

Rabies

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RABIES CONTROL

Victor C. Hobday

FOREWORD BY - L. M. Graves, M. D.

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MUNICIPAL TECHNICAL ADVISORY SERVICE

DIVISION OF UNIVERSITY EXTENSION UNIVERSITY OF TENNESSEE KNOXVILLE

. A WORD ABOUT THIS PUBLICATION

This bulletin deals with a subject that frequently deserves more attention from municipal officials than it receives. Most cities probably have inadequate control measures to guard against the danger of rabies, and quite often the problem is overlooked entirely. Perhaps such a situation is the result primarily of a lack of information - and it is this need that this bulletin attempts to meet by outlining effective measures and the reasons for taking action.

Mr. Hobday, in this bulletin, has attempted to correlate available authoritative information on the subject. He is, of course, primarily concerned with administrative features of control programs and not the medical aspects, although it was considered necessary to mention the latter for background purposes. We hope this bulletin will be a helpful guide to municipal officials who feel the need for a positive program of rabies control. The staff of MTAS is available at all times for consultation and assistance to Tennessee cities on the administrative, non-medical aspects of such programs, and we shall be glad to be of service in any way possible.

We wish to express our appreciation to Dr. R. H. Hutcheson, State Commissioner of Public Health, Dr. L. M. Graves, Director of the Memphis and Shelby County Health Department, and Dr. J. W. Erwin, Director of the Sullivan County Department of Health, for their review of the manuscript and constructive comments. We also wish to thank Dr. Graves, Dr. Erwin, Dr. Monroe E. Brown, State Director of Local Health Service, Mr. Raymond E. Dixon, Executive Officer of the Kentucky State Department of Health, and the staff of the Atlanta office of the U. S. Public Health Service, for their cooperation in furnishing materials and information on this subject.

Gerald W. Shaw, Executive Director
Municipal Technical Advisory Service

October, 1950

FOREWORD

Rabies is unique in that it is one of the few diseases that is both one hundred per cent fatal and one hundred per cent preventable. It knows no climatic, seasonal or geographical bounds but is world-wide in its distribution, Australia being the only large land area which has remained free from the disease.

It is known to have existed since before the Christian era and was recognized in this country as early as 1753. Despite our long experience with it and the fact that adequate knowledge for its control is available, its incidence in this country continues to increase year by year and Tennessee remains among the states with the highest number of cases.

Measured by human mortality figures alone rabies would be relatively unimportant in this country, but there are no statistics to measure the suspense, anxiety and mental anguish of the thirty thousand persons annually who are required to take antirabic vaccine because of exposure to the disease. Nor do these figures reveal the millions of dollars annual cost of livestock, medical care, and drugs.

The following article contains valuable, up-to-date information about the problem of rabies and sets forth the relatively simple means by which it can be controlled. It should receive the commendation of government agencies everywhere which are interested in the eradication of a dangerous disease and the saving of millions of dollars.

L. M. Graves, M. D., Director
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R A B I E S C O N T R O L

Introduction

A dog has been called man's best friend, but when infected with the disease of rabies a dog may be his worst enemy. The danger of a bite by a mad dog is pointed up by this fact - death always occurs if the disease of rabies develops. There is no known case of a human being recovering from rabies. Of course this does not mean that every person bitten by a rabid dog dies, because it is possible to prevent the disease after a bite by anti-rabic treatments. The impetus for adoption of adequate control measures may be found in the fact that in communities where animals are protected against the disease, the hazard to human beings has been greatly reduced or eliminated. In this bulletin medical aspects of the disease and control measures adaptable to Tennessee communities will be outlined.

The need for control

The effects of rabies are more widespread than the average person may realize. About thirty thousand persons in the United States annually are required to take the long and often painful series of vaccine inoculations after exposure to rabid dogs. It is estimated that nearly 500,000 people annually in the U. S. are bitten by dogs - not all of them necessarily rabid - but each bite carries a potential danger of rabies until it is proved that the dog was not rabid. It is also estimated that about 16% of persons bitten by rabid dogs actually develop rabies. From 1938 to 1945 an average of 36 persons died each year from the disease. The annual cost of human vaccine treatments and livestock losses has been estimated to exceed five million dollars.

Most states and communities have practically no rabies control programs. Even the few states, counties and cities which have excellent programs may be in constant danger of the disease being introduced from adjoining territories that have ineffective programs or none at all. The rabid animal respects no state, county or municipal lines but may roam for miles, spreading the disease wherever it goes. Thus is emphasized the need for nation-wide action.

