Mosquito Control in Water Resource Projects

These remarks by Dr. Saxvik, and those of Dr. Rowe which follow, are part of a discussion before the 52d meeting of the Missouri Basin Inter-Agency Committee held at Bismarck, N. Dak., October 24, 1951. The committee, created in April 1945, provides a means through which field representatives of Federal agencies exchange information and coordinate activities—among themselves and with the Missouri Basin States—in the preparation of reports and in the planning and execution of works for the control and use of the waters of the basin and for the development of the basin's resources.

I. Prevention vs. Abatement

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Today, we in this country have fashioned for ourselves the highest standard of living yet known to man. We are no longer content to exist in the midst of an unsanitary, dangerous environment. The fight for new remedies and treatments for control of disease is constantly going on. Advances in sanitation which have contributed to the convenience and comfort of the individual have been promptly adopted. Sanitary measures must interpose a barrier in some channel of infection to block the path between the carrier on the one hand and susceptible persons on the other.

Public thinking is on the threshold of a new concept of environmental health. Mosquitoes have been proved to be vectors of disease, but the constant annoyance caused by these insects can seriously impair physical and mental well-being. We have the know-how for controlling mosquitoes, and even for preventing their propagation. We are not going to sit idly by while subjected to the annoying and sometimes dangerous attacks of hordes of mosquitoes.

The Deputy Surgeon General of the Public Health Service, Dr. W. Palmer Dearing, stated on October 12, 1950 that "There are, however, other public health concerns which justify State stipulation as to mosquito control in water impoundment and irrigation projects. The viral encephalitides (forms of 'sleeping sickness') of which there are three major types, endemic and occasionally epidemic in the United States, are transmitted to man by mosquitoes of various species. Human encephalitis is a dangerous disease attacking man in a manner similar to poliomyelitis."

Dr. Dearing, in the same statement, said, "It is our conviction that pest mosquitoes should receive more attention from health authorities than they have in the past. Public health has become more than the absence of disease. Physical efficiency and comfort, on which mental equanimity depend to a substantial degree, may be seriously disturbed by the continued annoyance of pestiferous mosquitoes which may or may not have disease-transmit-

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ting potentialities. This principle has already been recognized by the Departments of the Army and of the Air Force in the development of pest mosquito control methods to be used for the protection of troops in the Arctic."

Mosquito Control

Mosquito control undertaken because of public demand usually becomes the responsibility of the local health department. After the problem has been allowed to develop, control by modern methods is both difficult and expensive. More public dollars are required and a greater potential hazard exists. In California, the annual expense for mosquito abatement alone is now nearly 2 million dollars. Where irrigation is extensive, typical costs per year, by counties, are: Alameda, $108,000; Fresno, $94,976; and Merced, $166,668. These figures do not reflect the cost of a complete program of correction. It is estimated that effective control of the overall problem would cost approximately 10 million dollars per year. Much prevention could have been effected at a nominal portion of this cost. In the Milk River Area of Montana, Malta and Glasgow, towns of 2,500 and 4,000 population, respectively, have found it necessary to begin mosquito control, and have annual budgets of $3,000 and $2,000 for this work. They are too late to prevent mosquitoes so they are beginning the costly cure. The same situation exists in several States where irrigation is practiced. Experience has demonstrated that through active and cooperative efforts of all the various agencies and groups engaged in water development work, a great many problems will be avoided and others will be minimized if careful planning for mosquito control precedes construction work.

Encephalitides Vector

Mosquitoes have been shown to transmit at least five strains of encephalitides—western and eastern equine, St. Louis, California, and Japanese B. The Missouri River Basin has representatives of the species of mosquitoes that carry these five strains. Also, several unidentified viruses associated with mosquitoes in nature have been found through recent research. Pathogenicity of these viruses to human beings remains to be determined.

In North Dakota, during the past 5 years, there have been 285 cases and 29 deaths due to encephalitis. During 1936–40 there were 160 cases with 60 deaths, while in the period 1941–45 there were 1,215 cases, with 187 deaths. This last period includes the epidemic of 1941 when in 1 year, there were 1,101 cases resulting in 134 deaths. During this epidemic, the case incidence was 171 per 100,000 population with a mortality rate of 20.8 per 100,000 population, indicating that encephalitis is a real problem in North Dakota.

