abrasions in the mucosa of the gastrointestinal tract.

MR. BUELL: Does rabies ever show up in fowl?

DR. TIERKEL: Yes, it does. It shows up in domestic fowl occasionally. However, there have not been instances of transmission by fowl.

MR. HART: I would like to ask this question. In some of these States where rabies has not been present for some time, there may exist a need for training of technicians in laboratory procedures. Are facilities now available where these people could go for a refresher course in the diagnosis of rabies?

DR. TIERKEL: The Communicable Disease Center of the Public Health

Service offers a refresher course in the laboratory diagnosis of rabies twice a year, once in the spring and once in the fall. We have just completed one course at our Montgomery, Ala., laboratories. The next course will be given in October. Then, upon request, we have gone into the field in those States which have enough students in their various branch laboratories, and have conducted a field course in a veterinary school or medical school or in the State health department laboratory. The course is 1 week in duration, that is, 5 days, and consideration is given to all of the aspects of rabies and its diagnosis. There are lectures and demonstrations, and each student has the opportunity to carry out recommended procedures.

DR. LEE: We have had presented here histories on some of the large-animal cases, and I notice from Dr. Giltner's report that there are many cattle involved. The veterinarians in South Carolina receive many calls about cows with choke. Usually, in such a case someone on the farm would stick his hand in the cow's mouth. But many of these cases were rabies, and now you cannot get a veterinarian in South Carolina to put his hand in a cow's mouth. When a cow is choked, the veterinarian looks first for rabies and second for choke. The same precaution is observed when a dog is brought into a veterinary hospital with a history of a bone in his throat. The veterinarian does not go prodding around to see whether there actually is a bone in the animal's throat. He first thinks of rabies and second of a bone.

DR. BREED: In what percent of those animals that were supposed to have been choked has rabies actually been found?

DR. LEE: I do not believe I can answer that as to animals. Are you talking about large animals?

DR. BREED: Yes, cattle.

DR. LEE: About the only cases we hear about are the ones that die after reported choke, and when the head is sent to the laboratory we find positive rabies. So I cannot tell you what percent of those reported as choke would have been an honest choke and not rabies.

DR. BREED: The reason I asked the question is that I have seen rabies in cattle in the Midwest off and on for a few years, and invariably the type of rabies we encounter is the furious type rather than the dumb type. You do not have much question left in your mind regarding those animals that show the furious type of rabies.

DR. LEE: We have a lot of farm mules down on the cotton and peanut plantations of South Carolina, and our experience has been that the mule with rabies invariably develops the furious form of the disease. In cattle we see the dumb form which invariably comes in with a history of having been reported to the veterinarian as a case of choke.

DR. ROGERS: At this time I would like to tell you whom I have selected as the committee to formulate the recommendations so that they may be paying particular attention to the remarks in the conference. I am going to ask Dr. Tierkel, representing the U. S. Public Health Service, to act as chairman; with Mr. Vose, representing the laboratories; Dr. Giltner, representing the Bureau of Animal Industry; Dr. Hendricks, representing the State Public Health Veterinarians; Dr. Riemenschneider, representing the State veterinarians; Mr. Erickson, representing the State wildlife service; and Dr. Linduska, representing the U. S. Fish and Wildlife Service.

I think we have pretty well covered the subject of symptomatology and laboratory diagnosis. We are ready to go on to the next topic - unless someone has another contribution.

DR. ASHCRAFT: I was wondering if we should discuss dog bite reporting and quarantine under this.

DR. ROGERS: That is what we were going to take up next. It would logically follow as the next item of discussion. We have on our list of subjects for panel discussion the designating of the agency at the State level for dog bite reporting. If you want to discuss dog bite reporting, it would come under this topic.

DR. ASHCRAFT: Our particular problem relates to the reporting of dog bites and the subsequent quarantining and examination of the dog or other animal that has inflicted the bite. At the present time bites are reported to the police department by the people. The police department is supposed to find out the name of the person bitten, the area of the body where the bite was inflicted, the description of the dog, the name of the owner of the dog, and whether or not the dog was vaccinated. This is the information we desire but it is not always the information we get. Any dog that has bitten a human but apparently is normal at the time of this investigation by the police department is house-quarantined for a period of 14 days. The owner, of course, is privileged to take the dog to his private veterinarian or to a kennel for that quarantine period. At the end of the period, the condition of the dog is checked by telephone, and in certain cases, personally, by the veterinarian in the health department.

The procedure we have followed in quarantining dogs involved in face bites has been changed since we recently have become alarmed over the number of reported face bites. We are insisting now that in cases of face bite the dog either be impounded or be quarantined in a veterinary hospital. That is something else on which I would like the opinion of this group. As I said before, except in the case of face bite the dogs are quarantined at home. In such cases the method of reporting is not particularly satisfactory to us. The report is made to our Communicable Disease Division and the quarantine list is then transmitted to the veterinary section for investigational purposes. We then cooperate with the physician who has treated the person. The Communicable Disease Division makes sure that the person has seen a physician. He may go to his own physician or, in emergency, may get his treatment at the Denver General Hospital. We try to see that they do get medical attention in all cases. I do not think the method we are following is the best one, and I would certainly like to get suggestions from the rest of you on improving it.

DR. ROGERS: It seems to me that there are several phases of the problem. First, what do we want to report; second, how are we going to make the report; and third, who gets the reports? The Public Health Service wants a report from the State health department, and the State health department must get the information from the local health department. So it comes right down to the problem Dr. Ashcraft has just stated: What kind of a report should we require, and how is the best way of getting an accurate report? We are open to suggestions.

DR. LEE: I am not going to say this is the best method, but it is the method that was incorporated in the rabies control act of South Carolina which was passed in June 1950. I will read from Section 7. "Every physician, after his first professional attendance upon a person bitten by a dog, cat or other animal shall, within 12 hours, report to the county health department the name, age, sex, color, and the precise location of the person so

bitten." May I add here that the State of South Carolina furnishes the antirabic vaccine free of charge, so there is no trouble in securing a report on that. "When no physician attends, the parents or guardian of every child so bitten shall, within 12 hours after first having knowledge that the child was so bitten, make like report to the county health department. When no physician attends, an adult so bitten, or the person caring for him, shall make like report to the county health department." So you see that the county health department is the first to receive a report by a physician or anyone having knowledge of a person bitten by a suspected rabid animal.

Under Section 13, which follows through on the transmission of the report from the county to the State level, "The county health department shall furnish information to the State Board of Health concerning all cases of rabies and the prevalence of rabies within such county, and shall make a monthly report showing the number of dogs inoculated, fees and penalties collected, and the number of cases of rabies occurring in such county." We have gone a little bit further than that since this law was written, and are establishing a morbidity report that comes through the Bureau of Vital Statistics. They have used this report in malaria, typhus, and communicable disease control. We are copying the same thing, having cards printed. We will have our morbidity reports originating from the practicing veterinarians in the State. They are the people who see most of the rabies in South Carolina. These reports, as well as a copy of the vaccination certificate, come from the veterinarians, the original going to the owner of the animal involved, the second copy going to the health department of the county in which the dog was located, and the third copy being retained for the veterinarian's records. Therefore, we have two offices of record on the dog. One is the office of the veterinarian who does the inoculation, and the other is the office of the county health officer. Every 30 days the county health officer, in turn, sends in a consolidated report to the Bureau of Vital Statistics, and as it works down there everything affecting the veterinary section is sent immediately to our office, so that we get the information in a matter of days after the report is received.

DR. ROGERS: I have a couple of questions to ask: First, do the veterinarians report clinical rabies, or only confirmed cases of rabies? And second, except for necessary arrangements for the giving out of antirabic vaccines, in those States and local health departments that give it out free of charge, is there any object in reporting dog bites that you do not know are from a rabid dog?

DR. ASHCRAFT: There is a reason for reporting dog bites other than from a known rabid dog. The dog may not be rabid at the time it bites but it may become rabid later. Most of our rabid dogs were picked up under the quarantine law of dog bite victims. Many of our dogs that subsequently came down with rabies were quarantined after biting, and after the bite has been reported. They were quarantined at home and became ill; the things that we had told the people to watch for had happened. We picked up these dogs and took them to the pound where they subsequently died, and rabies was confirmed. For that reason we feel that the dog bite reporting is important - especially in cases of face bites.

DR. ROGERS: What is your local program?

DR. ASHCRAFT: That is the local program.

DR. ROGERS: Does you State Health Department require that the dog bites be reported at the State level?

DR. ASHCRAFT: I do not know. Do you know, Dr. Riemenschneider?

DR. RIEMENSCHNEIDER: I know of no such requirement with regard to our State Health Department, but I'm not connected with it. And I am not acquainted with their system of reporting these bites.

DR. TIERKEL: As Dr. Ashcraft has pointed out, the reporting of dog bites is important at the local level. There is no real value in submitting this information any farther up the line. It is quite important to discover the possibilities of human exposure, and that is one mechanism for doing so. Dr. Ashcraft's use of the term quarantine, I am sure, refers to the fact that the dog is picked up and put under observation for a period of from 10 to 14 days, to find out whether he was infectious at the time he bit. It has been our experience that if the dog does not show any symptoms within that period of observation, chances are that he was not infectious during the time of the bite, and if antirabic treatment was instituted, it may be stopped at that point. I think that is the mechanism by which most local jurisdictions operate.

DR. ROGERS: It is a valuable procedure in a local control program, certainly.

DR. LEE: I would like to answer the first of your questions. You asked whether clinical cases are reported. They are reported in South Carolina. How are you going to run a control program unless you know the number of clinical cases? You have to know what you have in the State, or county, or section, or in whatever area you are trying to control rabies. Dr. Tierkel, were you talking about State or county level in regard to "local level"?