Under our Federal system control measures would fall within the police powers of the states, and a nation-wide program would therefore seem to be attainable only by action of all states. The U. S. Public

Health Service is prepared to work with the states toward this goal, including the making of grants-in-aid where financial assistance is needed. However, since this ideal situation apparently lies in the far-distant future, it behooves municipal officials to do their best to protect the people and animals of their respective communities. Municipal officials might also encourage county authorities to take action (as has been done in Sullivan, Davidson and Shelby counties), as a county-wide program would give more protection than only a city-wide program.

Information about the disease

The development of the disease in man has three stages. In the first stage restlessness, irritability, loss of appetite and melancholia are experienced, followed by headache, depression and emaciation. The second, or excitement stage is characterized by uncontrolled agitation, excessive salivation, difficulty in swallowing and convulsive spasms so severe that death often occurs during one of them. This is followed by the paralytic stage, which inevitably ends in death from cardiac or respiratory failure within two or three days. Rabies control, then, is entirely a matter of prevention, since cure of the disease is impossible once it has developed.¹

It is extremely important of course that the disease in animals should be promptly and correctly diagnosed, and that anti-rabic treatment be taken by persons bitten or exposed to the saliva of an infected dog. The symptoms in dogs are described by one writer as follows:

A troubled, distracted look may appear and grow in the dog's eyes; he may show a lack of desire to recognize or be friendly with other dogs or with man. Sometimes, however, he may actually become more gentle and friendly. Soon the animal becomes either unusually restless or quiet. The disease then appears to assume one of two general clinical forms, that of furious rabies or of dumb rabies.

If furious rabies is developing, the dog wanders about, avoiding familiar individuals. Then follow signs of excitability or irritability. If confined, the animal moves about ceaselessly, snapping or biting at objects nearby, especially at any recent wounds on his own body. He barks repeatedly without apparent cause. Fine tremors are almost always present, often followed or accompanied by spasmodic muscle contractions. The animal is said to develop a perverted appetite, swallowing cloth, stones, sticks, etc. If allowed freedom, he may stray long distances, snapping and biting at whatever he encounters and perhaps eventually returning home. The third group of signs reflects muscle paralysis; excessive salivation and possibly convulsions develop in this stage. The bark may become hoarse or disappear entirely; the lower jaw may hang loose, the tongue protrude, the head may be turned abnormally or droop

listlessly. Nearly always the hind legs grow weak, producing an ataxic gait, and finally fail to support the animal. Prostration and death follow shortly thereafter. The entire duration of sickness averages 4 to 7 days, though occasionally it is much longer.

If dumb rabies develops, paralytic rather than irritative phenomena predominate. The animal is not especially irritable, rarely bites, but is lethargic as though in a toxic state. Tremors and paralyzes soon develop, especially paralysis of the lower jaw, followed shortly by complete prostration. After lying quietly for a few hours or perhaps as long as 2 days, the animal succumbs.²

As part of any rabies control program the public should be thoroughly informed about the disease and of the proper action to take when a dog develops rabies or is suspected of having the disease. This may be accomplished by leaflets, pamphlets, newspapers, radio, and other publicity media. The foregoing quotation and the following are illustrative of the kind of information that should be widely disseminated.

When an animal is suspected of rabies, the dog-owner should confine him and watch to see whether his reactions continue in the rabies pattern. It is important not to kill the animal at the first sign of the disease. The tell-tale Negri bodies in the brain which laboratory inspection considers proof of rabies do not develop until about the seventh day after infection. If the animal has to be killed, which rarely occurs, it is important not to destroy the head since that is used in the laboratory analysis.

The rabid animal may infect a human from one week before he first shows symptoms until his death, the span of infection usually covering about 18 days. Infection may occur either from a bite or from contact of the dog's saliva with an open wound.

