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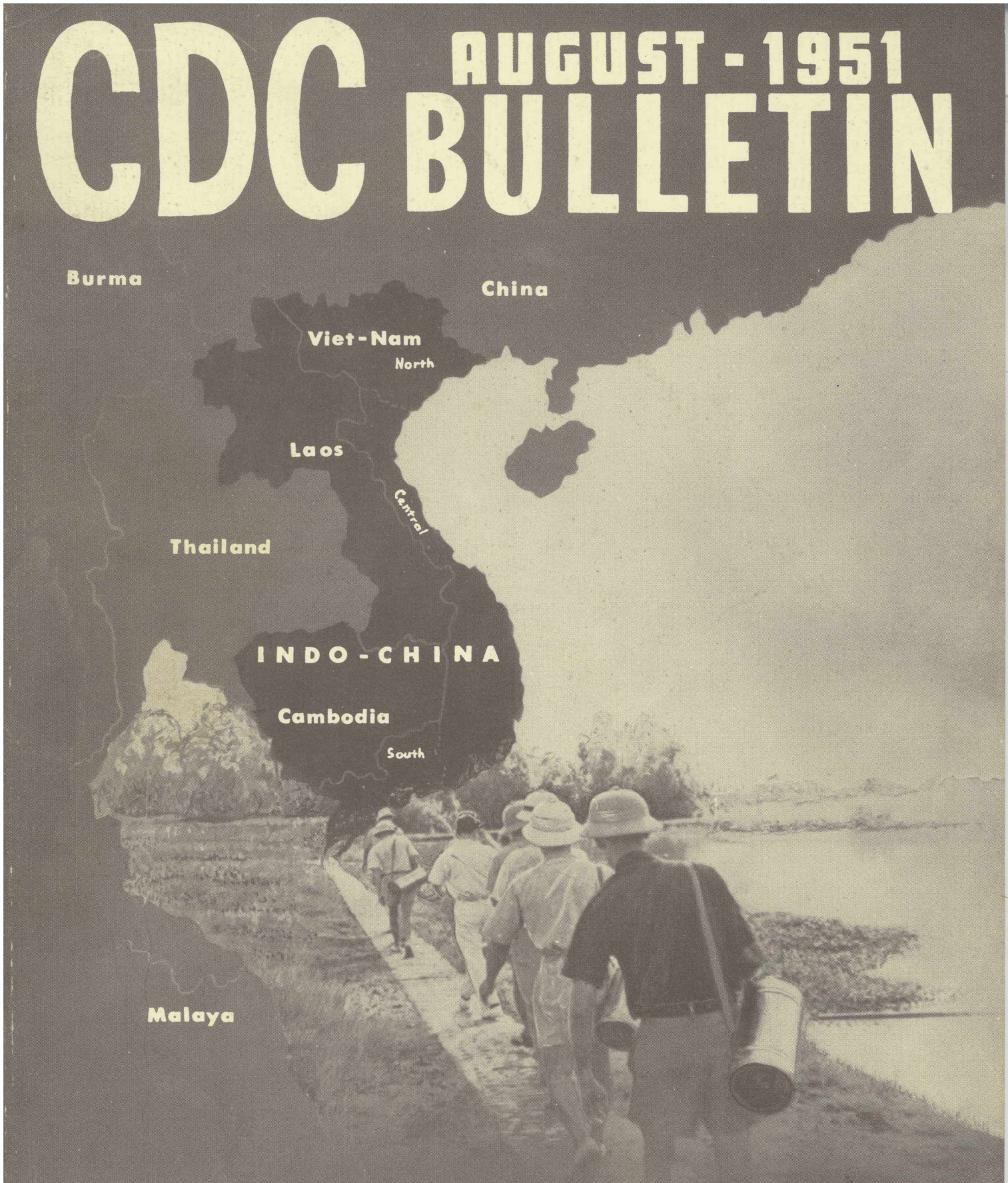

MALARIA CONTROL IN NORTH VIET-NAM, INDO-CHINA

Federal Security Agency Public Health Service Communicable Disease Center Atlanta, Georgia

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Malaria Control in North Viet-Nam (Tonkin, Indo-China), 1950

F. EARLE LYMAN, Scientist (R)*

INTRODUCTION

The broad ideals and objectives of the Economic Cooperation Administration (ECA) are to aid the free peoples of all nations to recover economic stability and to maintain unhampered their political integrity and socioeconomic independence by following the democratic philosophy of life. Because the good health of any nation is fundamental to the establishment of an economic balance, the Federal Security Agency through its Public Health Service facilities was requested to furnish to ECA the necessary technical personnel assistance to develop public health programs in certain countries of southeast Asia. As a result, the Public Health Service, Division of International Health, during the past summer detailed a group of officers** to the ECA United States Special Economic Mission to Cambodia, Laos, and Viet-Nam*** for the purpose of developing public health as an integral part of the over-all technical and economic assistance program.

These officers, following a period of orientation in Washington, left New York by air on July 5, 1950, for Saigon, Viet-Nam. Brief stop-overs en route were made in London and Paris to allow for professional contacts and conferences at the London School of Hygiene and Tropical Medicine, the British Museum, and the Pasteur Institute in Paris. Approximately 2 weeks were spent in Calcutta, which afforded the opportunity to visit the Calcutta School of Tropical Medicine and to observe malaria control larvicidal operations in and around this city and also water-wettable DDT residual house spraying in the rural areas of West Bengal.

The last stage of the trip from Calcutta to Saigon, the capital city of Viet-Nam, was made on July 25. Several days were spent in Saigon for orientation and discussion of operational plans and for distribution of personnel. The writer was assigned to Hanoi, the capital of North Viet-Nam, to establish a demonstrational malaria control program.

A brief historical background is essential to the understanding of the present working conditions in Viet-Nam. Since the end of World War II, there has been an entire revamping of British, French, and Dutch colonial policies in southeast Asia, with the result that a number of new independent nations have been established in this part of the world. As might be expected under such circumstances, a great deal of unrest and uncertainity has been created among these new nations as to their political and economic future, owing to formation of various pressure groups both from within and from without. Viet-Nam has been no exception. First taken over from France by the Japanese, it was later occupied under the Yalta agreements by the English in the southern half and by the Chinese in the northern half. Ultimately it was returned to the French who, after much negotiating, gave Viet-Nam its nominal independence under the constitution of the French Union. By agreement, the reins of government were turned over to the Vietnamese; however, the French still maintained control and operation of the military, the transportation facilities, customs, communications, and other facilities. Thus, the present political and military situation in Viet-Nam is extremely complex. Internal guerrilla warfare has been waged for several years with the French and Vietnamese nationals on the one side and the Communist-led Viet-Minh faction on the other. The French hold the most strategic centers of population which, although considered as secure areas, are completely surrounded and are constantly harassed by the Viet-Minh.

THE MALARIA PROBLEM

The principal malaria problem in North Viet-Nam is located in the foothill regions where the anthro-

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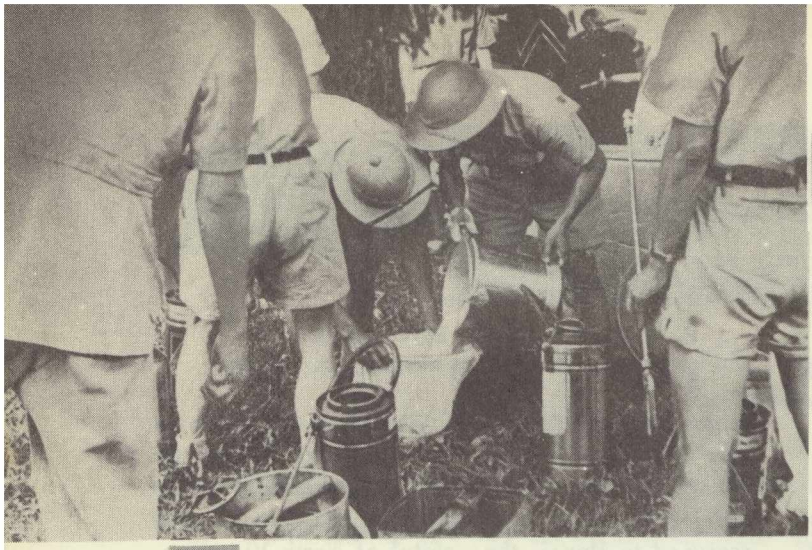
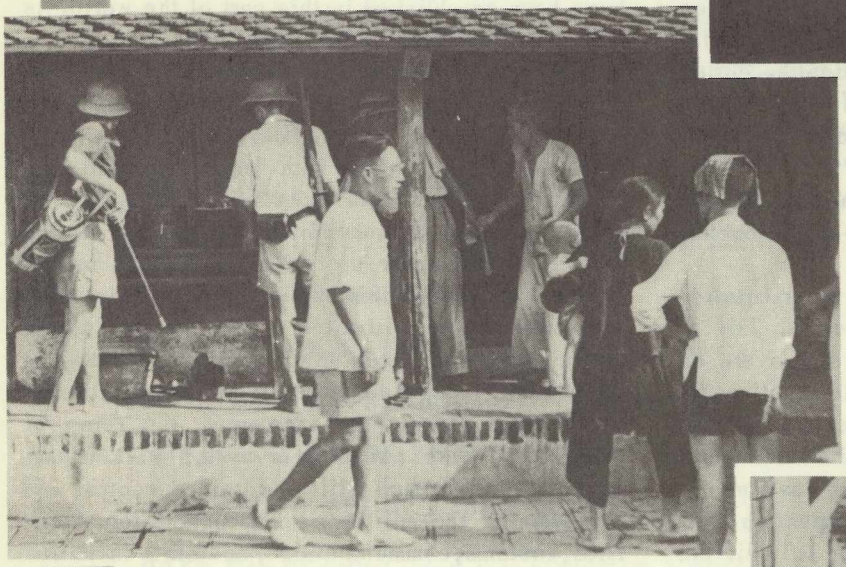
***Formerly French Indo-China but now comprising the three independent nations of Viet-Nam, Cambodia, and Laos, known as the Federation of Indo-China and belonging to the French Union.