DR. TIERKEL: I was talking about dog bites only, not about rabies cases.

DR. LEE: Well, even dog bites should be reported to the State, I think. We would like to know what happens to every dog, every child and every adult in the State who has been involved in an incident of dog bite. In South Carolina the practicing veterinarians report clinical cases weekly. All of which points back to one important thing in the control of rabies - or any other disease: The importance of public education! An educated public will work with the county health officer to supply him information, keeping him cognizant of current events in his county.

DR. HOLDEN: I think there should be no clinical cases of rabies in South Carolina, or any State, that are not confirmed by laboratory diagnosis. I think that with the remarkable cooperation you have had from veterinarians, you could persuade them to submit heads to a laboratory for diagnosis. I certainly think that veterinarians in Midwestern States should be encouraged to submit the heads to laboratories rather than to diagnose cases clinically.

DR. LEE: The reason for accepting clinical diagnoses hinges on the question of labor and the expense involved in getting the head from the point of origin to the State laboratory. There is the charge of $3.55, and the requirement that the head be packed in ice, with an outer sealed container for shipping or for sending by car to the State laboratory, in some cases a distance of from 130 to 140 miles.

We had 796 clinical cases in 1950. In the laboratory we have one senior bacteriologist and one girl. I do not think these two can perform that many tests. We have them working overtime on heads right now. It all

comes back to the economic factor: who will pay for the work? In time, when we get rabies down to a few cases, we can examine all heads. We hope that in the future we will be able to furnish containers, and maybe to pay the express charges on heads that come to the laboratory, but right now we cannot do it.

DR. ROGERS: I am sure that what the Public Health Service would like to have is statistics from the various States that would be comparable. If one State is reporting clinical cases without laboratory confirmation, and another State is reporting only confirmed cases, those statistics are not comparable. We know that at best statistics are inaccurate because of incomplete reporting, and if we add another inaccuracy, they are going to be even less comparable. Would the group like to make any recommendations on how we can make our statistics more comparable? Should there be a separate report of clinical and laboratory confirmed cases? Should we have two entries to report?

DR. MENGES: Unless you have the full support of the practicing veterinarians, you are not going to receive many clinical reports. In Michigan during 1 year (1948) we had only 13 clinical cases reported. That same year we had 294 positive heads. There we investigated all laboratory reports of positive heads, and thus worked backward to obtain clinical history.

DR. BELL: Perhaps there is justification for clinical diagnosis. Dr. Lee said that in South Carolina there is a lot of diagnosing to be done, and there is difficulty in getting the heads to the laboratory. But I think in every case where there is a bite involved, there sould be laboratory confirmation, no matter how much trouble it is, because postvaccinal encephalitis is a very real thing and a very serious thing. I do not think vaccinations should be undertaken lightly. They should be undertaken only where there is confirmation or where there is a time element involved.

DR. LEE: I would like to answer that. We do get confirmation on those clinical cases in which a human has been bitten. But we get many clinical reports where there has been no human exposure. The dog is just brought to a veterinary hospital and the veterinarian diagnoses it as a clinical case of rabies. The first question he asks is, "Has this dog bitten anyone?" If the person who brought the dog to the veterinarian says "No," that is as far as it goes. He does question to be sure that there is no human involved. But, if someone has been bitten, or is suspected of having been exposed, the head is sent in. Often we find that the veterinarian bears the expense of sending the head to the laboratory.

I was sitting in a veterinary hospital the other day when a little girl about 7 years old came in with her father. She had a 3-month-old pup in her arms as she walked through the reception room. Dr. McDaniel and I were sitting in the reception room, and I said to him, "Do you see what I see?" And he said, "Yes" and everyone became very quiet. There were half a dozen people in the waiting room when the veterinarian walked over to this dog and gingerly took him, walked through a door, opened a steel cage, and put him down. Then he caught his breath and said, "A case of rabies."

At another place there were about 15 people with dogs in a waiting room when a child came through a back door into the veterinary hospital leading a dog by a string. The dog was a definite case of rabies. The veterinarian happened to look around just as his own wife walked toward this child. The veterinarian said to her, "Honey, I'll get him." He walked over, quietly took the string, and walked the dog into a cage. This was an active

case of rabies being brought right in, and you could have stampeded those people just by saying, "There's a case of rabies." It's serious with us.

DR. ROGERS: What are we to do at the State level?

DR. TIERKEL: Not being at the State level, I do not know. I am here to find out what you folks want. The question has come up many times: Shall we include the reports of clinical rabies in the official statistics which go in at the State level and ultimately the national level to be redistributed? Or shall we consider only those cases which are diagnosed by laboratory methods? I have no opinion on it one way or the other. I have heard arguments on each side. The best argument for laboratory diagnosis is the one which Dr. Holden implied, that if we insist upon everyone sending his material to the laboratory, we will have a more accurate report. On the other hand, we are faced with the very real difficulty of the transportation of specimens from the point of origin to the diagnostic laboratory.

I think there is no question in anyone's mind about the competence of the practicing veterinarian to diagnose most clinical cases of rabies, and I do not think we should question him any more than we should question the physician who diagnoses many human diseases by clinical methods and reports them on the regular reporting card which is sent to the State. It is a very real problem, and one that we should consider as seriously as possible.

Dr. Lee pointed out yesterday that Dr. Giltner's report showed something like 328 cases which were diagnosed only by laboratory techniques. On the other hand, he knows, according to his survey system, that there were at least 796 cases diagnosed clinically. Dr. Menges pointed out that we cannot expect the cooperation of veterinarians, as far as reporting clinical rabies is concerned, unless there is a disease reporting system set up by postcard within the State. I agree unreservedly with this statement. I think it is something we ought to consider seriously, and I would like to have your views on it so that we can recommend something along the same line at this conference.

DR. ROGERS: The committee will have to formulate a recommendation, I presume, so any comment you have at this time which will help them to express the view of this entire group will be helpful.

DR. BREED: Of course, I appreciate the fact that you want a uniform system for all States. I suppose the public health people would like to have that. But in Dr. Lee's case, for example, in his territory where, apparently, rabies is exceedingly prevalent: I wonder if clinical diagnoses of rabies could not be accepted? Now in Nebraska, where we have little rabies, it seems as though public health or the veterinary laboratory would require examinations on those cases. This would be the same for some of the other States where there is little rabies. I believe that the prevalence of rabies in an area should be recognized by the veterinarian and that in areas where incidence is high clinical diagnosis should be accepted.

DR. ROGERS: Do you have any recommendations as to what agency should be designated as the one to receive the reports at the State level? That is the next logical point for discussion.

DR. RIEMENSCHNEIDER: I would like to make this observation. With the imminent development of the Civil Defense program, all State veterinarians who do not have their veterinarians reporting to them will have to set up a reporting system. Rabies certainly can be included in the reporting. I know that many places these reports go to the National Office of Vital Statistics

and then come back to the State department of public health before we see them. But with this new Civil Defense set-up, we are obligated to have a reporting system, and certainly rabies will be included.

DR. ROGERS: Now you are speaking of clinical rabies? Presumably, there are a limited number of laboratories in each State which do the laboratory diagnosis of rabies, and it should be a fairly simple matter to arrange for an exchange of information between the interested agencies as far as laboratory reports are concerned. You are speaking of clinical rabies being reported to the State veterinarian the same as we expect the other communicable diseases of man to be reported to the State health department.

DR. HOLDEN: I think it would be unwise to make it mandatory for veterinarians to submit heads to a laboratory. In areas such as this, in which we want to discover every single case of rabies, if it were made mandatory we would never hear of many cases that veterinarians are reasonably certain are rabies. If submitting heads was mandatory, they might feel that they would get into some sort of trouble if they did report a clinical case without having submitted the head to the laboratory. I think they should be encouraged but not forced to submit heads to the laboratory.

DR. ASHCRAFT: I think they should report cases diagnosed clinically. In any State where the infection is not heavy, laboratory confirmation should be made if at all possible. Many times your reporting hinges on your confirmation, and vice versa. In other words, if you can, get veterinarians to send the heads in; where the rate of infection is low it can be done. Where there is a possible epidemic or an increased amount of infection, I think you can make it mandatory that they submit those heads.

MR. VOSE: In Dr. Anderson's absence, let me report the system that is working satisfactorily in Nebraska right now. As I understand it, there is a working arrangement between most of the veterinarians in the State and Dr. Anderson's office as head of the Bureau of Animal Industry. Any suspected heads or suspected animals are reported and one of his men is sent out to investigate the circumstances. If there seems to be any value in examining a head, it is brought in to the laboratory. Not long ago a head was brought 200 miles. Workers took a trip out to get this head, and looked over all the surrounding circumstances. I think such a close tie-in, with all the agencies working together, will continue unless the rate of infection rises. I can understand how such a procedure as I describe could not be followed in some of the areas where there is a high rate of rabies incidence. But we hope that it never gets that bad in this area.

DR. HENDRICKS: I think that on the State level, the question as to whether or not we shall require laboratory confirmation of all cases depends primarily on the circumstances. I will give you an illustration or two. Recently, a farmer had an 800-lb. steer that became sick. Rabies was suspected, and the head was sent to the laboratory where the clinical diagnosis was confirmed. Two days later another steer of the same size developed the same type of illness; and a few days later a third steer. Now it happened that all these cases were located close to a laboratory and it was convenient to take the heads in. Had it been necessary to ship them by express, packed in ice, it would have been quite an inconvenience to send all those steer heads to a laboratory. The first one would have been sufficient, probably, and diagnosis could have been made on the other two on a clinical basis. In another instance, a farmer had a flock of sheep and two of them died. Rabies

was suspected and the heads were sent to the laboratory. Later on 10 more sheep died of the same symptoms. The first two were confirmed as rabies. I think it is unnecessary to have laboratory confirmation of cases which develop subsequent to confirmed cases on the same farm.