If an adult is bitten by an animal suspected of having rabies, it is permissible to wait a few days before beginning anti-rabies inoculation to determine whether the animal is actually infected. In the case of children it is less feasible to delay treatment due to their greater susceptibility and the possibility that they have inaccurately described conditions under which the wound occurred. The anatomical part involved is very important. Bites involving the face or neck have a much shorter period of incubation than do bites involving deep flesh wounds of the extremities.³

Other mass educational devices, the sound filmstrip and the motion picture, can be effectively utilized in an anti-rabies program. A 35 mm sound filmstrip, "The Fight Against Rabies" (CDC No. 5-093.0), and a 16 mm. sound motion picture, "Striking Back Against Rabies" (CDC No. 4-087.0), are excellent for the information of officials concerned with

such programs and the general public. A 35 mm. sound filmstrip, "Laboratory Diagnosis of Rabies" (CDC No. 5-105-0), and a 16 mm. sound motion picture, "Laboratory Diagnosis of Rabies" (CDC No. 4-111-0), would probably interest only technical personnel. These filmstrips and motion pictures may be obtained on a loan basis from the Medical Director in Charge, Communicable Disease Center, 605 Volunteer Building, Atlanta 3, Georgia, by paying only the return postage and insurance costs.

Control measures

Since prevention is the only means of protecting human beings against this dread disease, it is up to proper governmental authority to impose necessary preventive measures. The single most effective means of control is compulsory vaccination of all dogs. Vaccines approved by the U. S. Bureau of Animal Industry are effective for at least a year, and therefore a requirement that all dogs shall be vaccinated once a year will very effectively guard against epidemics of the disease and may even prevent any isolated cases from developing. Several European countries have succeeded in eliminating the disease altogether, and a case has never been known in Australia, where all foreign dogs must be quarantined for a long period after entry into the country.

The experience of Memphis and Shelby County is an excellent example of the effects of a good control program.

One of the most forceful demonstrations of the effectiveness of canine vaccination was presented just a year ago during an outbreak of rabies in Memphis, Tenn. Rabies incidence, which had been at a substantial endemic level in Memphis and in Shelby County for years, suddenly began to reach alarming epidemic proportions in the late winter and spring of 1948. By March, positive animal cases were being reported at the rate of more than one a day. The number of cases was twice that reported for the same period in 1947, and four times as many as in 1946. Over 150 persons had undergone the full series of anti-rabic vaccine treatments, which in the first 3½ months exceeded the total number of treatments for any previous entire year. At that time we were called in to assist in the planning and operation of an emergency control program.

It was noted that the disease continued to spread in spite of a strict dog quarantine, adequate stray dog control and a good licensing law. It was estimated that about 8,000 dogs were vaccinated annually. Working swiftly and efficiently, the Memphis and Shelby County Health Departments set up machinery for a voluntary dog-vaccination program by mobilizing the practicing veterinarians of the community and alerting dog owners through every conceivable medium. A series of 70 emergency dog-inoculation clinics were operated over a 6-day period at strategic locations throughout the city and county. The vaccination charge was \$1 per

dog, regardless of dose. As a result, 23,000 dogs were inoculated during the 6-day emergency program. Added to those vaccinated by veterinarians in their routine practice, preceding and following the campaign, it is estimated that 80 percent of the dog population was immunized.

The results of the Memphis program were phenomenal. In the ensuing months, the positive cases began to drop until the last case of animal rabies and the last human anti-rabic vaccine treatment were reported in July. Both city and county remained entirely free of rabies until March 10, 1949, when the first rabid animal since July 22, 1948, was picked up at the city limits. Seven months without a single case of rabies was a new and refreshing experience for Memphis. Despite the thorough dog control activities, it was not possible to eliminate rabies from the area until mass immunization was added in the emergency program of 1948. The results of this episode stand as dramatic testimony to the importance of canine vaccination.⁴

The results that may be expected from a failure to require vaccinations is found in the following report on Alabama, which has a progressive law that has been enforced in most counties:

In 1942 only 3 counties of the 67 in the State had more than isolated cases of rabies and 45 counties reported no rabies. The 3 counties . . . accounted for 181 of the 220 cases of animal rabies reported during the year. None of these three counties appointed a rabies inspector to carry out the vaccination program . . . During the period of 1937 to 1943 Mobile County had an average of 108 reported cases of animal rabies a year. In this instance there was active opposition to vaccination and only a small proportion of the dogs were vaccinated on a voluntary basis. During 1942 this county submitted 157 of the 220 animal heads found positive for rabies in the entire State.⁵

Additional evidence of the effectiveness of vaccinations is furnished by the following statistics for Summit County, Ohio:⁶

	1944	1945	1946	1947	1948	1949 (to 8/22)
Dogs registered	25,000	26,000	28,959	32,511	32,550	34,531
Positive cases of rabies	80	218	54	1	1	0
County wide quarantine	yes	yes	none	none	none	none
Voluntary vaccination	none	5,000				
Compulsory vaccination			yes	yes	yes	yes
Vaccinated dogs having rabies	0	0	4	0	0	0
Unvaccinated dogs having rabies	80	218	50	1	1	0
No. of dogs vaccinated	*	5,000	26,700	28,800	27,600	29,300
Dogs impounded and destroyed	4,940	6,227	3,300	3,196	*	*