Mixing water-wettable DDT. The suspension required straining through fine mesh cloth to prevent clogging of sprayer nozzles.

Spray crew foremen receiving directions through an interpreter.



Spray man, accompanied by armed guard, preparing to spray the porch of a house. Note the man at right wearing a cloth on his head to shade his eyes because of trachoma infection.

Distributing Aralen tablets in Ha Dong for malaria prophylaxis. Woman on the left is taking tablets with native tea.

pophilic mosquito, *Anopheles minimus minimus*, is the chief vector. According to French malariologists, malaria is not as serious a problem in the lower delta sections where *minimus* is ecologically replaced by the zoophilous species, *Anopheles hycranus sinensis*, considered a much less efficient vector than *minimus*. *Sinensis* is seldom found resting inside of houses during the daytime; it may more often be found resting in animal shelters. It does, however, frequently enter human habitations at night. Although a number of other *Anopheles* undoubtedly are concerned to some degree in the over-all epidemiology of malaria in Tonkin, their roles are not so clearly understood. Of greatest concern at present is the fact that in the Red River Delta within recent years the possibility of serious malaria epidemics has been created by the increased numbers of refugees from the foothills who have been arriving daily in the delta area. It is reported that these refugees are infected up to 100 percent with *falciparum* and/or *vivax* malaria. This movement of population is in part a result of the devastation to villages under the scorched earth policy which has been followed by the Viet-Minh during their retreat to the foothills under pressure of the French military forces.

OBJECTIVES

The primary objectives of the malaria control program in North Viet-Nam were (1) the establishment of an operational DDT residual spray program directed against the malaria mosquito vectors; (2) the development of an Aralen (chloroquine) distribution program to eliminate human gametocyte carriers; thus, theoretically, two links in the chain of the malaria transmission cycle would be severed and on the basis of statistical chance of transmission, the most rapid reduction possible would be achieved in the incidence of malaria; and (3) at the same time, long-range planning called for the establishment of a coordinated malaria control organization within the regional and provincial governments which would serve as a permanent nucleus for gradual expansion into areas brought within the security sphere at some future time.

METHODS OF OBTAINING OBJECTIVES

The first step taken toward establishing a functioning organization in North Viet-Nam was the training of spray crews, which was started within a week after our arrival in Hanoi. The first American aid program for Indo-China was formally initiated with all due ceremony in the village of Phung Khoang on August 18, 1950. The training work was done in Hanoi primarily on a practical demonstration basis. For purposes of an expanding program, each spray crew was made up of one foreman, one subforeman, and four spray men, and in addition, a truck driver, who did not participate in the actual spray operations. It was anticipated that eventually only one foremen would be required per crew and that the number of spray men would eventually be reduced to three. Approximately 1 week was required for spray-crew training, with two crews being trained at the same time. During the season a total of only four crews was trained owing to the lack of spray and automotive equipment and to prevailing insecurity conditions. Twenty or more armed guards were required to accompany the spray crews during spray operations for security reasons.

The initial spray crew set-up was found very useful on an expanding program where the inexperienced foreman and subforeman each had to handle only two rather than three or four spray men during the training period when all were new to spray procedures. Moreover, when an additional new crew was to be established, the new foremen were trained first, then an older, experienced foreman was transferred from an already trained crew to take charge of the new crew and the new foreman was used as his subforeman. The experienced subforeman of the experienced crew was moved up to the position of foreman of the experienced crew and took on a new, inexperienced foreman as his subforeman. Thus, each new crew had at least one experienced man in the capacity of foreman at all times.

The training of foremen and spray crews involved discussion through an interpreter of the basic biology of mosquitoes and mode of malaria transmission, together with the principles of control, using modern residual insecticides. It was gratifying to see how quickly this information was acquired and apparently understood by the spray crew personnel, who were very cooperative and anxious to learn. Later, each man was given instructions in the details of operating the sprayer. Practice in spray technique was done first with water. Then, mixing of a 5 percent DDT water-wettable powder suspension was carried out, and practice was given by the actual spraying of government housing quarters and refugee camps in Hanoi before proceeding to the treatment of villages near Hanoi.

During the training period each spray man was given the necessary wrenches, screwdriver, and pliers and taught to service his sprayer. The various technique and sprayer problems were worked out. In order to prevent stoppage of the spray nozzle, the nozzle screen was removed and all DDT suspensions were strained through fine-mesh cloth before being poured into the Hudson 2½-gal. sprayer, which is not considered to be too well designed for use with water-wettable powders. It was also found best to remove as much paint as possible from the pump head and rim of the sprayer to prevent flaking off of the paint and consequent stoppage of the nozzle. A toothbrush was found useful for cleaning the nozzle opening.

Concurrently with spraying operations, a program for the distribution of Aralen was also established; however, most of this work, due to scarcity of personnel, was done by the spray crew foreman as time would allow, or was accomplished by arrangement with local police authorities. A special Aralen distribution team with a man to head and organize this phase of the work was planned so that antimalarial prophylaxis would be initiated before spraying of a village was done. Organized follow-up distribution at weekly intervals was planned but this was not carried out in all instances due to lack of personnel. At the end of the spraying season, October 15, some of the spray foremen were transferred to do Aralen distribution work, primarily on a treatment basis, especially for refugees around Hanoi. The work of distributing 10 percent DDT powder for louse control in refugee camps around Hanoi and in each of the sprayed villages was initiated along with Aralen distribution.

Late in September personnel were obtained to form a malaria blood slide survey team. The objective of this survey work was to determine prevalence of malaria in returning refugees in Hanoi, who were reportedly 100 percent infected, and also to compare sprayed and unsprayed villages, and those treated with Aralen, by taking random samples of the population. Plans were made to continue and expand this work beyond October 15 by using a part of the hospital-trained spray crew foremen. Arrangements were made to ship the slides to the United States for reading, due to the present lack of facilities for large-scale work in North Viet-Nam.

ORGANIZATION

The functional aspects of the North Viet-Nam malaria control organization were visualized as consisting of: (1) medical epidemiology; (2) entomological survey and evaluation; (3) anopheline mosquito control; and (4) training and education.

In order to carry out effectively the program for malaria control on a long-range as well as on an impact basis, consideration was given to the establishment within the Regional Health Department at Hanoi of an over-all malaria control office which would determine policy, administer, coordinate, train, and assist in the guidance and direction of the several malaria control suboffices as might be established in the provincial capitals where security conditions would allow for operations. Under this plan each of the provincial suboffices would be expected, under guidance from the regional office, to set up its own requirements as to personnel, patterned after the regional organization. Selected key personnel would be trained at the regional level and would later conduct further training courses at each suboffice headquarters. Each suboffice would be consigned equipment and supplies from the regional headquarters to satisfy its needs in the province.

It was emphasized that actual spray operations must of necessity be decentralized into the provinces. This required that provincial malaria control organizations be established within each provincial capital, including offices and a shop-warehouse for maintenance of equipment and storage of supplies under safe conditions of control. It was recommended that all operational personnel live within the province in which they were to work.

During the winter months three of four key personnel would be allowed to come to Hanoi from each province for a 2- to 4-week training period in malaria control practice and in principles of administration and operations. The different provinces would be staggered so that personnel from only about three provinces would be in training at one time. These key personnel would then return to their respective provinces to secure and train operational personnel obtained within the province and to set up seasonal spraying plans and schedules.

Because of security conditions an alternate scheme was considered. Instead of having permanent spray crews working out of the provincial capital, it was thought that a training group might be established in the provincial capital. Each village would select one man who could be trained in the provincial capital and who could then return to his village with sprayers and DDT. There, he would train other men to assist him with spraying;

and when the spraying was completed, the equipment would be returned to the provincial capital for subsequent use in other villages.

SUMMARY OF ACCOMPLISHMENTS

The following towns and villages were treated with 5 percent water-wettable DDT residual spray between August 18 and October 1: Hanoi, Ha Dong, Phung-Khoang, Van Phuc, Thach-Bich, Hai-Duong (hospital), Van Quan, Ha-Tri, and Phuong-Tri.

Up to October 1, a total of approximately 4,000 lb. of DDT was used to spray 2,500 houses. Thus, based upon the average application rate per house, which in the United States is approximately 1 lb., a relatively large amount of DDT was used per unit sprayed since a typical village housing unit consisted of a walled compound containing the family living quarters and often working quarters, as well as housing for domestic animals.

A total of 28,000 Aralen tablets was distributed to refugee camps in Hanoi, and in the chief town of Ha Dong and the villages of Khuong Thuong, Dong Xa, Dong Quang, and Ho Khau. In addition, the hospitals at Hai-Duong and Haiphong were supplied with 20,000 tablets for treatment of clinical malaria cases.

Approximately 20 kg. of louse powder, 10 percent DDT, were distributed to refugee camps in Hanoi. Plans were made to distribute the louse powder to villages sprayed.

In October a total of 460 blood slides was taken from the villages of Quynh Loi, Khuong Thuong, Dong Xa, and the Don Quan refugee camp; these slides were shipped to the United States for reading. Only 410 slides were readable and averaged 11.5 percent positive for malaria with approximately twice as many *falciparum* as *vivax* infections.

Progress Report on Proposed CDC Building

FRANK R. SHAW, Sanitary Engineer Director*

Since 1947, the Communicable Disease Center has sought the construction of a building to house all of its activities other than field stations. At this time the Communicable Disease Center is housed in 45 buildings located in Atlanta and Savannah, Ga., and Montgomery, Ala. In the metropolitan area of Atlanta 16 buildings are occupied, and much of this space is rented from private interests through Public Buildings Service.

On July 26, 1948, Mr. Oscar Ewing, Administrator, Federal Security Agency, accepted the gift of the Board of Directors, Emory University, of a 15-acre site facing Clifton Road just north of the Emory University campus.