DR. BELL: I have to apologize to Dr. Tierkel for what I am going to say, but I do not think veterinarians can diagnose rabies uniformly, and I do not think medical doctors can diagnose encephalitis as to etiology. I think if you want to differentiate Eastern equine encephalomyelitis from Western, for example, you have to send material to the laboratory. In the past couple of months we have had three dog heads sent in by veterinarians who recognized the limitations of diagnosis. They were sent in because rabies was suspected. We could not find Negri bodies, and we could not transmit the disease to mice. In other words, those animals did not have rabies. Those were the only three such cases that we received, but perhaps there were others; there were some affected squirrels that the veterinarians did not send in. I do not think you can differentiate certain encephalitides, for example, from rabies or from vitamin deficiencies, uniformly and accurately, without laboratory confirmation.

MR. HART: I would like to ask Dr. Bell this question. You said that you did not find Negri bodies, and that upon inoculation you were unable to produce the disease in mice. Could you say, then, with absolute certainty that those animals did not have rabies?

DR. BELL: Yes, don't you think so, Dr. Tierkel?

MR. HART: What other criteria are there?

DR. BELL: Mice are very susceptible by intracerebral injection. The mice were not infected. We have received no histological evidence. Is there any doubt that these are sufficient criteria, taken together? Do you know of any other criteria that could be applied?

DR. TIERKEL: You are asking, Mr. Hart, if failure to find virus in the mice presents conclusive proof. Is that right? As far as we are concerned, yes, for all practical purposes. However, there have been instances where the so-called phenomenon of autosterilization has been known to take place. There is a time factor there, a period during which the virus might die out. Dr. Bell is entirely correct with regard to the importance of laboratory confirmation on any type of infectious disease of this nature, but my point is this: There are circumstances under which we can competently and honestly diagnose a case of clinical rabies without laboratory confirmation. In an area where we know that the dog population is not immune and is highly susceptible; where we have a history of a dog having been exposed by the bite of a stray dog or of any other dog; and where the symptoms show in classical, clinical, textbook style, I believe that there is enough evidence to diagnose typical rabies on a clinical basis. Of course we should have circumstances which provide a history of exposure, the prevalence of rabies in the area, and/or the fact that the animal in all likelihood is not immune. If there is any question of differential diagnosis with regard to clinical symptoms in other encephalitides of dogs, I think we must depend upon a laboratory examination.

DR. HOLDEN: I think a very simple answer to this question would be the percentage of heads submitted by veterinarians to the laboratory which are definitely diagnosed as rabies. In most cases, the practitioner has diagnosed the disease clinically or he would not send the head in. In what

percentage of the heads received by the laboratory can you demonstrate Negri bodies?

DR. TIERKEL: I don't know what the percentages are. They vary from one laboratory to another and, of course, factors with regard to the prevalence of rabies in each area will alter these percentages. In most laboratories I think it is about 30 percent. I would like to know Mr. Vose's experience with heads that come in that are negative.

MR. VOSE: For a good many years 100 percent of the heads were negative.

DR. LEE: Let's go back to South Carolina where we have a thousand cases. I can give you percentages on positive and negative heads. These heads are sent in by many persons. We had 328 positives and 331 negatives in 1950 which, to me, tells a story about the laboratory. We have someone there who knows how to pick out Negri bodies. He knows what he is looking for, and he can find it. We have not been able to get mouse inoculation started, but I have been fighting for use of the procedure for the last few months.

DR. RIEMENSCHNEIDER: I'd like to report that in Colorado the laboratory examined 246 negatives and 118 positives from sources all over the State.

DR. ROGERS: This has been a very interesting discussion. Are there any other comments before we go to the next topic. I think we should at least start on the wildlife discussion before lunch.

DR. TIERKEL: Dr. Rogers, I do not know whether or not we have come to any agreement on the reporting of clinical rabies, but I would like to bring up another point under reporting. One of the things mentioned was that reporting should be on the State level. It was suggested that since the office of the State veterinarian in each area has been designated as the official Civil Defense agency with regard to the reporting of certain animal diseases, that the same agency might also include rabies in its reporting. I would like to point out that years ago a system of reporting was set up whereby rabies in animals was reported by the State health officers in weekly telegraphic reports. As I told you yesterday, we now have 47 States and the Territories reporting to us.

I have noticed since the fresh outbreak of rabies in this area that there has been a bit of confusion in the reporting of rabies. Most States have several laboratories which are responsible for the diagnosis of rabies, usually the public health laboratory and its respective branches throughout the State, plus the livestock disease control laboratory, and perhaps the veterinary school in the particular State. I would like to make a plea to those convened here to see to it that these laboratories are alerted to the importance of submitting these reports; further, to see that weekly figures on the positive diagnosis of rabies are sent to the State health department so that when we get the weekly telegraphic reports from the State health officers we may formulate an accurate picture at the national level. The Bureau of Animal Industry sends questionnaires out on a yearly basis, and we feel that we know what is currently going on throughout the country, and can redistribute this material to each of you in the field so that you may know what is going on about you all the time.

Two weeks ago we had in Atlanta an epidemiologists' meeting on morbidity and mortality reporting for the country. All the States in the

Union were represented by the State epidemiologists sent to the conference by their respective State health officers. We analyzed completely the list of those diseases which should be reported from the local, State, and national level. Rabies in animals was one disease which was analyzed. It was almost unanimously agreed that rabies in animals should be reported from the State health department to the National Office of Vital Statistics in Washington. We get that information within hours after it is reported to Washington. It is then reproduced and distributed throughout the country. Many of you, I am sure, receive these weekly reports, and if you do not, I will be very happy to see that you do get them. The important thing is that we do not want these reports to reflect the work of one laboratory. I am making a plea that you see to it that the veterinary diagnostic laboratory, as well as the public health laboratory, the veterinary school, or any other official or private laboratories within the jurisdiction of your State send the data to the office of the State health officer so that he can forward it without delay to the National Office of Vital Statistics. We will have come a long way if we accomplish that.

MR. HART: Increased attention is now being directed toward improving communicable disease reporting throughout the entire country because of the potential that exists for overt or covert warfare by an aggressor nation upon the United States. I think this fits into that particular pattern in that we must have all diseases reported, including rabies, and must send an epidemic intelligence team into an area to find out whether an epidemic is a result of enemy action and an induced disease, or whether it is just a natural epidemic that is occurring.

DR. ROGERS: In our State Health Department we do have an arrangement with the other agencies that receive reports on animal rabies. I mention the subject because it occurred to me that such might not be an universal practice. The laboratories in the State do report to us, and we include the reports with our morbidity statistics.

Are there any suggestions now for continuing the panel discussion on diagnosis and reporting, or for going on to wildlife rabies panel?

DR. TIERKEL: There are two motion pictures that we would like to show before lunch. One is a general control film, which takes about 10 minutes, and the other is a short film on diagnosis, which takes about 4 minutes.

PANEL ON WILDLIFE RABIES*

DR. ROGERS: May I call on you, Dr. Kozicky, to contribute to the panel as the initial commentator?

DR. KOZICKY: First of all, I would like to make my position clear. Perhaps I can add to the discussion as a research wildlife biologist. In Iowa we have a Wildlife Research Unit which is a cooperative endeavor sponsored by the U. S. Fish and Wildlife Service, the State Conservation Commission, Wildlife Management Institute, and Iowa State College. We have two objectives: one is to train biologists in wildlife management, the other is to conduct research in wildlife. We have been in operation since 1935. I notice one of the things you have on the agenda for this afternoon is the life history and ecology of various so-called vectors. We have done extensive work involving several dissertations, for doctor's and master's degrees, on the spotted skunk, the striped skunk, the red fox, and the raccoon. So, we have considerable knowledge available about the life history and ecology of those species.

Among the various projects that we have at our unit is one that deals with a survey of wildlife diseases. That is, our conservation officers in our State, our biologists, and our game management men, perhaps numbering well over 100, are aware of the importance of wildlife diseases, and send specimens to us for diagnosis by the Iowa State College Veterinary Diagnostic Laboratory. Therefore, we have a reasonably good running account of what is going on and are aware of any outbreak of disease. If the disease is of particular importance and warrants it, we have at times gone into the field and studied the local area in which it exists. We have done this in a case of tularemia in rabbits.

There are a few things I would like to say regarding rabies in wildlife, things I think are important, and one of the first ones is this: I think, definitely, when it comes to wildlife rabies, we must have it substantiated by a laboratory diagnosis. There are too many other wildlife diseases, some of them of unknown etiology, that might be confused with rabies - that is, if you consider only the clinical symptoms. I am thinking particularly of the encephalitides that we know exist in the skunk, the fox, and the raccoon. If we are to rely on facts instead of supposition, we must have the clinical diagnosis substantiated by a laboratory diagnosis. In Iowa we are doing this.

The second thing is that we definitely need to know exactly how rabies is perpetuated in wild and domestic animals. Of course we know that we need a control campaign when there is a rabies outbreak, but we will never get at the crux of rabies control, the heart of it, until we know how the disease is carried over from year to year. We can go back through history and find that rabies outbreaks arise and subside; yet, we do not know how the disease is carried over from one year to the next. Another important thing is that we need to know exactly what animal is concerned. The spotted skunk has been called spotted cat, spotted skunk, civet cat, bob cat, and other names. We need to know whether the person reporting is talking about the civet cat, the striped skunk, the red fox, the gray squirrels, the red squirrel, or the fox

*See page 19 for report from Iowa State Conservation Commission which gives additional information on wildlife rabies.

squirrel. We cannot lump everything into broad categories such as skunks, squirrels, or even foxes. So please bear that in mind.