*Statistics not available

The effectiveness of mass immunization of dogs was dramatically illustrated in Golden, Colorado, which has had a compulsory dog vaccination ordinance in effect since March 3, 1949. Neighboring Denver was without such an ordinance. In the first three months of 1950, Denver and the surrounding area reported 60 known cases of rabies, more cases than had been recorded in the entire state for the ten previous years. Golden, though in the heart of the affected area, did not have a single rabies case.

Mass immunization of dogs and other rabies controls are often endangered by official complacency. The following comment was made by a veterinarian with respect to the Denver situation:

Much of the failure of rabies control programs in various communities is due to lack of cooperation on the part of local city councilmen who assume the role of pseudo-experts and immediately persecute the veterinarian for commercialism.

The rabies problem in Denver was presented to the council in 1947 with the prediction that if nothing was done, a more serious problem would develop. The ordinance was tabled. Our present epidemic is the result.⁷

Voluntary controls are far less satisfactory than compulsory measures in an anti-rabies program. This news item appeared inconspicuously in a Knoxville newspaper on April 23, 1950:

GET DOGS IMMUNIZED. HEALTH OFFICER URGES

Have you had your dog immunized against rabies? Dr. A. G. Hufstedler, county health director, advises rural residents to have their dogs vaccinated to avoid another epidemic. Knox County was quarantined in 1948 because of rabies. Twenty-four persons, mostly children, were bitten by dogs in the last three months. Two of the animals were rabid. County Humane Officer Mark Tarwater said he would have a veterinarian visit communities where as many as 10 dogs could be vaccinated at a time. Cost would be \$2 per animal.

The announcement deserved more prominent attention. It probably would have received it, and would have been more effective if the County Health Director could have announced that vaccinations are required (and why), instead of simply pleading with dog owners to take such action. Appeals for voluntary vaccinations and the imposition of quarantine restrictions will be heeded by the public when an epidemic is underway, because people are alarmed then, but in normal times, with very few cases of rabies to make scare headlines, most people will not voluntarily comply with such measures. The best solution therefore seems to be that governmental authority should be used, as in so many other fields, to protect the public health and welfare.

Programs in three Tennessee counties

At least three Tennessee counties have instituted programs to deal with the threat of rabies: Sullivan, Davidson, and Shelby. The main points in these programs will be briefly reviewed.

The Sullivan County Board of Health, acting under sections 5775-5783 of the Tennessee Code, has adopted a Rabies Control Regulation which contains most of the customary methods of control except licensing of dogs, which is a power it does not possess. This regulation requires every dog, cat and household pet over six months old to be immunized by vaccination against rabies once each twelve months, and an identification tag bearing the owner's name and address and the date of the last vaccination must be worn at all times by the animal so immunized. Until six months old the animal must be confined or kept on a leash. A dog, cat or other household pet suspected of having rabies must be confined and separated from all other animals for at least 14 consecutive days, and if exposed to a rabid dog or animal must be so confined for at least six months or be killed and buried. The County Health Officer is authorized to place a quarantine on all dogs or other animals when he considers that circumstances require such action. Provision is also made for the disposition of stray and ownerless dogs, the disposal of dead animals, and the confinement of female dogs during the copulating season. Penalties of \$5.00 to \$50.00 for each offense are provided for violations of the regulation.

Chapter 633 of the Private Acts of 1949 established licensing and vaccination requirements for all dogs in a county having a population of 257,267 to 260,000 (Davidson County). This Act makes it unlawful to own, keep or harbor any dog over six months of age that has not been immunized by vaccination against rabies once each twelve months, and a certificate of a licensed veterinarian is required as evidence of such vaccination. The veterinarian makes the certificate in triplicate; one copy is given to the owner of the dog, one is sent to the health department, and one is retained by the veterinarian. A license fee of \$1.00 on each dog must be paid to the County Trustee on or before January 1 of each year, but no dog may be licensed unless a certificate of rabies vaccination is presented. A metal license tag is issued that must be worn by the dog at all times, and duplicates may be obtained at 25¢ each. Kennel fees are also established, but every dog in the kennel must be vaccinated before the license may be issued. Female dogs must be confined at least 21 days during the copulating season. Any dog running at large, in violation of the statute, is subject to impoundment and redemption, within five days after a postal card notice to its owner, upon the payment of a pound fee of \$1.50, and if unvaccinated the dog must first be vaccinated. Dogs not redeemed within the period of redemption are subject to destruction. The law requires vicious or biting dogs to be kept securely tied or fenced or housed securely. The health department is authorized to confine as long as necessary any dog that has