A formal request by the Public Health Service for the appropriation of $10,000,000 resulted in Public Building Services contracting for the planning of the building, with the cost not to exceed $10,000,000. The planning of Federal buildings is a function of the Public Buildings Service of the General Services Administration. In most cases the PBS develops the plans in Washington, but in this case it was decided that it would be expedient to have the plans developed under contract, by a local architect. In the spring of 1950 a contract was awarded Robert and Company Associates of Atlanta, and on June 5, 1950, the firm was presented a building program which outlined the needs of the Communicable Disease Center with respect to space and services. The constantly changing situation with regard to building costs caused the Public Buildings Service to authorize the contract architect to base planning on May 1950 prices.

Preliminary planning soon revealed that the original program could not be carried out within the price limitation of $10,000,000. Consideration of this situation resulted in the decision to leave Technical Development Services at Savannah, Ga., and to exclude the warehouse and shops from the program.

At present the planning has progressed to the point where tentative plans for the several buildings have been approved by the CDC Building Committee, consisting of the Chiefs of the various Services, and by Public Buildings Service; and the architect is proceeding with the development

*Secretary, CDC Building Committee, Engineering Services, CDC.

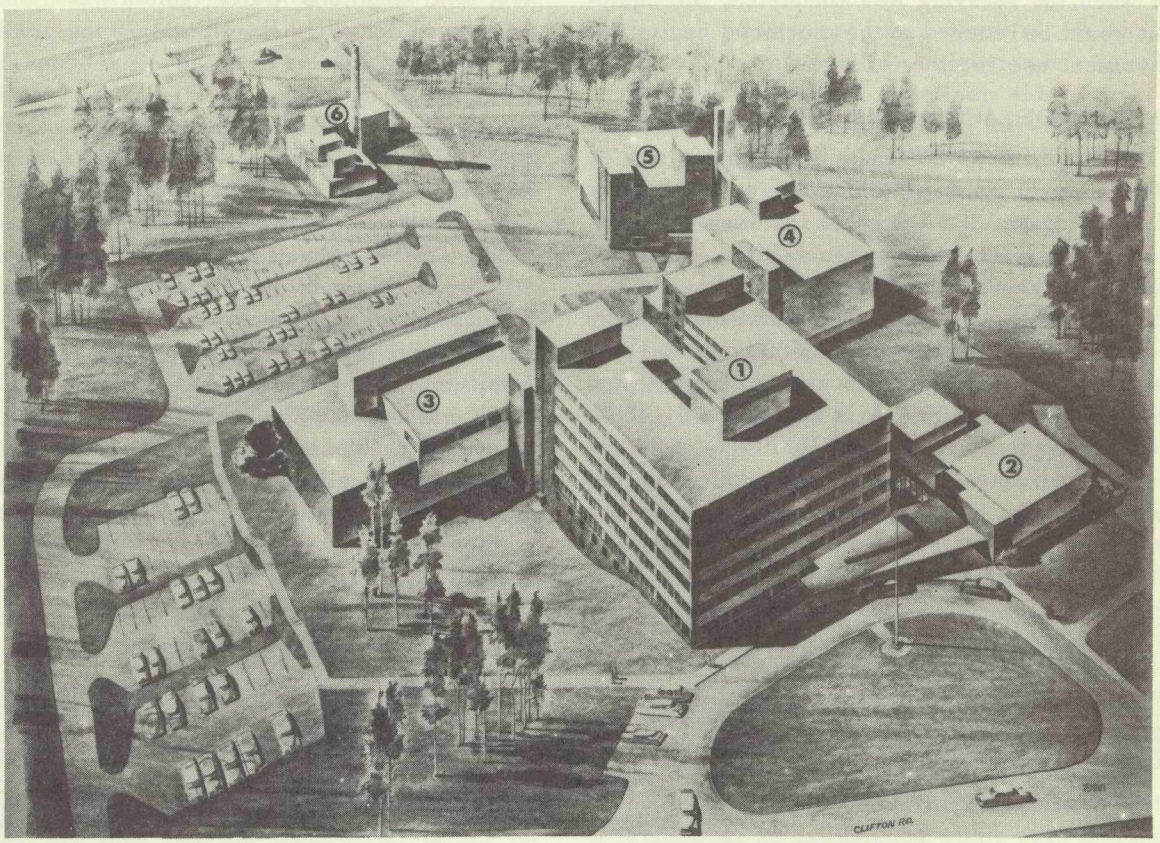


Figure 1. Preliminary study for proposed Communicable Disease Center Buildings.

of the final plans. The general plan includes six buildings. The nature and arrangement of these buildings is illustrated in figure 1. For purposes of identification, the buildings in figure 1 are numbered. Building 1, the Main Building, consists of a five-story laboratory core bordered on three sides by an eight-story office section. Building 2 contains a cafeteria seating 135 persons and an auditorium seating 300 persons. Building 3, the Audio-Visual Production Building, has four floors; Building 4, the Infectious Disease Building, has five floors; Building 5, the Virus Building, has five floors; and Building 6 is the Boiler House.

All of these buildings are planned as mass-type structures, and all are windowless except for office space. The windowless buildings and windowless laboratory section of the Main Building will be completely air-conditioned with 100 percent fresh air. The Cafeteria and Auditorium (No. 2) are detached from the Main Building and may be approached from the covered but unenclosed passageway from the front of the Main Building, or through an all-enclosed passageway at the rear of the unit and directly opposite the Cafeteria. The Audio-Visual Building (No. 3) is connected to the main building and may be entered from corresponding floors. The Infectious Disease Building (No. 4) is detached from the Main Building so as to minimize the danger of contamination of a large group of people in other activities, but each floor is connected by covered but unenclosed bridges. The Virus Building (No. 5) is completely detached from the other buildings and must be entered through the main entrance at ground level. It was isolated in this way because of the nature of the work which will be conducted therein.

Special precautions are being taken in this design to avoid the creation of any danger or nuisances to the community and to the personnel within the buildings. Air for air-conditioning will be taken in at the ground at one end of each building and will be exhausted at a very high point at the opposite end of the building. Wherever the air from a particular research area might create air pollution, it will be treated so as to kill or remove all harmful matter before it is exhausted to the atmosphere. The plans will include a

crematory for the complete destruction of the carcasses of all experiment animals and of solid waste which might be the source of infection to people. This destructor will be in the nature of a crematory rather than an incinerator and will be designed so as to avoid the possibility of odor nuisances from the hot air coming from the top of a very tall stack. In cases where infection might be carried between workers within the space to persons outside the space, air locks with showers and lockers will be installed in the entrance way. No avenue of entrance or exit will exist except through the shower cabinets and air lock units which serve as a barrier against the flow of air from these laboratories to spaces outside of them. Lockers are provided for personnel to store their laboratory clothes in the laboratory end of the air lock, and for their street clothes in the exit end of the air lock.

All laboratory glassware and animal cages from laboratories handling highly infectious matter will be disinfected before they are taken from the laboratory to the areas where they are to be cleaned and sterilized. All liquid waste from such "hot" laboratories will be disinfected before it is discharged to the public sewers. Only small animals will be maintained in this installation. The present planning provides for housing of these animals within the infectious disease and the virus buildings.

The public water system will be protected against backflow of contaminants by the installation in the supply main of an approved backflow preventer and the distribution system within the buildings will be protected against siphonage by the installation of vacuum breaker or by delivery through air gaps.

The laboratories are planned on the Module System, the module being 12 ft. wide by 18 ft. deep. The rear of the module borders a pipe space in which the various services are located. Outlets for hot and cold water, gas, electricity, compressed air, and vacuum will be available at each modular division point. These will be piped into the individual module or multiples of modules as the particular needs indicate, but their availability makes all spaces flexible for changes in use and operation. Distilled water will be available at a station in a corridor of each floor of the laboratory units.

As revised, i.e., with the elimination of the warehouse and shops, and Technical Development Services, the square footage floor area involved is indicated below:

	Space for Individual Activities	Total Space in Each Building
Main Building (No. 1)		
Laboratory Services	43,964	
Other Services	60,680	
		104,644
Cafeteria and Auditorium Building (No. 2)		
Cafeteria	3,483	
Auditorium	2,983	
		6,466
Audio-Visual Building (No. 3)	8,288	
		8,288
Infectious Disease Building (No. 4)		
Laboratory Services	14,204	
Animal Space	8,337	
Central Services	5,342	
		27,883
Virus Building (No. 5)		
Laboratory Services	9,988	
Animal Space	10,306	
Central Services	8,414	
		28,708
Boiler House	12,021	
		12,021
Total		188,010

Proposed public buildings are documented to Congress at the initiation of the project and are redocumented every 2 years. Last February, Public Buildings Service redocumented the proposed CDC building and raised the amount originally requested from $10,000,000 to $12,600,000 to provide for current increase in building costs and so that the warehouse and shops might be included.

Much interest was exhibited by Congressmen and members of the Budget Committee in the Public Health Service's request for inclusion of funds for the building in the 1952 fiscal year appropriations and in press releases relative to the building. Special hearings were held and many favorable comments were made. Although the House of Representatives Appropriations Sub-Committee did not recommend the appropriation this year, its comment in Report No. 322 of the House of Representatives should be helpful to subsequent efforts. The comment is as follows:

"This program provides for laboratory and field investigations, control operations, and training facilities to supplement and support activities of state and local health departments in the control of a host of communicable diseases. These activities are essential as normal peacetime measures. Some of them also provide the foundation for special operations which would be necessary in case of a national emergency such as, for example, biological warefare. The communicable disease center [*sic*] is now conducting research in this general area although it is seriously handicapped by lack of laboratory facilities for this specialized kind of work. Inquiry was made as to steps being taken to provide suitable physical facilities to permit this important work to go forward. Funds have heretofore been appropriated for plans and specifications and the committee is informed that the General Services Administration is now preparing those plans. The committee believes that this is an important piece of work and suggests that the urgency of the times requires that this project be given high priority of attention by appropriate officials of the Government."