To me it is particularly gratifying to see this group so interested in wildlife diseases. It is something in which those of us in the field have been deeply interested for a number of years. I want to assure all of you that we are willing to cooperate in any manner possible in control of rabies, or in finding the factors to determine how the disease is carried over from year to year.

DR. ROGERS: Any questions that anyone would like to address to the speaker, or any further comments?

DR. LINDUSKA: Mr. Chairman, I have a few observations and remarks which I expect may be more confusing than convincing. I believe, regardless of the responsibilities and interests represented in this group, that we all recognize rabies as a disease having considerable public health significance and also, at times, obviously one which has tremendous importance to some of our agricultural assets.

Yesterday I mentioned briefly the nature of the participation in past years of the Fish and Wildlife Service in rabies suppression programs. I would like to reiterate today that those facilities are available wherever the problem is of such a nature as to justify the type of participation that we are enabled to offer. I might describe further the thing that Dr. Kcsicky has touched upon briefly, which concerns a very worthwhile opportunity for furtherance of much-needed research in the problem.

We now have in the Fish and Wildlife Service a program involving 17 land-grant colleges and conservation departments. It is a cooperative type of program involving the Fish and Wildlife Service, the State conservation commissions, the State colleges, and the Wildlife Management Institute. For this particular area, in addition to the Iowa Unit, we have stations in Colorado, Oklahoma, Ohio, and Missouri. In the far West we have stations in Montana, Oregon, Arizona, Idaho, and Utah. The programs of these cooperative units are arranged by a coordinating committee representing the agencies I have just mentioned. I am quite certain that wherever the conservation commission felt there was a need for research into rabies problems, such a need would be considered favorably in their recommendations for research programs.

There is another thought that occurs to me today and which I failed to mention in the course of discussions yesterday. Even though we all agree, uniformly I think, that rabies is a problem of considerable magnitude, at the same time we must admit that rabies is a type of disease that has potentially a great emotional impact on the public. People who probably remember a little of their medieval history will recall the occasional raids on towns and villages by packs of wolves that presumably ate a part of the population and left others to die in the throes of rabies. Such reports of pre-Pasteur days have instilled a fear of rabies that persists today. Rabies is an emotional subject and can be sold. For that reason I think that it is probably worthwhile to insert in our discussion a little objectivity and circumspection in dealing with this program, because I can conceive a possible danger in overselling the subject and obligating ourselves to a type of control that may not be actually justified in a great many cases. I say that without intending to be the least bit disparaging in my comments on committees of this type. I certainly feel that they are worthwhile and that their objectives are healthy.

I would like to emphasize again that I am inexperienced on the subject of rabies, but it seems to me that this conference has brought out the fact that

we have two main problems. I will agree with Dr. Lee in his comments that they are not entirely unrelated. We have, first, the problem of rabies in urban areas where valuable pets, dogs, and humans are concerned. In such situations we have community governmental structures possessing the techniques and mechanism for dealing with the problem. We have learned at this conference of at least two situations which have been dealt with very effectively on the local level. I was certainly impressed with the reports of the two gentlemen from Denver. It seems to me that they have the situation well in hand, and a worth-while program under way. Likewise, we were all impressed by Dr. Lee's report from South Carolina. He seems to have sold his program there and is well on the road to handling the problem which, primarily, is an urban one although, as he has pointed out, it does have implications as far as the wild species are concerned.

Then we have the problem of rabies in nature, and when we transfer rabies from urban areas into the rural districts, into agricultural areas, and into semiwilderness areas, we complicate our problem tremendously. I feel that it takes on an entirely new significance. There are a number of questions I want to ask at this time, instead of presenting them to the committee, because I think they may stimulate further discussion and may bring to light something that may be helpful.

There is really only one main question, but it has several parts: What is the real significance of wildlife in the transmission of rabies? In considering that we might ask, At what point are we justified in launching a wildlife population reduction campaign? What is the degree of density necessary in a population before it becomes a hazard? Is a high population of susceptible carnivores in itself a justification for a reduction program? Epizootics and high populations seem to be associated, but it is well to bear in mind one thing. Since the time the Fish and Wildlife Service first participated in a reduction program on rabid coyotes in 1915, it is my recollection that there have been sporadic outbreaks every year since that time in our livestock country in the West. Obviously, we should not accept each of those outbreaks as a justification for launching into an extensive control operation.

If presuppression of an overpopulated species is not desirable, if we cannot accept high numbers alone as a justification for suppressive measures, what are the criteria by which we judge that a program is justified? Is it the finding of 1 rabid fox per section, or 10 rabid foxes per section? When do we say, "Well, now we have to go to work?" On the other hand we might alter that same question to involve the items we are considering most closely here - livestock and humans. Shall we start when the first individual is bitten? Or with the first livestock loss? Or where, do you think, is the beginning point?

If we wait until a disease is rampant throughout a wild population, be it in foxes, raccoons, or skunks, then the question occurs to me: What are the real advantages of control measures at this time? The few reports that we have on the subject would indicate to me that in reducing a population through artificial control we accomplish temporarily the type of reduction that may establish a safeguard for humans and livestock, but on the other hand, the population is perhaps a half or two-thirds of the way up to the peak of its population curve, with the expectation that it can recover itself and present us with the same problem a few years hence. Conversely, if those infected populations are allowed to run their normal course with

natural die-offs taking place, the population reaches a state of depletion such that it ordinarily might require up to 10 or 15 years longer to bring the animals back to a density that might constitute a problem for us. These questions may seem a little facetious, but I am asking them earnestly. I do not know the answers. I wonder if anyone does.

Dr. Kezicky has already touched on one further question I had, and that is: What is the permanent reservoir for this disease? I think, looking at it from a long-time, national viewpoint with an ultimate objective of possibly ridding the country of rabies, that we cannot expect to deal with the problem head-on and on a catch-as-catch-can basis. We have to do some fundamental fact finding, have to find out wherein lies the weak link in the chain of transmission and carry-over ability of the disease, and must try to effect control by working at that weak point. I would say that certainly, if it is in some domestic animal, the dog, for instance, our chances for accomplishing complete eradication of the disease would be excellent. If, on the other hand, we find that rabies can be perpetuated in some reservoir of susceptible wild animals, we have a much bigger problem than we otherwise would have. Nevertheless, I think it would be somewhat foolish to launch many of these control programs without having such basic information. I mention these things not with any ambition whatever of encouraging activity in the line of Federal work for which I am partly responsible - that of wildlife research. I would not be in the least hesitant to see the problem handled in other quarters; as a matter of fact, I would encourage it. I am simply throwing out these thoughts at this time as my reaction to this meeting to indicate some of the needs we must recognize before we can deal effectively with what we all know to be an extremely important problem. If there are any other comments, I would be glad to have them.

DR. ROGERS: We would welcome any other comments or any questions addressed to any of the previous speakers.

DR. BELL: There is very good support for Dr. Linduska's statement that artificial control of a population causes it to increase. Of course we do not know if that is true with skunks and foxes, but we do know from rather extensive work on other kinds of animals that it is true generally speaking. Dr. David Davis has done some excellent work along those lines in rats in Baltimore. Recently, a scientist from Australia was here, and we discussed animal diseases and populations. I asked him: "Isn't it strange that you don't have any cycles in rabbits in Australia?" He said, "Oh, yes, we do have cycles over there, and we have some very extensive cycles. Back in the sandhill country where no controls are put on rabbits they go way up and they go way down, but where we attempt to control them we have a constant high population." There is a good deal of evidence of the same thing in deer, through the work of Dr. Cheatham and Dr. Sevringham. We do not know whether this is true in the case of skunks.

The question is: Is rabies a wildlife problem, is it a public health problem, or is it both? I think that public health workers and wildlife research personnel can work together on it. It is a problem that concerns both. There is very little support for long-range population studies in relation to disease unless you have disease. With rabies we could justify a study on skunks with relation to disease. This would be applied research; it would be practical research. But after 2 or 3 years, when rabies dies off, it would again become pure research. That is not the proper attitude. This work has to be carried on continuously, over a period of 10, 15, or 20 years

whether or not rabies is present, and I believe that public health and wildlife personnel should work together on the problem.

DR. ROGERS: Any other comments?

DR. BLAKENSHIP: I understand from casual conversations that in Kansas some studies on transmission of rabies in wildlife have been done, and I think Dr. Menges knows about it.

DR. MENGES: The studies to which Dr. Blakenship refers concern rabies in skunks. The work was done by Dr. Leasure and Dr. Twichause at the School of Veterinary Medicine, Kansas State College. Since I am not too well acquainted with all the details, I suggest that everyone interested in this problem read the report of their work when it is published.

DR. BLAKENSHIP: I would like once again to agree with Dr. Bell on the necessity for public health and wildlife personnel working together, and to recognize Dr. Linduska's viewpoint. I would like to state a little more about what we are faced with in public health. You can tell the public a proved fact such as that 22 percent of all children under 4 years of age die of accidents, and they give only perfunctory attention. But let one child die of rabies and the public is aroused. If, as the result of letting rabies run its course in wild animals, a human death occurs, the outcry is clamorous. We do have these interests that are common, and at the same time they have angles that make them divergent. I can support Dr. Bell wholeheartedly; we need to work together, Dr. Linduska, very closely.

DR. LINDUSKA: I recognize that cooperative action is necessary. Throughout a good many of our activities we have enjoyed only the closest of cooperation with the Public Health Service and other Federal agencies, and we certainly encourage such cooperation whenever possible. That was what I had in mind when I was speaking of the need for research, because we recognize our own limitations. There are a great many phases of the program with which we are not competent to deal, and certainly we would expect to call on other agencies for specialized personnel.