bitten a person or is suspected of having rabies. The Board of Health is responsible for enforcement of the law, and penalties of \$5.00 to \$50.00 for each violation are provided. The Act also stipulates that any city within the county having a population of 165,000 or more (Nashville) may impose the same regulations and license fee, and to the extent that the city exercises such powers the county regulatory provisions do not apply to dogs within the city limits.

Memphis enacted a dog control ordinance in 1928 and a 1935 Act of the state legislature provided for a control program in Shelby County. A modern dog pound constructed in 1936 at a cost of \$19,000 is operated in connection with the city and county programs. The Memphis program is under the supervision of the department of public safety, and the health department is responsible for enforcing certain control regulations. The county program is administered by the health department. The operation of the two programs is described in the following release by the Memphis and Shelby County health department:

In view of the fact that rabies is maintained solely in animals, primarily the dog, the routine control measures consist principally of the annual licensing of all dogs, picking up dogs running at large, the elimination of stray dogs, the elimination or control of dogs exposed to rabies, the strict management of dog bite cases, the microscopic examination by the laboratory of the brains of dogs suspected of having rabies, and the anti-rabic treatments by the medical division of persons bitten by rabid dogs.

Annual licensing of dogs in the city and county is required and the license fee is one dollar (\$1.00) for each male or female dog over four (4) months old. Persons operating kennels are not required to pay the above license fee but in lieu thereof shall pay a special license fee as kennel keepers. When dogs are impounded for any reason the owners of same are required to pay a pound fee of one dollar and a half (\$1.50) in the case of city dogs and one dollar (\$1.00) in the case of county dogs before these dogs can be redeemed. Approximately 26,000 dogs are licensed in the city and 10,500 in the county annually. The revenue derived from license and pound fees more than pay the expenses incidental to all dog control operations. The gross revenue in 1948 (license and pound fees) was \$10,235.25 for the county and \$31,851.15 for the city.

Main features of a control program

The foregoing facts should establish the need for a rabies control program in any city. The MTAS attorney is of the opinion that any city in Tennessee has authority to take such action. What are the specific measures that a city should use in such a program? MTAS upon request will assist a city in drafting an ordinance, but certain essential provisions of such an ordinance and suggested administrative practices will be briefly mentioned.

1. Annual licenses should be required for all dogs, to be issued between January 1 and March 31 and to cover the calendar year. This allows enough time to avoid swamping veterinarians for vaccinations within too short a space of time. This period also precedes the time of greatest incidence of the disease. "Contrary to popular opinion, rabies is not a summer disease confined to the so-called 'dog days,' but is a year-round problem, being most prevalent in the late winter and spring."⁸

2. Vaccination should be required before a dog is licensed. There is greater assurance that a dog will be immunized from one year to the next if the vaccination is given at the same time of issuing the license. Paducah, Kentucky, uses a very simple plan which will work well with the cooperation of veterinarians. All the veterinarians of the city are designated agents of the city to issue dog licenses. Each veterinarian obtains a book of pre-numbered license certificates, in duplicate, and correspondingly numbered metal tags, and pays the city 25¢ for each certificate in the book; if all certificates are not used a refund is made when the book and tags are returned. (The metal license tag might be eliminated by substituting for it the metal tag usually issued by a veterinarian to indicate a dog has been vaccinated.) The license ordinance imposes a license fee of \$1.25 on each dog, whether male or female, and provides that the veterinarian shall retain \$1.00. The veterinarian inoculates the dog and then delivers the original copy of the certificate and the metal tag to the dog owner, retaining the duplicate copy of the certificate in the book to be later returned to the city. The metal tag is to be worn on the dog at all times. It is better that the fee be the same for male and female dogs, and as low as possible, to encourage the vaccination of all dogs with a minimum of enforcement action. The license fee probably should not be more than enough to cover actual costs incurred by the city in operating the dog control program and the veterinarian's fee, and it may even be desirable that the city should pay its costs from the general fund in order to lower the amount of the license fee. Dogs should not be allowed to run at large for 30 days following a vaccination, as the vaccine is not fully effective until the end of that time. Vaccination should be required when a dog is six months old and annually thereafter, and dogs under six months of age should be confined, since puppies are not as readily immunized as adult dogs.