WHO Progress in Brucellosis

MARTIN M. KAPLAN, Veterinary Officer*

The World Health Organization, in its program for communicable disease control, gives special attention to brucellosis because of the effects of the disease upon the health of large numbers of agricultural workers and other exposed groups in many countries, and the huge economic and nutritional losses resulting from the decline in milk production and breeding efficiency of affected livestock.

The masked nature of the disease in humans and the difficulty of its diagnosis cause doubt as to the acceptability of the reported statistics regarding incidence. Therefore, in spite of the 4,000 to 6,000 cases per year officially reported for the United States during the past several years, reliable estimates place the number of cases annually at 10,000 to 40,000, and perhaps as high as 100,000 (1-3). As another example, France reported approximately 1,400 cases for 1949, whereas there were probably over 9,000 cases that year (4). Other countries having relatively large numbers of cases are Mexico, Argentina, Peru, and other Latin American countries; Italy, Malta, Spain, and other Mediterranean countries.

The disease in animals is known to exist in nearly all parts of the world where there are susceptible livestock, and the existence of widespread infection in the cattle, sheep, and goats of the Mediterranean countries and Latin America is well established. In the United Kingdom and in northern and central Europe, except for the Scandinavian countries, between 15 and 50 percent of the cattle herds are infected with brucellosis (5). For the United States, the figure is approximately 16 percent (6). As far as is known from the meager information available, the disease apparently is of little importance among animals in the economically undeveloped countries of Asia and Africa except in areas where European breeds of livestock have been introduced. It should

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be pointed out, however, that where careful local studies have been pursued in some of these countries as, for example, in certain parts of India (7), indigenous infection has been shown to be surprisingly prevalent (10 to 50 percent).

It is not the purpose of this paper to deal with the technical aspects of the disease. For this information, the reader is referred to a recent article by the author (8). However, it would be helpful to summarize briefly the major problems and needs in the field of brucellosis. These are as follows:

1. Surveys in various countries on the prevalence of the disease in man and animals; the improved reporting of statistics.

2. Epidemiological studies concerning the transmission of brucellosis by the different animal reservoirs.

3. The international standardization of the sero-agglutination test; the improvement and standardization of intradermic agents and other diagnostic procedures for man and animals.

4. Uniform and simplified bacteriological techniques for the culture and typing of *Brucella*.

5. Critical studies on antibiotic-sulfonamide and vaccine therapy in human brucellosis.

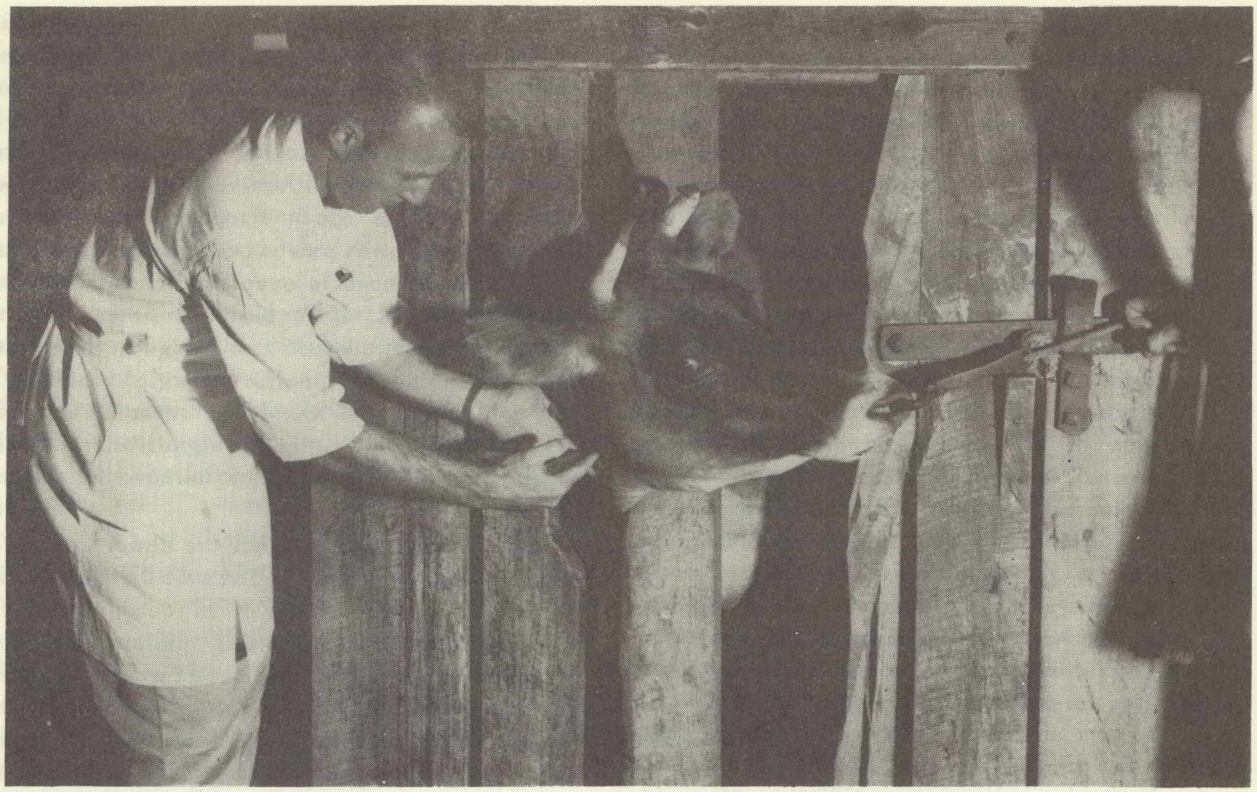
6. The application of known effective measures for the control of brucellosis in animals and the prevention of its spread to man.

In order to meet these problems effectively, close collaboration was established last year between national and international medical and veterinary authorities, particularly WHO, FAO (Food and Agriculture Organization), International Office of Epizootics, and Inter-American Congresses on Brucellosis. Probably the two most important steps taken were the formation and convening of a joint FAO/WHO Expert Panel on Brucellosis, and the designation of 12 FAO/WHO brucellosis centers in different countries of the world. In November 1950, 26 members of the panel met in Washington during and after the Third Inter-American Congress on Brucellosis. A published report of this first session contains specific recommendations concerning the problems listed previously (9). Following are the opinions of the panel on some of these questions:

Laboratory diagnostic criteria for determining human infection receive detailed consideration in the report, including improved methods of culture of *Brucella*. Next to culture of the organism, the sero-agglutination test is considered to be the most reliable means of diagnosis. In view of the wide variation of antigens and procedures used in different laboratories, recommendations are made for the standardization of this test so that results reported in one laboratory will have bases of references elsewhere. The complement fixation and the opsonocytophagic tests are not believed to have practical value in routine diagnosis, although in special circumstances they might be useful. It is believed further that the results of an intradermic test should be interpreted as determining a specific allergic condition of the individual, and should be regarded as being free from other diagnostic significance. Further study and standarization of intradermic antigens are urged.

The panel recognizes that the newer antibiotics such as aureomycin, chloramphenicol, and terramycin, used singly or in combination with streptomycin and a suitable sulfonamide, mark a great advance in the treatment of human brucellosis. It is pointed out, however, that they do not furnish a complete solution to the problem, since relapses have been observed following the use of each antibiotic singly or in combination. Careful clinical and laboratory studies are urged for evaluating properly the various chemotherapeutic agents. Vaccine therapy is placed subordinate to chemotherapy, and careful studies in vaccine therapy are recommended in order that their places in the therapeutic armamentarium may be more clearly defined.

It is further noted that since brucellosis is not generally transmitted from person to person, the prevention of human infection is dependent upon the control and elimination of this disease in animals. The report points out that cross-infections of cattle, sheep, goats, and swine, as well as human infection, can occur with any of the three species of *Brucella* (*Br. abortus*, *Br. suis*, and *Br. melitensis*). Economic losses are caused in affected livestock by abortion or premature birth, decreased milk flow, and temporary or permanent infertility. As an example of the hugh savings which can be effected by a successful campaign against brucellosis, it is estimated that in the United States a reduction of incidence of bovine brucellosis by one-half has resulted in a $50,000,000 annual saving to the livestock industry. In Norway, where brucellosis of cattle has been almost completely eradicated, the cost of the entire program was less than the estimated



Testing for brucellosis.

annual loss formerly caused by this disease. Therefore, a large part of the report is devoted to the problem of control of brucellosis in livestock, and detailed recommendations are made in this connection.

Chemotherapy is ineffective in animal brucellosis. The bases of control, therefore, lie in sanitary procedures, diagnostic tests and elimination of infected animals, vaccination, and a combination of the latter two procedures. Each of these control measures is covered separately, and procedures are recommended which can be adapted both to economically advanced and to lesser developed countries. The report stresses the desirability of uniformity in laboratory diagnostic procedures and their interpretation, and of the production and use of biological products, particularly strain 19 vaccine for cattle, employed in this disease.

Finally, the panel urges expanded activities on the part of WHO and FAO in brucellosis research, in the distribution of stock cultures and standard serums, and in the provision of technical advice to requesting countries.

WHO and FAO have already taken action on many of these recommendations. During 1950 and early 1951, FAO/WHO brucellosis centers were designated in Argentina, Australia, Denmark, England, France, Greece, Italy, Mexico, Turkey, Union of South Africa, the United States, and Yugoslavia. It is planned to establish one additional center in Latin America and two more in the Far East. The center in the United States is located at the medical and veterinary schools of the University of Minnesota, under the direction of Dr. Wesley W. Spink.

Apart from their usual routine duties, these centers function for local and international purposes in brucellosis. They are used primarily as diagnostic centers for the preparation and testing of standard antigens, vaccines, and other biological products, and as teaching and information centers for their own and nearby countries.

Information documents on brucellosis are prepared by WHO and distributed periodically to the centers. Thus, through exchanges of information and correspondence between the panel members and between the centers, the latest advances in research are rapidly communicated to leading brucellosis workers throughout the world.