I want to clarify my position on another point, and that is that I am not a purist. I recognize that there are certain situations in which control may be desirable or necessary, and in my request for a little objective thinking and some circumspect reasoning on this particular program, I am not thinking entirely in terms of preserving animals at any cost. I am merely trying to bring to light something that should be before all of us - that is, that no ambitious and expensive control program should be launched until we have some knowledge of the expected results. I think it is high time that all government agencies begin to think a bit in these terms.

DR. LEE: There is an economic problem connected with this, too. It is not funny to sit in your office, hear the telephone ring, and have some stockman tell you that a dog is bouncing through his herd of 200 head of purebred, whitefaced cattle out on the pasture. He says "How much would you think the cost of vaccinating my cattle against rabies would be?" And you are not in a position to know whether the rabies vaccine would do the cattle any good or not. If only for an economic reason, you have to do something about it. I noticed in Dr. Giltner's sheet here that there are 948 head of cattle involved, to say nothing of horses, sheep, swine, goats, and a few of our valuable mules. You have an economic problem when rabies gets into livestock, and you have no choice on what you are going to do. You have to do something immediately, or the livestock industry is going to

be right on your front step wanting to know why you didn't do something about it.

I would like to get some help on fox eradication in South Carolina. How do you get a college grant? You mentioned these grants to colleges to study wildlife diseases. Is that general? I mean, what does a college have to do to get one?

DR. LINDUSKA: If you are speaking of the Cooperative Unit program, it is not strictly in the nature of a grant. There, again, the program arises spontaneously in the State, and the request must come to the Federal service. However, that in itself does not constitute getting a program or insuring that one will be set up. The Units are considered partly on the basis of national need. The program is cooperative, as I stated, and, very briefly, involves about this sort of an outlay on the part of the cooperating agencies:

The Fish and Wildlife Service hires a leader whose salary is from $5,000 to $6,000 a year. They also provide him with a vehicle for transportation. The State college makes a contribution in kind, which can be written off in terms of increased teaching load, the use of facilities at the institution, or as an actual cash contribution. The State conservation department also matches that amount, to the extent of about $6,000. That amount varies considerably from State to State.

It is quite a flexible program. Some of the States set up several graduate fellowships which account for a large part of that $6,000. Others arrange for the purchase of special types of equipment. The Wildlife Management Institute has, in the past, set up $1,000 in each of these institutions to be used at the discretion, very largely, of the Cooperative Unit leader. I am probably talking out of turn, when we have a Cooperative Unit leader right here in the group who can tell you all about it. However, that is the nature of the program. It is not a grant directly to the State to be used as it sees fit. The program has been very effective, I think, and a popular program; and we feel that it has accomplished a great deal.

DR. LEE: How do we go about getting something like wildlife control?

DR. LINDUSKA: I would say that here, again, maybe Mr. Buell ought to be taking over. The Fish and Wildlife Service is not in the control business as such. We have the facilities of trained personnel, and a laboratory in Denver that is devoting a great share of its time to developing new, more economical, and more selective control procedures. That type of background and technical know-how is available to the States primarily on a supervisory basis. On the program that we have been operating, as I mentioned, there are various agreements that are entered into, one of them being that the actual cost in connection with rabies suppression and rabies abatement, shall be borne by whoever wants to put up the money - the State, the county, or the city. Mr. Buell, maybe you had better tell them more about this.

In Georgia we have provided one technical man to help head up their program, to make recommendations as to the type of supervisory personnel they ought to have, and to further recommend the type of controls and control procedures that should be used in that particular area.

MR. BUELL: The predator control work done in parts of Nebraska is a good example of such control. The reason for that control is strictly economic - principally a result of calf and poultry losses to coyotes in the western part of the State. The Fish and Wildlife Service is operating in 15 counties

in Nebraska with county and Federal funds. In those 15 counties there are seven trappers who work under the direction of the Fish and Wildlife supervisor. Each of the trappers works in one or more counties, in most instances, more than one. In any case, the county in which a man works pays his salary, his mileage and travel. We furnish all the necessary equipment and supplies, supervise his work, and render reports to the county commissioners. Whenever the county commissioners, or residents of that county, feel that control work has been carried as far as they want to carry it, they simply cut off the funds and that ends it. In other States it is not as simple. In North Dakota, for example, part of the funds are provided by the State Game and Fish Department, but in every case the county, or in some cases a local association of ranchers, provides at least half of the funds. If they do not feel that it will be worthwhile, control activities are not undertaken.

MR. TWICHELL: Along the lines of getting control, or of helping control, that Dr. Lee was discussing, I imagine he would do better with his own State Conservation Department than he would with the Federal service because the Federal service probably could give him only a man or two. I do not know what his State has in the way of conservation personnel - perhaps 100 wardens scattered throughout the State. In Missouri we have about that number, plus approximately a dozen wildlife biologists, perhaps 300 personnel all told throughout the State. They would be pretty well in touch with the situation and able to give a good deal of help in the matter of control.

Yesterday, several persons suggested controlling foxes and skunks by some kind of eradication program. I do not think this group can arrive at any broad decision on that matter, as a rule of thumb. It is something that probably your State health department should take up with your State conservation commission when the time arrives, to work out some program for a local situation. It will not always be the same in all areas. You would have one kind of a program if you thought foxes were your main diseased species. You would handle that differently than you would skunks. I see little need for an eradication program on a State-wide basis unless you had a very large epidemic.

Skunks, for example, are small, short-legged animals. If you get in there early you can stamp out the carriers by working in a township or maybe a smaller area. You probably know case histories on dogs where a rabid dog has gone for miles and miles spreading disease. Some of your smaller wildlife animal species cannot travel as far or as fast. Your State organization will be able to help control wildlife species, if necessary, and will know the best methods of going about it. That, again, depends on local conditions. Certainly, in your range country entirely different control methods are used than can be used in most of the Midwestern States.

I know our own Department would be only too glad to cooperate with the State health department on any rabies control where we know that wildlife species are a serious cause of the spread of rabies.

There have been many cases mentioned yesterday and today of cows or other animals getting rabies from an unknown source which was assumed to be a skunk. There is no more logical basis to assume it was a skunk than to assume it was a dog that caused it. If you do not know, why single out any one species? I think, undoubtedly, that dogs are the most common spreaders of rabies. Very successful rabies control campaigns have been carried out by control of dogs. Some of your eastern States have been having much more

serious outbreaks of rabies than we ever had. There are some instances where foxes have been responsible for many of the cases. As I said before, I think the only thing we can do here is just try to work out the solution when the time comes. This should be accomplished through cooperation between local and State agencies. We cannot make a rule that will apply to different species in various areas.

DR. ROGERS: I think, so far, the discussion has brought out that we need some research, we need more knowledge, before we act to eradicate any animal species; and it was also brought out that in this phase of rabies control we need cooperation between the various agencies that are interested in the program. Would you have a suggestion, Dr. Tierkel?

DR. TIERKEL: In an attempt to find some beginning point for solving this problem, first of all I would like to point out that there is, on paper, an official memorandum of understanding between the U. S. Public Health Service and the U. S. Fish and Wildlife Service with regard to the control of rabies in wild animals. This memorandum of understanding was signed by both Dr. Day, Director of the U. S. Fish and Wildlife Service, and Dr. Scheele, the Surgeon General of the U. S. Public Health Service. This document outlines the areas of jurisdiction and responsibility for assisting States and local jurisdictions in the control of rabies. I think Dr. Linduska probably pointed out the fact very clearly, but I thought I would bring the matter of this document to the floor to let you know that something actually was done about getting together on an agreement in these matters.

With regard to Dr. Lee's question as to what he should do about his fox problem in South Carolina, I think Dr. Linduska pointed out that there is available at the regional office of the Fish and Wildlife Service in Atlanta assistance of one type or another for areas in the southeastern States. Mr. Roy Moore has been in charge of that work in the Atlanta office for many years and they have had successful fox reduction projects all through the Alabama, Florida, Georgia, and Tennessee areas. I do not know whether South Carolina has ever taken advantage of the service which is offered by the Fish and Wildlife Regional Office there. But, as has been pointed out by the Fish and Wildlife Service, they are on a purely consultation and training basis. They will send a man into the affected area to train selected men who are chosen or hired by the local authorities. In effect, it is a training program by the Fish and Wildlife Service; and the local men, after they have been trained, go out and do the actual trapping in that area.

With regard to cooperative research, there is no question about the fact that something should be done, and we should not wait any longer. I think one of the resolutions that should be brought before this meeting is that cooperative research in wildlife rabies be instituted as soon as possible. We want to get as much information as we can about these little points which we have tried to bring out in the meeting today and in the preliminary program. As far as our present knowledge is concerned, with regard to the possibility of reservoirs of symptomless carriers in wildlife, the only research I know of is one study that was done by Dr. Harold Johnson at his laboratory in Montgomery, Ala. He surveyed a group of about 268 trapped foxes and routinely checked each one of these animals for the presence of rabies virus. He checked the brains and the salivary glands with the idea that if he found any animals which had rabies virus in the salivary glands and not in the brain, that would

be evidence for the possibility of symptomless carriers or reservoirs among the fox population in the southeastern area. The results of the experiment were conclusively negative. In a certain percentage of these he found virus in the brain and in the salivary gland, which meant they were able to transmit the disease. But in not a single instance was he able to recover the virus from the salivary glands and not from the brain. So all of the known efforts have been negative with regard to the possibility of symptomless carriers in terrestrial animals.