3. A dog pound should be provided, and personnel, either a dog catcher or perhaps police officers in smaller cities, should be charged with enforcement of the provisions of the ordinance. Any dog without a license tag on his collar should be considered prima facie unlicensed and should be impounded, subject to redemption by the owner within three to seven days upon the payment of a fixed fee (such as \$1.00) plus a daily charge (such as 50¢). Even licensed dogs running at large may be made subject to impoundment if it is desired to prevent dogs from running at large. Impounded dogs not redeemed within the stated time period

should be sold or killed by a humane method. Dogs not wanted by anyone, instead of being killed, could be much better disposed of by selling them to laboratories that produce anti-rabies vaccine, and those persons with misguided sympathies in this respect should be reminded that it is only by the use of such dogs in such laboratories that the control and prevention of this dread disease is possible to protect man and other animals. If killing is necessary, probably the best and simplest method, generally approved by veterinarians as most humane, is to construct an air-tight chamber into which carbon-monoxide gas can be introduced through a hose or pipe connected to the exhaust pipe of any truck or automobile - in less than a minute the dog is painlessly killed.

4. Stray dogs should be made subject to immediate impoundment and to be disposed of by death or sale to a laboratory, and this provision should be strictly enforced. It is the stray dog, with no owner responsible for having it vaccinated, that is the most effective agent for spreading the disease, and it should therefore be promptly eliminated.

5. Some cities have made arrangements with an organization, such as the Society for the Prevention of Cruelty to Animals, a Humane Society, or the Animal Rescue League, to enforce the dog ordinance and administer the dog pound. There are enough headaches connected with the whole matter that city officials should quickly make such an arrangement whenever possible, providing the city can be assured of efficient and thorough administration of the program. The city should be prepared to resume control if at any time it appears that the program is not being properly administered, and in any case should retain sufficient authority to insure that the provisions of the law are enforced.

6. Dog owners should be made liable in civil action for damages or injuries caused by their dogs, whether licensed or not.

7. It should be required that any dog that has bitten a human being or has shown symptoms of rabies shall be confined, in the dog pound or elsewhere, under the supervision and observation of a veterinarian. Any dog known to have been exposed to rabies should be so confined for at least six months or should be killed.

8. The proper public health authorities should be empowered to impose quarantine regulations when considered necessary to avoid spread of the disease.

9. Appropriate and reasonable penalties should be provided for violations of the ordinance.

Conclusion

The primary aim of a dog licensing program should be the prevention of rabies. Officials should not assume that because there has never been any cases of rabies, or perhaps very few cases, that an epidemic will never occur, because an outbreak may come at any time. An ordinance requiring vaccinations is a long step forward, but it should be accompanied by a good public relations program. How much better that the citizens of a community should be thoroughly informed of the dangers of rabies and the reasons for compulsory vaccinations as a measure for their protection instead of simply announcing that the law of the city requires them to have their dogs licensed and vaccinated! A leaflet could advantageously be distributed with each dog license issued, or could be given even wider distribution.

The line of least resistance and the path of procrastination with reference to this problem is to do nothing unless an epidemic stirs a community to demand action. Wouldn't it be preferable to prevent the epidemic? Saving the life of one child would more than outweigh the inconvenience and effort involved in a positive, aggressive program of prevention.

FOOTNOTES

¹ Bulletin of the Department of Health, Commonwealth of Kentucky, Vol. XXI, No. 11, June, 1949, page 163.

² Leslie T. Webster, M. D., Rabies (New York, The MacMillan Company, 1942), pages 5-6.

³ "Rabies," by Francis Candlin, D.V.M., in Colorado Municipalities, monthly publication of The Colorado Municipal League, Vol. 26, No. 4, April, 1950, page 59.

⁴ "Rabies Problems and Control," by James H. Steele and Ernest S. Tierkel, in Reprint No. 2941 from the Public Health Reports, Vol. 64, No. 25, June 24, 1949, pages 5-6.

⁵ "Control of Rabies," Reprint No. 2805 from the Public Health Reports, Vol. 62, No. 34, August 22, 1947, page 7.

⁶ Colorado Municipalities, op.cit., page 60. The statistics were taken from The Allied Veterinarian.

⁷ Ibid., page 61.

⁸ Bulletin of Ky. Dept. of Health, op.cit., page 162.

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