In order to enable some laboratories to undertake the necessary activities, WHO made monetary grants in 1950 to certain of these centers, particularly to those in France, Italy, Turkey, Mexico,

and Argentina. The United Nations International Childrens Emergency Fund (UNICEF) assisted in the establishment of the centers in Yugoslavia and Italy by purchasing laboratory equipment and chemotherapeutic products. In 1951, WHO will purchase standard media, dyes, and antigens for distribution and use in all the centers.

Several members of the FAO/WHO Expert Panel on Brucellosis, while not attached directly to any of the centers, are collaborating in their own laboratories and clinics with the work of the centers.

Of great importance among the gratifying results already achieved by these centers has been the progress in the adoption of unified laboratory procedures, especially in the diagnosis of brucellosis. This approach is being extended to include the production of vaccines and other biological products. In addition, overlapping and duplication of research work have been avoided, each of the various centers now being engaged in needed work on different aspects of the disease. Where difficulties or divergent results have been experienced by one center, it has been possible to enlist the aid of a second center for checking purposes. Advanced and well-equipped centers are thus used to assist other centers which cannot cope with a particular problem.

Besides the general functions and individual research problems, the following specific projects and studies, many of them suggested and initiated by WHO, are now under way in the various centers:

1. The exchange of strains of *Brucella*, their comparative testing according to procedures recommended by the brucellosis panel, and the selection of the three type species of *Brucella*. The strains agreed upon as representing the three type species will be freeze-dried and distributed to all the centers as reference strains.

2. Antibiotic-sulfonamide and vaccine therapy in human brucellosis.

3. Hemoculture in human beings, and other diagnostic procedures apart from the sero-agglutination test.

4. The sero-agglutination test in man and animals.

5. The standardization of antigens used in the milk-ring test, and application of the ring test in cattle.

6. Simplified production of strain 19 vaccine for cattle.

7. Improved diagnostic and vaccine procedures in sheep and goats (intradermic and milk-ring tests).

8. Local and regional surveys on the prevalence of brucellosis.

The wholehearted cooperation given to WHO and FAO by the brucellosis centers exemplifies the willing spirit of national health administrations and scientific workers for international collaboration under UN leadership. The great source of facilities provided by these centers, pooled by coordination of their efforts by WHO, is an invaluable asset in the advancement of knowledge in this field. The results and benefits thus obtained become available for rapid world-wide distribution and are contributing greatly to the conquest of brucellosis in many countries.

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Experimental Studies on Bovine Q Fever

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In studies of early outbreaks of Q fever in Australia and Europe, various sources of infection were suggested, but the epidemiology remained somewhat obscure. Australian cases were associated with contact with cattle; however, natural infection in cattle was not demonstrated with certainty (1-3). In the United States, an outbreak occurred in 1946 among slaughterhouse employees in Amarillo, Tex. A single shipment of cattle was presumed to be the source of infection in this outbreak, but again, the naturally infected source could not be identified. In the spring of 1947, observations by Young (4) provided evidence of an endemic focus of infection in southern California. He observed cases of Q fever, diagnosed clinically and later confirmed serologically, following arid seasons and dust storms. A brief field study by Shepard and Huebner (5) disclosed additional cases, and furthermore, serologic evidence of infection in dairy cattle was found.

Through concerted efforts of the Public Health Service, the California State Departments of Health and Agriculture, and the Los Angeles City and County Health Departments, an extensive study of Q fever in the Los Angeles area was undertaken. One of the first findings of this group was the isolation of *Coxiella burnetii* from the milk of a high percentage of dairy cattle in the area (6). Thus, for the first time, the causative agent of Q fever was isolated from cattle with which human cases had had either direct or indirect association.

After the discovery of natural infections among dairy cattle, it became of prime importance to obtain a complete knowledge of the nature of Q fever infection in this species. Infected dairy cattle probably had been examined on many occasions by practicing veterinarians, yet they were unaware that a new disease was present. The carcasses of infected cattle had been processed through local packing plants, yet veterinary inspectors had observed no unusual pathology during their post-mortem examinations. Thus, a basic knowledge of the symptomatology and pathology of this disease was desirable. As a prerequisite to eventual control, the pathogenesis and epizootiology of the disease must be well understood. Some of the aspects of this disease possibly could be investigated in the endemic area; however, because of the adverse effect on operational economy, most dairymen were reluctant to cooperate on well controlled studies. Furthermore, observations on the experimental disease in cattle would provide useful leads in such field investigations as were possible to conduct. Hence, controlled experimental studies in the laboratory were necessary to obtain a thorough knowledge of bovine Q fever.

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EXPERIMENTAL STUDIES IN CATTLE

Experimental studies of Q fever in cattle were initiated by Parker and associates (7-9) in mid-1947 at the Rocky Mountain Laboratory, Hamilton, Mont. The first attempt to infect calves involved four heifers inoculated intravenously, intranasally, intravaginally, and by feeding contaminated bran, respectively. Large doses were employed, yet all four calves were refractive to infection.

After *C. burnetii* was recovered from milk of naturally infected cows in California, an attempt was made to infect two lactating cows by inoculation via the teat canal or by injecting *C. burnetii* into the mammary gland substance. Inoculated quarters of these cows continued to shed rickettsiae for extended periods, varying from 17 days to 200 days after inoculation.

A nonpregnant lactating cow became infected after introduction of a mixture of a yolk-sac culture of *C. burnetii* and semen (artificial insemination) into the cervical canal. The milk of a single quarter became infectious and remained so for more than 400 days. Since the urine of this cow was infectious for a brief period after inoculation, it was postulated, at that time, that infection may have occurred through contamination of the teat orifice with infective urine. These were the first successful attempts to infect lactating cows.

The symptomatology of the experimental disease in cattle has varied considerably, depending upon the dosage and strain of *C. burnetii*, and upon the route of inoculation. Cows inoculated with the Nine Mile strain of *C. burnetii* via the teat canal

manifested no clinical symptoms, whereas cows inoculated by the same route with a comparable dosage of a California strain developed clinical symptoms of brief duration, characterized chiefly by mastitis, fever, depression, and anorexia. Cows and calves inoculated intradermally with either the Nine Mile strain or a California strain also developed clinical illness. Lactating cows which became infected after genital exposure or through inhalation of *C. burnetii* manifested no clinical illness. In all probability, the natural disease in cattle is not associated with any marked symptomatology.

The pathology of the disease was studied in four normal lactating cows inoculated with a California strain of *C. burnetii* via the teat canal, and sacrificed at varying intervals after inoculation. Gross lesions at autopsy were limited chiefly to the mammary gland and regional lymph nodes. Inoculated quarters of the cow sacrificed during the acute phase of infection were very edematous with heavy serous accumulations in the subcutaneous tissue of the udder. A marked serous lymphadenitis was noted in the regional lymph nodes receiving lymph drainage from the inoculated quarters. In cows sacrificed during the chronic phase, only a serous lymphadenitis of lymph nodes receiving lymph drainage from infected quarters was observed. Histopathologically, a subacute interstitial mastitis was the most consistent finding.

In early studies, certain experimental data suggested that Q fever in cattle was a localized infection of the mammary gland, the rickettsiae gaining entrance via the teat canal. Thus, the milking process could be an important factor in its spread. To test this thesis, five cows with normal mammary glands were repeatedly exposed by dipping their teats in infectious milk both before and after milking (hand milking). During and subsequent to the 9-month period of exposure, frequent tests of milk for infectiousness revealed essentially no evidence of infection. Furthermore, there was no serologic evidence that any of the five cows had become infected. These five cows were then exposed in similar fashion to milk containing both *C. burnetii* and *Streptococcus agalactiae* for a period of 4½ months. This was done to ascertain whether concurrent bacterial mastitis predisposed cattle to Q fever infection, and also to determine whether these cows would contract streptococcal mastitis, a disease whose portal of entry is the teat canal. Three animals acquired streptococcal mastitis, whereas none contracted Q fever. On the basis of this experiment, it appears that the process of hand milking is not an important factor in the cow-to-cow spread of Q fever.

In view of the negative results obtained in the preceding experiment, other probable routes of infection were explored. Two lactating cows were exposed by supraconjunctival instillation of 0.1 ml. of a 10^{-4} dilution of a yolk-sac culture of *C. burnetii* (California strain). After such exposure and an additional one given 61 days later, essentially no evidence of infection was demonstrated in either cow.

The spinose ear tick, *Otobius megnini* Duge, is indigenous to southwestern United States and therefore includes both endemic areas in Texas and California. Jellison, *et al.* (10) reported the isolation of Q fever rickettsiae from ticks of this species collected from cattle on infected dairies in southern California. Although the role of this tick in the epizootiology of Q fever has not been thoroughly investigated, laboratory attempts to transmit Q fever to cattle with this tick have been essentially negative. Of four cows which were hosts to the infected nymphs or larvae which were progeny of infected female ticks, only one developed specific complement-fixing antibodies; however, *C. burnetii* was not recovered from either milk or blood of this cow.

The dermis of cattle readily supports the growth of *C. burnetii*. This was first demonstrated in two bull calves inoculated intradermally with 1 ml. of a 10 percent yolk-sac culture. These calves experienced a febrile reaction and a rickettsemia of brief duration, and local skin lesions were produced at the site of inoculation. Similar results were obtained in a lactating pregnant cow exposed by the same route. Other observations on this cow included the following: (a) abortion occurred the 7th day after inoculation and *C. burnetii* were recovered from the placenta, (b) the milk of all quarters contained Q fever rickettsiae for about 2 weeks, and (c) the urine, particularly during the 3d week after abortion, was infectious. The presence of *C. burnetii* in the urine could represent actual elimination of the organism in the urine or contamination with postparturient uterine discharges.