We have just completed a small preliminary project along those lines in wild rodents at Harvard University under Dr. Fagan who is assigned from our office to the School of Public Health there. His experiments were likewise negative by experimentally induced infection in several species of wild rodents. You all are probably familiar with the fact that the only animal that has been implicated as a truly symptomless carrier has been the Desmodus **rotundus**, the vampire bat, of South America, Central America, Trinidad, and Mexico. This animal, apparently, is able to fly about for many months, inflicting bite wounds in susceptible animals and transmitting the virus through the saliva during the bite, without apparently showing clinical symptoms. Observations have shown that these animals will ultimately be infected with the disease; but they have been observed for periods as long as 8 months being able to fly about and not become ill, and still transmit the disease.

I think that Mr. Twichell's remarks were a real contribution. There can be little doubt about the value of intelligent reduction programs. Assuming that such is the answer to the problem of wildlife rabies in accordance with our present knowledge, there is no doubt that the administrative responsibility for carrying out an intelligent program of this type should rest with the State, and that the State conservation commission should cooperate not only with its own agricultural and public health personnel, but with the neighboring States as well. And that, after all, is the reason why we are here on a regional basis: so that we can discuss our own problems and try to find some common denominator in exchanging information and getting these controls to be continuous across State lines where the problem goes on. If we can get some mechanism in operation whereby we can have this free interchange of information, we will have come a long way.

DR. ROGERS: I think that very well summarizes the general remarks that have been made on this topic. Unless there are some objections, I believe we will go on to the next topic of discussion, rather than going into the specific control measures for wildlife. Does anyone wish to talk specifically about the effectiveness of trapping versus poisoning, and to go into minute details?

DR. LODER: I would like to ask one question. In other virus fields, we are investigating the vector problem. Is there a possibility of a vector reservoir between fowl and animals making possible a transmission that is unknown, a cycle that is entirely unknown to us?

DR. TIERKEL: The possibility is always there, doctor, but there has never been any evidence that arthropod vectors are a factor in the dissemination of rabies. One of the main points to consider is the fact that rabies virus is not found in the peripheral circulation of infected animals, with one exception, and that is the chick embryo by yolk sac inoculation. We are just not able to pick it up out of the blood.

DR. ROGERS: Are there any other questions before we go on?

MR. MOHLER: What I want to say is more or less generalized. I have been sitting here feeling very happy today, and I would like to tell you why. The reason is that wildlife representatives have been invited to be in on such a conference. I would like to make a point or two about general education, information, attitudes, and common understanding that I think might be helpful all the way around. There are some technically trained wildlife men here, not very many, but some. It would have been difficult to get any of these men into such a group meeting 10 years ago. All the other professions represented here are of long standing.

Last evening down in the lobby a few doctors and wildlife men got together, shot a few deer, dressed out an animal or two, knocked down two pheasants, and tossed plugs to a few bass; and we learned something down there. A few years ago at the Nebraska Academy of Science meeting here in Omaha, the Biology and Wildlife Section which I attended was also attended by five medical doctors and five wildlife biologists from the State of Nebraska. It was a very interesting session. We learned a lot, because we found that we had something to offer each other. As Dr. Blakenship suggested, each group has something of interest to all.

The work is new enough to the general public in Nebraska, and I think that is probably true in most other States although many of you are far ahead of us in that respect. The main thing we are doing in wildlife investigation in Nebraska - because the personnel is limited and it is 600 miles from here to the other corner of the State - is to follow wildlife populations as best we can. We have done that by several different methods, concentrating on the major game species, and we have done a great deal of checking with people; in this work you learn something about people's attitudes and understanding and general ideas concerning wildlife. One thing that we found here in Nebraska is that the general understanding is far behind the actual situation in the wildlife field.

We can be more specific when we talk about phesants or grouse, or some other game. Pheasant would not be a bad example. Some people are wanting to shoot more pheasants when the population is declining, fewer when the pheasants are increasing. There is that much lag between the field information and what the public knows. Now that is because public relations, publicity, and general understanding are not receiving enough attention at the present time.

DR. ROGERS: Are there any other remarks pertaining to wildlife before we go on?

DR. TIERKEL: How do you feel about poisoning and trapping? What is the story on that? Anybody have any ideas on it?

MR. TWICHELL: Poisoning is quite commonly carried on in western range States where there are wide areas of low human population, few dogs, and comparatively few fur animals.

I cannot imagine a rabies situation getting so serious that you could make much progress with poisoning, say in my State, or in any place in this district except perhaps the western part of the Dakotas. You can hardly get into a poisoning campaign without the permission of the landowners where you are putting out the poison, and most of the time you will not get permission. It would have to be very serious - I think more serious than Dr. Lee's situation. Of course, poison is effective not only in killing what you are seeking to kill, but in killing many other species simultaneously.

Trapping, I think, is the best method. Hunting is used to some extent, but I think one trapper with a dozen traps could kill more foxes than this whole group could, hunting. If they were aware that the situation was serious enough, they would get out and trap a number of animals. Trapping is probably necessary only where you have a peak population. In that case it is easy to trap the population down to a reasonable level - perhaps down to the level where rabies will not spread very fast. But going below that level is a hard job. Just as if you had this room full of flies: you could go around and swat them 20 a minute until you had 50 flies left - and then you would give up. In another week you would have your population right back again. As I said before, I do not think we could make any recommendations here as to mutual procedure until the occasion arises and circumstances are known.

DR. LINDUSKA: There, again, I think the local approach is recommended by reason of the fact that most of the States at one time or another have participated in some sort of reductional program regardless of the objective or the reason for it. Your State veterinary groups, and your State public health people, I think, through working with the State conservation department can develop procedures that are most effective for that area.

MR. BUELL: I agree with Mr. Twichell that there are places where poison cannot be used. In some areas poison can be used; in other areas, traps are the only answer. In any case the use of poison cannot be overlooked in any control program. No matter what means of control is used, it is always necessary to get the permission of the landowner before you go on his land. On public lands, no permission is required. When my men use poison, we insist that the landowner accompany them so he will know exactly where the poison is placed and how it is put out. I doubt if poison could be used in the eastern areas where the population is dense, and probably not in Missouri. In getting back to where I started, the use of poison is strictly a local proposition.

DR. ROGERS: Any other ramarks?

MR. SPEAKER: I think the Iowa Conservation Department has some good ideas as to possibilities in case a program is indicated, and I would like to have them present some of the possibilities, suggesting potential methods of operation.

MR. LEAVERTON: Iowa's conservation organization is similar to those in Missouri, Nebraska, and other Midwestern States.

For the management of game, the State is divided into three areas, each one consisting of 33 counties. An area game manager lives in each area and is responsible for the management of game and for the development of State-owned land that is under the supervision of the Game Section. Each area game manager has a work crew of three men, and may secure additional help when it is needed for the development of game lands and for the management of game in his area. The area manager is an experienced trapper and has at least one experienced trapper in his work crew.

There are 54 conservation officers in the State. Each officer has from one to three counties in his territory, and he is responsible for the law enforcement, educational programs, and game conditions.

The conservation officer keeps in close contact with the game conditions in his territory. If any situation arises such as rabies outbreaks, beaver damage, or other nuisance or disturbance from wildlife that would create the necessity for controlling upland game in his territory, he calls

upon the area manager for assistance. This arrangement is working very satisfactorily.

We also rely on the Iowa Research Unit at Ames, Iowa, for the diagnosis of diseased animals and birds, as Mr. Kozicky has explained to you. We receive reports regularly on animals and birds that are sent to that department for diagnosis.

We occasionally call on the personnel of the Fisheries Section and the Biology Section and they cooperate fully in this work.

In addition, upon request, the area game managers conduct trapping schools for the control of coyotes and foxes. Usually requests come through the county extension agent, the Sheep Growers Association, or other organization interested in the control of foxes or coyotes in their county. Arrangements for trapping schools are made through the local conservation officer.

These trapping schools are conducted on a plan similar to the one used in Missouri. During the past 1½ years we have conducted 35 trapping schools in 35 counties with an average attendance of 30.

So far, every indication is that the control of wildlife in Iowa has been satisfactory. We have had very few requests for the control of animals as the result of an outbreak of rabies, and our personnel have adequately handled the several requests for wildlife control as the result of damage complaints. We are willing to assist in every way possible in the control of rabies in wildlife, and we feel that our organization is prepared to meet such emergencies.

DR. ROGERS: Are you ready to go on to the next topic? Any further comment on the wildlife section?

PANEL ON OVER-ALL STATE AND LOCAL RABIES CONTROL PROGRAM

DR. ROGERS: Colonel Lee has certainly given us a good description of coordination of local efforts at the State level in this program in South Carolina.* Would anyone like to comment on that subject further, and tell us about how you do it in your State? I take it, Colonel Lee, that your program is outstanding; no one has any criticism or suggestions for improving it.

DR. LEE: I thought maybe someone would give me some new ideas.

DR. TIERKEL: You will notice that we have included the subject of registration of dogs in the agenda. We have always recommended the registration of dogs as being one of the most important cogs in the wheel of rabies control. My experience in the field has shown that it is difficult to carry out a system that has registration and immunization of dogs at different times of the year. So we have tried, and Dr. Ashcraft has had the same experience, to combine the two in a single operation. In Dr. Ashcraft's paper he said that they had eliminated registration. Actually, they did not eliminate it, they merely combined it with the vaccination because they have the type of information they want right there on their files since the dogs are being officially vaccinated.

DR. ASHCRAFT: We eliminated paid licensing.

DR. TIERKEL: Paid licensing, yes, which amounts to the same thing.

DR. ASHCRAFT: We are still registering.

DR. TIERKEL: I was using the term licensing and registering synonymously. That is a small point, but you would be surprised how important it is. The average dog owner does not mind coming in to get the whole thing over with once a year; but it is extremely difficult to get him to come in to the county court house, pay his fee, get a certificate, and get a tag, and then weeks or months later get him to do the same thing over again when he has his dog vaccinated - another certificate, another tag, another fee to pay. It reduces the effectiveness of the program. So combining the two, or eliminating the registration, is a very important item in carrying out these immunization programs.