Serologic Examinations

The Rocky Mountain Laboratory of the Public Health Service, at Hamilton, Mont., has been examining a series of routine blood samples submitted to the North Dakota State health department laboratories for examination of antibodies of western equine encephalomyelitis in human beings. A total of 2,194 serums was examined; 356 showed a positive result. Samples from all 53 counties in the State were included. On a percentage basis, this was a 16.2 percent positive sample, or one out of six serums examined. We fully realize the seriousness of this disease when we consider that one out of six residents of North Dakota has had encephalitis in varying degrees of severity at one time or another, if the results of the tests of blood samples are representative of the extent of infection in residents of the State.

As yet, there is no known specific therapeutic treatment for virus encephalitis. The importance of prevention is immediately obvious: prevention is possible only through the control of the mosquito vectors. There is presumptive epidemiological evidence that poliomyelitis may possibly be transmitted by biting insects, perhaps mosquitoes, and if by mosquitoes, then by species widely prevalent in this area.

A study of the outbreak of encephalitis in Barnes County in 1949 lends support to this evidence. During a brief period, three distinct types of central nervous system illness occurred. Two of these were caused by known diseases—poliomyelitis and western equine en-

cephalomyelitis—but antibodies for the recognized neurotropic viruses present in this area were not found among the greater number of ill persons, indicating the existence of a third undetected and unidentified virus whose mode of transmission is unknown.

Equine Encephalitis

While encephalitis in equines is not considered a public health problem, the disease has economic importance and is of considerable concern to agricultural interests. The number of cases in horses is steadily dropping, which can be accounted for by the 300-percent reduction of the horse population during the last 15 years. Pest mosquitoes are of economic importance to the dairy and stock farmer. It has been proved that milk losses are considerable on dairy farms during the mosquito and fly season. Beef cattle, if bothered by pest mosquitoes, fail to gain weight or to develop properly. In considering the over-all benefits of mosquito abatement, these agricultural benefits must be taken into account.

Control Program

The North Dakota State Department of Health has initiated a mosquito survey and control program. Through the cooperation and financial aid of the Public Health Service an entomologist has been obtained to work with Federal, State, and local agencies toward carrying out mosquito-prevention measures during the planning, construction, and operation of water resources projects. The entomologist will evaluate present habitat and species found in the State, and will seek to determine what disease-carrying species are present. The changing ecologic conditions will also be studied to evaluate the future mosquito problem.

It is the sincere hope of all health officials that future water resources development projects include antimosquito precautions and practices. Efforts aimed at the elimination or minimization of health hazards due to mosquito vectors would do much to control disease transmission, and at the same time would tend to reduce the density of pest mosquitoes. If this is done, another step forward in the improvement of our environment will have been made.

Control and Poliomyelitis

It has been observed that in the past few years a high percentage of cases of poliomyelitis have come from rural areas where DDT and other insecticides are not widely used for control of mosquitoes. Although there is no positive data available, workers in the field have observed a lowering of the incidence of virus diseases in urban areas where DDT is used to control mosquitoes. This has been true in North Dakota, where a majority of cases of poliomyelitis and encephalitis have occurred among rural residents, rather than in the larger communities where mosquito control has been practiced.

Data show that many species of animals serve as hosts to the viruses, with a widespread and complicated infection chain in nature which involves arthropods, birds, and small mammals. Data bearing upon mosquito transmission of the virus are sufficient to propose that antimosquito measures are the best method of control at present. A barrier between the carrier and susceptible persons must be established by adequate mosquito control. It is the only known method for controlling encephalitis and perhaps other virus diseases. North Dakota now has a considerable mosquito problem due to large areas of stagnant water in potholes and low-flow streams during the warm summer months. The development of irrigation, if not properly constructed, will increase this problem. Water is a factor common to all outbreaks of encephalitis. Water determines where maximum populations of people will be found and where mosquito densities will be greatest. The encephalitis rate is now excessively high in North Dakota, and if we allow an increase in mosquito density, we will have a problem of increased magnitude. It is essential that present mosquito problems not be aggravated and that new ones not be created.