Since the air-borne spread of Q fever rickettsiae was suggested in previous outbreaks of Q fever, it was desirable to determine whether cattle could be infected by inhalation of *C. burnetii*. In the first attempt, a pregnant lactating cow was exposed

Prophylactic Immunization and Poliomyelitis

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Early in the epidemic of poliomyelitis which began in the state of Victoria, Australia, in January 1949, attention was directed toward a possible relationship between prophylactic inoculations and paralytic poliomyelitis. Sporadic cases of paralysis following the injection of an antigen had been reported in England during the progress of the immunization campaign which began in 1942, but there was no evidence to suggest a causal relationship. A few cases early in the Victoria epidemic who had received injections of single or combined antigens shortly before onset of their disease led Dr. B. P. McCloskey, Poliomyelitis Officer of the State Health Department, Melbourne, Australia, to include a history of immunization as a part of the routine investigation of reported cases (1). This information was obtained from the parents of 340 of the 375 cases reported between January and August. McCloskey determined the sites and severity of paralysis and checked the dates and sites of injections of the 35 cases where any inoculation had been reported within 3 months of onset of poliomyelitis. He presented evidence to show that, in the Victoria epidemic, in 31 cases known to have received an injection of diphtheria toxoid or pertussis vaccine, alone or in combination, within 3 months of their onset, paralysis was more frequent in the inoculated than in the uninoculated limbs. Twenty-six out of 35 inoculated limbs were paralyzed. Of the 89 uninoculated limbs, 17 were paralyzed. In addition, of the 16 cases under 3 years of age receiving inoculation within 35 days of onset of illness and for which complete data were available, paralysis occurred in the limb last inoculated before onset in 15; and there was a considerable increase in the severity of the paralysis in the last inoculated limb as compared with the degree of paralysis in each limb of a control group of children.

In London, Dr. J. K. Martin from the Department of Child Health, Guy's and Evalina Hospitals, reported 17 observed cases occurring between 1944 and 1949, in which paralysis was preceded by injection within 28 days of onset, and 78 additional cases occurring between 1941 and 1949, for which records were available for study (2).

Dr. D. H. Geffen, Medical Officer of Health, Metropolitan Borough of St. Pancras, London, investigated all cases of poliomyelitis reported in the borough in the 1949 epidemic and found six who had contracted polio within 22 days of immunization. He then obtained further information from other boroughs in London and presented data on site of injection and site of paralysis of a total of 29 cases in children under 5 years of age where inoculation within 28 days was associated with paralysis of the injected limb (3).

On the basis of the above reports it appeared unlikely that the association between inoculation and paralysis was by chance, and a statistical study was undertaken by Hill and Knowelden of the Department of Medical Statistics, London School of Hygiene and Tropical Medicine (4). Since the need for a rapid answer made it impractical to follow a sufficient number of immunized children of given ages to observe the risk of development of poliomyelitis, another approach was used in this study. Records were obtained from 33 widespread areas in England of relatively high incidence of polio during July, August, and September of 1949. Local health officers were requested to obtain from reported polio cases under 5 years of age such data as sex, birth date, paralysis, and inoculation history. A control group was sought among children of similar sex and age who were reported as having measles at about the same time but after the onset date of their paired polio cases. Since there were insufficient numbers of measles cases reported, approximately half of the controls were made up by selecting from the local birth registers another child whose birth date was as close as possible to that of the paralytic polio case who was of the same sex, and still in the same area so that information on inoculation could be obtained. One hundred sixty-four controls that could be paired with cases were secured. On the question of site of paralysis and previous inoculation, data obtained in this study indicated that there was no evidence that an injection 3 or

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more months previous to the illness affected the distribution of paralysis in any way. Thirty-five children under 2 years of age and seven children between 2 and 5 years of age were found who had had an inoculation less than 1 month before the onset of paralytic disease. In the group of inoculated children under 2 years of age, the legs were proportionately less affected than in uninoculated children and there was a striking preference for the left arm, which is the usual site of inoculation. Twenty-nine of thirty-six, or 81 percent, of the children under 2 years of age had paralysis in the limb of injection although not necessarily confined to that limb. This proportion is greatly in excess of the figure (13 of 65 or 20 percent) shown by children whose last injection was more than 1 month before onset. In comparing the inoculation histories of the children with poliomyelitis with the histories of their controls in the 164 pairs for which a satisfactory control could be found, there is a striking difference in the frequency of the history of immunization less than 1 month before the onset of the poliomyelitis case. Sixteen of the 164 polio cases gave such a history while only one of the controls had had an inoculation within a month of the onset of its paired polio case. At other intervals there is no difference between the polio cases and their controls in history of inoculation. With respect to the time interval between inoculation and onset of poliomyelitis, 26 of the 33 children who had paralysis within 28 days in the limb of injection showed an interval of 8 to 17 days. None fell below 8 days.

These studies would seem to indicate that the distribution of sites of paralysis are abnormal in children who have been inoculated within a month preceding the onset of their illness. In recently inoculated children the limb of injection is a site of paralysis much more frequently than is the case in children not recently inoculated. The difference in history of immunization within a month of onset in the pairs of polio cases and their controls indicates that some of the cases in the polio group may have been precipitated by the inoculation.

In order to investigate the question as to whether a similar situation exists in the United States, Dr. Gaylord Anderson, University of Minnesota, reviewed case histories of 2,709 cases of polio which occurred during the 1946 outbreak in Minnesota (5). Among the items included in the case histories taken in 1946 was a question about all injections or immunizations the patients had ever received, the date, and the name of the physician. A total of 2,677 contained a definite record of immunization or a specific statement that the patient had never been immunized. All histories of children 7 years of age or under were selected for more detailed study of the relationship to prior immunization. In 85 cases, confirmation was obtained from physician or clinic of a definite record of immunization during the 6 months prior to the attack of poliomyelitis. Of the 85, 33 were cases in which onset of polio occurred within 1 month after the most recent injection, 12 in the second succeeding month, and 16 in the third, indicating a concentration of cases occurring within a month following injection. Of the total of 33 cases with confirmed history of immunization within the month preceding onset of polio, 19 cases, or 58 percent showed a correlated paralysis, that is, paralysis of the limb which was the site of the injection, while of 52 cases occurring 2 to 6 months subsequent to antigen injection, only 8 cases, or 15 percent, were correlated. Also 20 cases, or 61 percent of the 33 immunized during the preceding month had arm involvement, as contrasted with only 11 cases, or 21 percent, of 52 which were immunized 2 to 6 months preceding, 19 percent of the sample immunized before 1946, and 21 percent of those who had never been immunized. In addition to the apparent concentration of cases during the first month after immunization and a tendency toward localization of the paralysis in the limb into which the injection had been given, 24 cases, or 73 percent, of the 33 first month cases were classed as severe spinal cases, as contrasted with 42 percent of the 2- to 6-month group. This, however, may be related to a difference in age distribution, since the patients in the 1-month group were younger. To correct for this, members of the group under 2 years were compared, and although these figures are very small there is a definite suggestion that the first month cases were more severe. Analysis of the time interval between last antigen injection and onset of illness lends further support to the idea of a causal relationship. Of the 33 cases, 17 developed in the 10- to 14-day interval and 20 in 5 to 14 days. Eleven of the 19 correlated cases developed in the 10- to 14-day interval and 16 of the 19 in the 5- to 19-day interval, while the interval of noncorrelated cases showed less concentration. To shed further light on the duration of this possible effect, all the case histories obtained during the outbreak were reviewed from the point of view of history of various types of immunization

and types of response to polio infection. No differences were noted. Whatever effect the antigens may have had in conditioning paralysis during the first month following injection, apparently it was not permanent.

To obtain further information on this question, a study was set up by the New York State Department of Health during the summer of 1950. A total of 2,137 cases of polio was studied and for each a history was obtained regarding all injections received during the 2 months prior to onset of disease. Control information identical with that from the cases was obtained from 6,055 case household members and from a group of 14,710 persons made up of the household members of three additional control families for each case family. Analysis of these data showed that the history of an injection during the month before onset was twice as frequent among polio patients as among the controls. This ratio was about the same for immunizing agents, penicillin, and a miscellaneous group of other injections. The analysis also disclosed that the risk of getting paralytic polio at each age group is doubled in the recently injected population. In addition, clear-cut association was demonstrated between site of injection and site of paralysis.

The evidence seems conclusive that the location of the paralysis produced by the virus of poliomyelitis may be conditioned in some cases by recent injections. The recent study in New York State indicates that antigen injections apparently are no different from injections of other miscellaneous materials. There has been suspicion, which the New York study would seem to confirm, that injections may be a factor in determining the difference between a recognizable paralytic infection and an unrecognized or nonparalytic involvement. All of the data indicate that the effect is transient, its influence appearing not to persist for longer than 1 month. Although the risk of increasing the susceptibility to poliomyelitis by the injection of immunizing agents or other material is slight, it should be taken into consideration when elective injections are given. Immunization procedures for the prevention and control of acute communicable diseases need not and should not be curtailed. Since the effect of an injection on susceptibility to paralytic poliomyelitis does not appear to persist longer than 1 month, routine prophylactic inoculations can be easily carried out at times when the prevalence of poliomyelitis virus is not likely to be high.

A report of an *ad hoc* subcommittee of the Committee on Research and Standards of the American Public Health Association, accepted by this Committee, states as follows (7):

"Recent published and unpublished data strongly suggest that an individual who develops poliomyelitis within a month after receipt of injection of an antigen, or possibly of some other material, shows an increased frequency of paralysis in the extremity into which the injection has been given. There are also suggestions that among the reported cases of poliomyelitis are cases 'which would not have been clinically diagnosed as poliomyelitis at all if their (recent) inoculation had not brought them into the paralytic group.'

"Although further studies on these questions are imperative, the data so far available would suggest that, in the face of an abnormal prevalence of poliomyelitis in a given locality, antigen inoculations may well be postponed until after the subsidence of the abnormal prevalence. It should be stressed, however, that there is no evidence that this effect of inoculation persists for more than one month. On the contrary, the risk of poliomyelitis among persons who have been immunized more than one month before onset is no greater than among non-immunized persons."