Dr. Ashcraft pointed out that they did not believe they could perpetuate the system of immunization clinics. That may be true in his jurisdiction. I feel that in most parts of the country the use of the clinic system is still an excellent idea, provided you get the wholehearted cooperation of the practicing veterinary profession. We do it in the Southern States and in many of the so-called lower Mississippi Valley States. I do not know how it is in your area, but clinics are an excellent idea and they make it more convenient for people to have their dogs vaccinated. It brings together the practicing veterinarian and the dog-owning public, and it works beautifully.

Another important point is the over-all State program of the type that Dr. Lee described. There should be one man to devote practically all of his time to control where rabies is indigenous. He has to go about the State and lay all the foundation work in getting the program under way. You have to get the program lined up at the State level; there must be cooperation with the State public health veterinarian and State livestock authorities. Unless a good foundation is established, the local health departments will be handi-

*See p. 27 for discussion of the program in South Carolina.

capped in their work. Problems on a regional level must also be worked out, so that you standardize your techniques and exchange information on methods of getting the program under way.

DR. ROGERS: Your remarks are very pertinent, Dr. Tierkel. I can see how we may need to take some of these remarks to heart and apply them in our local control program in Nebraska.

Are there any other remarks on this subject?

DR. BYINGTON: Dr. Lee's description of the South Carolina program was very interesting. But we must not forget that the Southern States are far ahead of the Middle Western States and the Western States in the development of local health units. How many full-time health officers do you have down there, doctor?

DR. LEE: Full-time health officers - 28, covering 38 counties; the counties without health officers have a practicing physician paid on a clinic basis.

DR. BYINGTON: I think Iowa has one, Nebraska has four, and Colorado has only a few health officers. It is going to be very difficult to get this thing set up in local health departments until you have either strengthened local health departments or, as an alternative, have the State handle it on some kind of an area basis such as described by the State conservation personnel.

DR. TIERKEL: That is a very good point, Mr. Chairman, and I am glad Dr. Byington brought it up. I think we have to examine our own States and see what facilities we do have at the local level. That is why it seems to me that it is so important to have someone in the State to go into these areas and work right with the local people. They need not be local health units. That would probably be the most desirable, but such a person working at the State level, could work just as well with the county commissioners or with whatever structure of local government there was available. You will find, too, that the county agents will be a great help in many of your rural agricultural areas.

DR. ROGERS: Dr. Ashcraft, you have a remark to make about the type of immunization clinics that are most effective, do you not?

DR. ASHCRAFT: We feel that the handling of the problem by furthering the usual veterinarian-client relationship is the best solution. This provides for a professional type of service with the individual problem being handled by the individual veterinarian. It is felt that the best method of providing continuous service for the public and for providing a continuous long-range program of rabies control is through the expansion of normal services offered by the veterinarian in his office. In cases when clinics are necessary, we feel that considerations pertinent to the selection of clinic stations must include provision of outlets for sterilizers, availability of the selected place to the populace, and provision of adequate room to prevent confusion. We do not feel that outdoor clinics are at all feasible, at least in Denver.

DR. TIERKEL: I think it is a question of existing local conditions. Certainly in Colorado we could not even think of outdoor clinics when we held clinics there. I recall having left there in April in a snowstorm, and I am sure that the States in this region probably experience the same type of weather in the early spring months. However, I think it is desirable to choose public places. If they are not completely enclosed they should be adequately sheltered for inclement weather; there should be facilities for sanitary hand-

ling of animals and for acceptable application of immunization techniques.

DR. ASHCRAFT: That, of course, is one of the reasons why we leaned toward vaccination of the dog in the veterinarian's private office under the system that we now have.

DR. TIERKEL: Well, that is perfectly all right, too, but in many areas I have found that the veterinarians prefer not to hold clinics in their offices.

DR. ASHCRAFT: Well, we do not hold clinics in veterinarians' offices. These are regular office calls the same as any other visit.

DR. TIERKEL: Another point is the fact that Denver is endowed with a very large veterinary profession. I do not think we can say that for many other cities in the United States, certainly not in this area.

DR. RIEMENSCHNEIDER: Denver is endowed with a heavy veterinary population, but I will assure you that other areas in the State are not as well endowed for the control of disease. When you get away from Denver, you run into this problem of lack of personnel. For this very reason, we have divided the State into districts, and the veterinarians take care of the problems within their own districts. Our veterinarians, county extension personnel, and the health departments have all cooperated with us very well.

DR. HOLDEN: I think we are talking about two different problems and two different situations. In an acute epidemic I think Dr. Ashcraft would have clinics, too, so that he could get as many dogs vaccinated in as short a period as possible. Such a program would probably be instigated here in the Midwest in the event rabies gets into the canine population.

DR. ASHCRAFT: I hope that nobody feels that I am against clinics in emergency efforts. We are not now on a presuppression program, we are on a continuing basis. We are past that presuppression stage and I hope we stay past it.

DR. ROGERS: I think we are generally agreed that circumstances alter cases, and it all depends upon our objective. If the objective is to get as many dogs vaccinated in as short a period of time as possible, then you set up any kind of a clinic that is acceptable both to the professional group doing the immunizing and to the people who are receiving the benefits therefrom. If you want a high type of immunity continued in your dog population, then you continue your immunization in the veterinary hospitals and veterinarians' offices - if that is the kind of service the people expect. Isn't that right?

DR. LEE: Yes. I do not think I am in favor of open-air clinics, either. It rained on us 2 days. It was surprising to see how many people came to those clinics, soaking wet, with a bedraggled dog, to have him vaccinated. I saw two high school girls making out certificates which were soaking wet. The veterinarian was soaked, and so was the sanitarian, but they were still holding the clinic. It was the only thing we could do. The people were there.

I have some figures I could quote, but it is too late now, to show you how the publicity started on the fifteenth day of March and how the veterinarians began to report from 1 percent to 400 percent increase in vaccinations in their own hospitals in the month of March and in the first 2 weeks of April. The aftermath of all the clinics, of 1,009 clinics in 1 week, is that the veterinarians are still vaccinating dogs in their private hospitals; and they have been kind enough to go along with a clinic rate of charge. Maybe in 5 years they will all go to the veterinary hospital because, as Dr. Blankenship

said, we have brought to the veterinarian people who were not used to taking their dogs to a veterinarian annually to have him vaccinated. We have given them some knowledge of rabies, we have brought to their attention the importance of vaccination, and we hope in time the relationship will build up to the point where it will be unnecessary to hold clinics.

DR. BLANKENSHIP: The figure of 70 percent of the dogs vaccinated, a goal of 70 percent was mentioned two or three times. I was intrigued by the figure and I wondered where 70 percent as an objective came from.

DR. TIERKEL: It is an estimate based on the observations of the experience of communities where mass immunization programs have been carried out. We found that if a community vaccinated less than 70 percent of the dog population they did not get satisfactory results. This figure has been set as a goal for local immunization programs wherever intensified mass immunization has been carried out. We have never used the 70 percent objective for a State-wide area, but I do not see why we should not do so.

DR. BLANKENSHIP: That might be a good subject for a statistical thesis.

DR. TIERKEL: As to Dr. Byington's question on the control of rabies in the rural areas, I would like to point out that a rabies outbreak is seldom limited to an urban area. Since the disease is widespread in the surrounding county, the control program must include the rural area as well. In the Memphis outbreak, our clinics in the surrounding Shelby County were handled in the same manner as these in the city.

DR. BYINGTON: In other words, if you immunize the rural dogs and let it go at that, is that all that is necessary?

DR. TIERKEL: There is the wildlife problem, too. You heard this afternoon a discussion of how we hope to attack that problem. So far, the only successful method used has been population reduction. We have to attack it basically.

AUDIENCE: How about prophylactic vaccination in farm animals?

DR. BYINGTON: In plague, you cannot kill all the plague-infected rodents in the western half of the United States. There are 75 species and they are all over creation, but you can kill them off around an area where people live. You cannot kill all the domestic rats, but that is no reason why we should not have rat control in well-established cities. It seems to me that it would be possible, certainly, to reduce the population of skunk, raccoon, or any other animal if we knew that it was the carrier of the disease in the area where the disease occurs.

DR. TIERKEL: Yes, that's right! I do not think anyone would object to setting traps on his own farm.

DR. BYINGTON: We attempt to control rat populations by killing and poisoning them.

DR. BELL: You cannot kill off all the skunks.

DR. BYINGTON: They don't do it in rodent control - they build them out.

DR. BELL: That's right. But we cannot build out foxes or skunks. So I do not think that is a practical solution.

MR. SPEAKER: How about the size of the population? Is the skunk population so large that it is possible to make a dent in it by systematic control methods? As Mr. Twichell said, the last few are the hard ones to get.

DR. BYINGTON: Also, the last few animals are the ones that do not transmit the disease. When you reduce your infection to a certain rate, you do not have any more cases.

DR. BELL: I think what it amounts to is that we are a group of people ignorant of the subject of wildlife.

DR. BYINGTON: That is no reason why we should not go ahead. We are ignorant on a lot of things. We are ignorant on smallpox vaccination. You know there are a lot of tricky things about the vaccine virus and the virulence of various strains of smallpox, but that is no reason why we do not control smallpox outbreaks by smallpox vaccination. We are ignorant on some of the bacteriology of diphtheria, but we still immunize children. Why let the thing go on - let the fire burn on until we have a lot more figures on how animal populations perform and the ecology of the whole thing? That is not the way public health gets ahead. You go ahead and do what you can with the knowledge at your command.

DR. BELL: Well, I think it is time we started getting some more knowledge.