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Fly Control Incidental to the Residual Spray Program*

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In cooperation with State health departments throughout the southeastern United States, the Public Health Service during the past 6 years has conducted a DDT residual house spraying program in rural areas for malaria control and malaria eradication. The fact that extremely satisfactory malaria mosquito control has been realized is a subject reported in another paper (Bradley and Lyman (1). Since most of you present are familiar with the operational phases of the residual spray program, it will not be necessary to review the details except to say that the inside walls and ceilings of rural homes in designated malaria areas are treated with a 5 percent water emulsion of DDT, xylene, and an emulsifier applied at the average rate of 200 mg./sq. ft. In an effort to obtain better insect control, the treatment was later extended to total premises spraying of barns, stables, privies, and other outbuildings. But the benefits which have been derived from this spray program are by no means confined to malarial mosquito control; for such insects as cockroaches, bedbugs, pest mosquitoes, and house flies have been subjected also to the consequences of contact with residual DDT. It is our purpose here to show something of the relative degree of fly control that has been obtained during the past 3 years.

According to reports from the several States, based primarily upon verbal remarks by householders, DDT was much more effective in controlling house flies during 1945 and 1946 than it has been subsequently. In fact, during those years it seems that the people were much more aware that flies were being killed and actually were more interested in that fact than they were that malaria mosquitoes were being controlled. Since the primary objective of the residual spray program, the control of malarial mosquitoes, was being attained, little notice was given during the early years of the program to the incidental control of other house-frequenting insects, although we were aware of the excellent results being obtained in the control of these pests. In fact, we know that the popular acceptance of the program was due to a large extent to these side effects. However, in 1947 numerous complaints were received that DDT was not giving as adequate fly control as formerly, and naturally we were interested in determining the reasons for this lack of control, since accumulating evidence about this time, from both field and laboratory studies, indicated that house flies were showing a resistance to DDT.

Accordingly, evaluation of residual spray results in terms of fly control was initiated in 1948. For the past 3 years a total of approximately 30,000 inspections of both sprayed and unsprayed houses has been made. Inside of these houses total fly counts were secured from the one room containing the largest number of flies. As might be expected, the room most frequently containing the largest number of flies was the kitchen; however, a relatively large percentage of rooms (30 percent) other than the kitchen was recorded as having the highest fly count. In table 1 there is presented a comparative 3-year summary of fly counts from the inside of sprayed and of unsprayed houses, taken up to 5 months after spraying, and based upon the average percentages of the houses inspected which fall within certain fly density groups.

It is clearly shown by comparison of these data that a significant degree of fly control was achieved for sprayed houses. In table 1 it may be observed that in each of the 3 years a far greater percentage of sprayed houses fell within the lower fly density groups (0 and 1-10) as compared with unsprayed houses. In other words, sprayed houses had fewer flies than unsprayed houses. For example, approximately twice as many sprayed houses, on the average, had no flies as compared to unsprayed houses. If we assume the relationship that the greater the over-all fly population, the greater

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Insect and Rodent Control Problems in Region IX

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The States comprising Region IX (Colorado, Wyoming, Montana, Idaho, and Utah) lie almost wholly within the semiarid region of the United States. The lack of water has considerably retarded the growth of agriculture and industry and, as a result, the population density is low and insect- and rodent-borne disease is consequently less evident. This article summarizes briefly the problems encountered in the Region.

MOSQUITOES

Mosquito problems in the Region have several aspects. The major one is concerned with mosquito production on irrigated lands. In the five States there are now under irrigation approximately 8,758,293 acres** or 45 percent of all the land under irrigation in the Western States. The management of this irrigation water with periodic flooding and drying as well as the discharge of surplus water into poorly drained areas results in the breeding of enormous numbers of floodwater mosquitoes particularly *Aedes vexans, A. dorsalis,* and *A. nigromaculis.* When this water is drained into semipermanent ponds and roadside ditches conditions soon become ideal for the production of *Culex tarsalis* (a proved encephalitis vector).

The problem is complicated along the marginal area of the Great Salt Lake where irrigation water discharges into areas along the marshy shore line. Due to the high concentration of population in this area together with expanding industrial development and defense establishments, the citizens of several counties have banded together and organized mosquito abatement districts. This was made possible by the adoption of a State law empowering local communities to organize for mosquito and fly control purposes.

Malaria was at one time present in Utah but very few locally contracted cases have been found in recent years despite the presence of a western vector, *Anopheles freeborni.* Reported malaria morbidity in Region IX is shown in table 1.

Other mosquito problems exist. In several recreational areas mosquito control measures are being planned by local authorities. In northern Idaho a considerable mosquito problem exists in the spring and early summer around some of the permanent lakes in that area. When the snow melts in the spring the level of these lakes rises flooding low-lying meadowland and the alluvial fans of several stream systems. The resulting large swarms of floodwater mosquitoes make life miserable for the inhabitants and livestock in the area. This problem may be alleviated to a large extent on Lake Pend Oreille when the dam at Albeni Falls, Idaho, is completed. This dam will hold the lake at a constant level during most of the breeding season and the intermittently flooded areas will be under water for this period.

Table 1

REPORTED MALARIA MORBIDITY*
1940-1950

Year	Colorado	Wyoming	Montana	Idaho	Utah
1940	3	7	1	7	5
1941	2	2	–	–	–
1942	3	3	1	4	5
1943	30	2	7	1	313
1944	36	13	28	3	157
1945	830	17	31	39	112
1946	86	82	7	66	93
1947	9	9	3	16	48
1948	8	–	1	–	2
1949	4	–	–	2	2
1950**	3	3	–	1	–

*From annual summaries by States of notifiable diseases.
**Preliminary.

FLY CONTROL

Several cities in the Region have active fly control projects. Flies become a serious problem in some areas and, especially in the towns catering to tourists, some effort is being made at controlling them. The concurrent emphasis on good community sanitation for rodent control will probably relieve the fly problem somewhat and it will make possible the promotion of better fly control. Authorities at Boise, Idaho, planned a combined mosquito and

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**Irrigation Agriculture in the West. U.S.D.A. Misc. Publications 670 (November 1948).

fly control program for the summer of 1951. Fly-borne disease is present in some areas but to what extent is not known.

RODENT CONTROL

At present the problem of rats in the States of Region IX is limited to certain areas in the five States. They are a problem on the eastern prairie with localized infestations in the Great Salt Lake Valley and in northern Idaho. There is some indication that rats are limited to certain areas and do not seem as firmly established as elsewhere in the United States. In some towns they are localized at several foci and do not invade all parts of the towns despite readily available food supplies and harborage. There is some evidence that minimal control measures such as general sanitation and intensive eradication measures in their foci will entirely rid some areas of rats.

The entire subject of rodent distribution, history of infestation, and recommended control practices in Region IX will be the subject of a later paper.

PLAGUE

Sylvatic plague is present in all the States of the Region. The proximity of these infected wild rodents to colonies of domestic rodents is one of the major justifications for rodent control in the cities in this area. If domestic rats should become infected, the danger of human cases would be intensified. No economically feasible control methods for wild rodents are known, but removing their most intimate contact with man should supply reasonable protection as well as suppress populations of the destructive, disease-carrying Norway rat.

OTHER ARTHROPOD PROBLEMS

Ticks, particularly *Dermacentor andersoni*, are widely distributed in the mountainous areas. This tick transmits Rocky Mountain spotted fever and Colorado tick fever. Tick infestations are commonly encountered during May through July and constitute a menace to fishermen and vacationers. *Ornithrodorus* or soft-shelled ticks occasionally have been implicated in tick-borne relapsing fever, particularly at the higher elevations.

Certain species of the family, Ceratopogonidae, or biting gnats, are locally important. They have seriously interfered with confort in several areas in Utah and Idaho and at Rifle, Colo., where the Government maintains a pilot plant for producing oil from oil shale.

Tularemia is widespread and can be contracted by handling wild rabbits and other susceptible wild rodents, by the bite of deer flies and ticks, and by drinking water contaminated by the excretions of certain animals.

CDC Training Program in Environmental Sanitation

RICHARD F. CLAPP, Sanitarian*

The trained environmental sanitarian of 1951 emerges with the combined qualities of sincere personality, enthusiasm, ability in public and personal relations, carefully directed experience in a good local health unit, and academic attainment in the arts and sciences. He can effectively secure permanent improvements in environmental health.

For the inexperienced individual, equipped with satisfactory personal attributes and academic background, the Sanitation Field Training Program bridges the gap between "textbook" and "applied" sanitation. It facilitates the transition from school to initial employment by accelerating the acquisition of practical experience in a prepared area under particularly qualified supervisors who can devote full time to this effort. For example, a working familiarity with the techniques of accurately testing pasteurization plant instruments may be acquired only through actual supervised practice. This applies equally to residual spraying, use of concrete, public speaking, interview-

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ing in community sanitation surveys; in fact, to virtually all of the tangible and intangible elements of sanitary science.

At present only a few of the applicants for sanitation field training meet the specifications for the 1951 model sanitarian. Until very recently no specialized undergraduate university course in this field was offered, and only in the past few years has attention been given to the raising of qualifications of sanitarians. Today the requirements vary widely by States. As a result, field training for the majority of sanitation personnel must include some material to help close gaps in the basic science background and to provide some insight into the organization, administration, and socio-economic aspects of public health. The attempt is made indirectly; in the study of major items of public health, the student sees examples which develop his appreciation of the importance and responsibility of the sanitarian, which stimulate enthusiasm, and which indicate the ethics of public employment.

Another type of training applicant who may fall into either of the preceding groups is the sanitarian with years of public health experience. He may desire training in the form of a refresher course, or to expand his activities from specialized to generalized sanitation, to change from one specialty to another, to qualify for a more advanced position, or for a variety of other reasons. This applicant may require little more than the recent information on a given sanitation specialty, but frequently he profits from a complete review of the field.