DR. BYINGTON: I do too, but in the meantime, let us do what we can with what knowledge we have.

DR. BELL: Ten years from now, if we go on just killing wild animals, we are going to be in exactly the same position we are in today.

DR. BYINGTON: How do you know we are?

DR. BELL: We have heard about "phoby skunks" in the literature from the 1800's. I still hear about "phoby skunks," and that's all it amounts to.

DR. BYINGTON: I do not see any basic difference between trapping rabid animals on a farm and trapping skunks if they are catching the chickens.

DR. ROGERS: There is one more subheading on which we have not touched, and that is the matter of public education and educational campaigns. Dr. Lee gave us a very good illustration of how that worked in his State, and as I heard him review what happened in South Carolina, I was struck with the resemblance between the methods used in his educational campaign and the methods which have been used in other disease control campaigns. They are well-established as the means of disseminating information. Would anyone care to make any comments on that before we close this section of our panel and go into executive session?

DR. TIERKEL: Just a few remarks about the educational material which is available. You have seen the motion picture films. We have two filmstrips: one is on control, the other goes into more detail on laboratory diagnostic techniques. Both of these films are available from the Communicable Disease Center, and if any of you want to use them in your programs or educational campaigns, drop us a line and we will get them to you as quickly as we can.

Also, there are available six educational posters, in color, on rabies and its control, prepared, with our cooperation, by the Health Publications Insititute, a nonprofit health education organization in Raleigh, N. C. These may be ordered by writing to Mr. Felix Grissette of the Health Publications Institute, 216 North Dawson Street, Raleigh, N. C.

We have available at the Atlanta office printed material on rabies and its control. We would be very happy to send this to anyone who wants it, as well as the educational pamphlets made up by the States and by the Public Health Service.

DR. ROGERS: Does any State have similar material available? Something that might be useful?

DR. ASHCRAFT: We have a pamphlet, a throw-away, that we used during the vaccination campaign. Dr. Riemenschneider has a copy of it. We will be glad to send it to anyone. These were used when we were still requiring paid licensing.

DR. ROGERS: Dr. Riemenschneider, would you care to pass that around? If anyone wants one, write to Colorado.

DR. HENDRICKS: Iowa has a technical bulletin on rabies which goes into quite a little detail, and another leaflet designed for lay use including facts about rabies, and some summaries. We are not bragging about the number of cases in Iowa, but these summaries give a break-down of the species, monthly occurrence, and similar information by counties. I will pass these around if anyone wants to see them.

DR. ROGERS: Thank you. Does anyone else have similar material that he cares to distribute, or to show?

DR. BLANKENSHIP: At this time may we bring up one more point. We have heard nothing about the immunizing material. What do we use? Dr. Tierkel just showed us one pamphlet that said, "Have your dog immunized every year." I have a pup that is 7 weeks old and he is likely to live until he is 12 years old. I will probably have him immunized every year from now on. I have heard rumors that there is a prospect of getting a vaccine which will produce a longer period of immunity. Could we hear from Dr. Welsh or Dr. Rice, from Lederle?

DR. ROGERS: Yes indeed, we would be glad to hear from either of these gentlemen.

DR. WELSH: I think the simplest way to get this before you is to read what amounts to a summarization of our present information, written by one of our associates. I think this will give the information on our rabies vaccine.

"Avianized rabies vaccine has been marketed by the Lederle Laboratories since April 1, 1950. It is distributed under a special license issued by the U. S. Bureau of Animal Industry. The special license is designed to promote the accumulation of data on field use, which is not normally encouraged under an unlimited license procedure. According to the special license requirement, the state veterinarian or public health official obtains reports from the veterinarians using the products in dogs. The veterinarian reports the number of dogs vaccinated, and indicates if any reactions occur following vaccination. These reports are accumulated by the state veterinarian or public health official and forwarded to us for summarization and we, in turn, send the summary report to the United States Bureau of Animal Industry at four to six months intervals.

"To date, over 80,000 doses have been used in dogs without any serious reaction reported that could be attributed to the vaccine. One field trial is worthy of special note. In the summer of 1949, 7,100 dogs were vaccinated with avianized rabies vaccine on Staten Island, and although pain immediately following the intramuscular injection, which lasted up to 30 seconds, was reported in a small percentage of the dogs, there was no other reaction reported. In this group of dogs there were five deaths but all were followed up by the veterinary staff of the New York City Department of Health and none could be attributed in any way to the vaccine. In 1950 another mass immunization in dogs was conducted in the same borough. A total number of 6,300 dogs were vaccinated and of this number 4,200 received avianized rabies vaccine for the second time. Again, there were no reactions of significance that could be attributed to the vaccine.

"Since our avianized rabies vaccine is a live nonpathogenic virus, the question of reversion to the original virulent state by transmission of the

virus from dog to dog has been suggested. The reversal of a nonpathogenic modified virus to a virulent state is considered by biologists to be almost impossible. It has not been demonstrated under laboratory conditions. If there was a possibility of reversion, it would be entirely dependent upon the transmissibility of the virus from animal to animal. With the avianized rabies virus, numerous trials have been conducted in this laboratory to demonstrate the lack of transmissibility. The brain and salivary glands have been obtained from avianized rabies virus vaccinated dogs, and inoculated intracerebrally into mice, guinea pigs, and dogs without a single instance which would indicate that the virus was present in these tissues. In addition, studies have been conducted by the U. S. Public Health Service, Communicable Disease Center, Montgomery, Alabama, to determine transmissibility of the avianized virus. The following paragraph is taken from their report:

" 'Samples of blood and saliva were collected from groups of five different dogs each day during the first ten days following vaccination. Then on the 13th, 21st, and 22nd days. Samples were then collected from groups of ten different dogs on the 24th, 29th, 31st, 34th, 36th, and 41st day after vaccination. Blood and saliva from the groups of five dogs were pooled for intracerebral inoculation in mice. Whole blood was defibrinated by shaking the glass vials. From the 27th day on serum as well as whole blood was used. All of the five sample pools of whole blood, saliva and serum were injected intracerebrally into a group of six mice each. Whole blood was injected at 1:2 dilution, serum was injected undiluted, and saliva injected at 1:20 dilution. One thousand units of soluble sodium penicillin G and 2 milligrams of streptomycin per millimeter of suspension were added to the saliva specimens. No virus was recovered from any of the specimens.'

"Furthermore, the reversion of the virus to a virulent state in the production procedure is not possible, since it is only passed on embryonated chicken eggs. It is pertinent to note that the modification of the egg adapted to rabies virus has proceeded to the point where it is so far removed from its ancestral virulent type that it multiplies readily in all tissues of the developing embryo. This is in contrast to the fixed rabies virus which has a predilection for nerve tissues. Serious postvaccinal reactions may occur following the injection of brain tissue origin vaccines. Postvaccinal reactions, sometimes characterized by paralysis, have been demonstrated to be associated with the injection of brain tissue origin vaccines. This has been a serious problem in human medicine, and is an important consideration in the vaccination. Since avianized rabies vaccine is prepared from chick embryo, the possibility of postvaccinal reaction is practically eliminated. The safety data accumulated to date confirms this observation.

"One of the important considerations of rabies vaccine modified virus is the duration of immunity of the dog following a single intramuscular injection. Up to the first of this year, our laboratory challenge tests in dogs have demonstrated that the immunity following a single intramuscular injection of rabies vaccine, avianized virus, was durable to and beyond one year. In early February, a two-year challenge test was conducted and the preliminary results at 50 days post challenge are enclosed. Due to the occasional long incubation period of rabies in the dog - we had one case that went 260 days - a final report cannot be submitted at this time. However, past rabies challenge experience and the unusual high mortality in the control group, justifies a

preliminary report. The results indicate that the avianized rabies vaccine confers a much more durable immunity than phenolized brain tissue vaccines and for all practical purposes protection can be considered to be in excess of two years."

I think this is probably as much of a condensation of our present information as I can give you at this time. This new vaccine is now being used in 35 States. We still have no reports of any reversion of the virus, and we have had no reports of any postvaccinal paralysis. We have reports and data that indicate the period of protection is appreciably longer than we can get from killed vaccine made of the central nervous tissue. It is going to take another 2, 3, or 4 years to determine the full length of the protection from one injection. We know that it is good for 2 years, maybe good for 3, maybe good for longer. Until time passes, and we accumulate more data - that is all we know!

DR. ROGERS: Does anyone have any questions that he would like to ask Dr. Welsh, of Lederle Laboratories?

If not, I believe we had better bring our panel discussion to a close, go into committee meeting, and reassemble all interested parties at 4:00 o'clock.

RECOMMENDATIONS

WHEREAS, rabies has become established and appears to be spreading through the upper Mississippi and Missouri Valleys and so constitutes a serious threat to human health, agricultural economy, and wildlife resources of this area, representatives of the affected States and the personnel of responsible Federal agencies met at Omaha, Nebraska, on May 21-22, 1951, and in closing agreed as follows:

1. That each of the affected States inaugurate coordinated programs for the control of rabies; that each State's program can most effectively be carried out through the creation of a committee composed of representatives from those agencies at the State level responsible for public health, livestock disease control, and wildlife conservation.

2. That each State arrange for adequate diagnostic facilities, and that reports of rabies cases in animals be collected by an approved State agency, and that the State health officer include these data in the weekly telegraphic reports to the U. S. Public Health Service.

3. That the epizootiology of rabies in wildlife is inadequately understood, and to urge that investigation of this subject be made to provide information necessary for the intelligent and effective control of this disease.

4. That technical assistance and guidance is available from the U. S. Public Health Service of the Federal Security Agency, the Fish and Wildlife Service of the Department of the Interior, and the Bureau of Animal Industry of the U. S. Department of Agriculture.