To meet the several needs in environmental sanitation training, a variety of courses has been established. An 8-week course of intensive field practice is offered to the qualified graduate in sanitary science. A 12-week course of classroom study and laboratory and field practice is available to those requiring fundamental background material. Concentrated short courses, generally not exceeding 2 weeks, are scheduled in many of the several fields of sanitation, principally for the specialized individual.

Prime requisites for effective field training are qualified training personnel and a suitable, prepared training area. In addition to an academic background and experience in the material to be presented, the training officer must be able to transmit information and skills through field training methods – guidance more than direction, supervision more than didactic indoctrination. Field training must be his primary interest, and he must constantly alter and improve his methods. There is no blueprint yet available for anything approaching the ultimate in successful field training. The opportunity to learn by example is a basic principle. The training area must provide these examples and *entre'* must be gained to them. It is almost axiomatic that the most suitable areas will be found in conjunction with well staffed and operated local health units. A health officer and his staff who have brought an area to a high level of sanitation normally welcome the establishment of field training, and are indispensable in paving the way in the area for field activities of the training center. With the backing of a respected health department, contacts with industries, organizations, other branches of the local government, and all the individuals important to the training program are made with relative ease. As consultants, the training center personnel may reciprocate by services rendered to the local department in strengthening its sanitation programs, which again may make it a more efficient and effective ally. In addition, the area should provide a variety of representative samples of the types of field problems which are included in the training program. In many counties, health departments carry on such limited programs that they would constitute unsatisfactory training areas. In some geographic areas, adverse climate is encountered, which limits effective field work to only part of the year, a matter to be considered in course scheduling as well as in training area selection.

The 12-week course for sanitarians includes at least an introduction to all the elements usually considered to be within the scope of activity of this category, and additional information to show how sanitation is integrated with the entire public health effort. Field training in individual problems such as rural water supply, rural sewage disposal, garbage collection and disposal, and insect and rodent control are scheduled to precede the broader programs such as milk control, food sanitation, and school sanitation which involve combinations in application of skills of the individual phases. An effective training procedure in any problem has been found to consist of orientation of the trainees immediately before field work through use of visual aids and discussions, then field observation and actual practice followed by review; the review may employ the introductory visual aids, discussion, and

short examination. The most effective visual aids are considered by many training officers to be color slides of the specific field problem to be met. A number of these have been produced for training stations by the CDC and some training officers are developing their own visual presentations. Some of the newer sanitation activities, including housing, accident prevention, and air pollution, are scheduled for consideration in proportion to the extent of their application by local health departments. Basic science in bacteriology, chemistry, and mathematics is included only to the extent that the pertinent phases of these subjects may be obtained. Consideration of administrative procedure, record keeping, public relations, public speaking, legal background, and health organization round out the course. The shorter courses which are presented consist essentially of more detailed and intensive work in individual phases of the 12-week course.

It is obvious that so large a volume of material presented in such a short period must be closely scheduled if it is to be covered most efficiently. One of the major developments in field training has been the preparation of schedules which assure coverage of the subject matter without being unduly inflexible. Some flexibility is required to permit trainees with special interests to concentrate on one subject more than another, and to compensate for field work limited by bad weather. By preparing schedules which permit trainees to carry out field work in small groups, preferably groups of two, the effectiveness of field operations has been found to be materially improved. In restaurant visits, for example, a trainee group of more than two renders the experience almost valueless.

To insure the best instruction obtainable, elements of the courses in which the station personnel are not essentially qualified are given by consultants. These consultants are secured from a variety of sources such as Training Services Headquarters, CDC, other training centers, State and local health departments, and industrial service organizations. They may participate both in classroom discussion and in field practice.

The successful completion of any field training course does not qualify an individual to undertake independent action in a health department immediately. It simply accelerates his acquisition of experience, and shortens the period of employment during which he must work under close supervision. In addition, during formal field training only accepted methods of procedure are employed, the use of good examples is emphasized, and the opportunity is available to discuss thoroughly each problem. This stimulates the trainee's development in the right direction, and avoids the perpetuation of errors that might result if his total initial experience were obtained in a single local health unit.

The responsibility of the training centers to the trainees and to their sponsoring departments is keenly felt. The recognized shortcomings in training stimulate constant experimentation and revision. The goal of sanitation field training, the provision of complete field experience to to qualified personnel, is still ahead.

CDC Annual Fall Meeting

Preliminary plans have been completed for the annual meeting of CDC field and headquarters personnel. The meeting will be held in Atlanta, Monday through Wednesday, October 15-17, 1951. It is felt that by scheduling the formal program at the beginning of a regular work week, individuals attending will have the opportunity of staying 1 or 2 days after the meeting to attend to other business. This year plans have not been made to include Specialty Panels as part of the formalized program, since the special interest groups have time to get together and discuss subjects pertaining solely to their specialties on the afternoon of the last day (Wednesday), or during the following 2 days, if advisable.

The committee on arrangement has planned the accompanying program, which involves the various aspects of communicable disease programs, and which will inform field personnel not only of operational facilities but also of the over-all activities of CDC. State health department personnel who may be interested in the topics to be discussed, and

especially those from States where specific disease investigations are being conducted by CDC, are cordially invited.

Information on hotel rates and other necessary details of an administrative nature will be furnished at a later date. It is expected that the meeting place will be located in close proximity to CDC Headquarters, Atlanta, Ga. Persons desiring additional information concerning the meeting should write to:

Larry Saylor,
General Chairman, CDC Fall Meeting,
Communicable Disease Center,
50 Seventh Street, N. E.
Atlanta, Georgia

TENTATIVE PROGRAM - 1951 FALL CDC ANNUAL MEETING
(October 15-17)

MONDAY
(Chairman of the Day: Mr. Gilbertson)

A.M.	
8:30-4:30 P.M.	Registration
9:00	Assembly
9:15-9:30	Dr. Vonderlehr - Welcome and Introduction
9:30-11:30	PANEL: EMERGENCY ASPECTS OF PRESENT CDC PROGRAM Moderator: (Executive Office)
9:30-9:40	Place of CDC Field Personnel in a National Emergency Program (Executive Office)
9:40-10:00	Epidemic Intelligence Program (Epidemiologic Services)
10:00-10:15	Sampling Techniques in Aero-biology (Technical Development Services)
10:15-10:30	Air-Borne Pathogens (Laboratory Services)
10:30-10:40	Intermission
10:40-10:50	Veterinary Public Health Aspects (Veterinary Public Health Services)
10:50-11:00	Epidemic and Disaster Aid Program (Executive Office)
11:00-11:15	CDC Participation in International Health Activities (Executive Office)
11:15-11:30	Discussion
11:30-12:00	THE PRODUCTION OF AUDIO-VISUAL AIDS (Audio-Vidual Production Services)
P.M.	
12:00-1:30	Lunch
1:30-3:00	PANEL: TYPHUS-RODENT CONTROL AND INVESTIGATIONS Moderator (Engineering Services)
1:30-1:45	The Typhus Control Program (Engineering Services)
1:45-2:00	Assistance to States in Rat Control for Cities (Guest)
2:00-2:10	Incidence of Typhus by Premises and Number of Cases (Entomologic Services)
2:10-2:20	Recent Trends in Typhus Incidence in U. S. (Epidemiologic Services)
2:20-2:35	Plague Studies (Laboratory Services)
2:35-2:50	Rodenticides (Laboratory Services)
2:50-3:00	Discussion
3:00-3:10	Intermission
3:10-5:15	PANEL: FLY CONTROL OPERATIONS AND INVESTIGATIONS Moderator (Guest)
3:10-3:25	Current Status of Fly Control Program (Engineering Services)
3:25-3:40	Fly Population Evaluation Methods (Entomologic Services)
3:40-3:55	Recent Advances in Epidemiology of Diarrheal Diseases and Polio and Fly Control (Entomologic Services)

3:55-4:10	Fly Control Aspects of the Residual Spray Program (Entomologic Services)
4:10-4:25	Insecticidal Fly Control (Technical Development Services)
4:25-4:40	Problems of Fly Resistance (Technical Development Services)
4:40-4:55	Sanitational Fly Control (Technical Development Services)
4:55-5:15	Discussion
5:15-7:00	Hospitality Hour
7:00-8:00	Buffet Supper

TUESDAY

(Chairman of the Day: Dr. Bradley)

A.M.

9:00-11:00	PANEL: WATER RESOURCES DEVELOPMENT ACTIVITIES Moderator (Guest)
9:00-9:15	State Health Department Needs in Water Resources Development Program (Guest)
9:15-9:30	River Basin Development Programs (Guest)
9:30-9:40	Midwest Activities (Midwestern CDC Services)
9:40-9:50	Arkansas-White-Red River (Engineering Services)
9:50-10:00	New England-New York (Entomologic Services)
10:00-10:10	Far West (California Central Valley/Great Basin) (Engineering Services)
10:10-10:25	Mosquitoes and Irrigation in Western States (Educational Aspects) (Engineering Services)
10:25-10:35	Intermission
10:35-10:50	PHS Policy in Pest Mosquito Control (Entomologic Services)
10:50-11:00	Discussion
11:00-12:00	PANEL: MEETING TRAINING NEEDS (Training Services)

P.M.

12:00-1:30	Lunch
1:30-1:45	LEPTOSPIROSIS (Laboratory Services and Veterinary Public Health Services)
1:45-3:05	PANEL: ENCEPHALITIS INVESTIGATIONS Moderator (Epidemiologic Services)
1:45-2:05	Midwestern Field Epidemiological Investigations (Midwestern CDC Services)
2:05-2:25	Montgomery Laboratory Investigations (Laboratory Services)
2:25-2:40	California Studies (Entomologic Services)
2:40-2:55	Veterinary Aspects (Midwestern CDC Services)
2:55-3:05	Discussion
3:05-3:15	Intermission
3:15-3:30	STATISTICAL SERVICES OF CDC (Epidemiologic Services)
3:30-4:00	RECENT LABORATORY DEVELOPMENTS (Laboratory Services)
4:00-4:15	PEST CONTROL AT SMALL INSTITUTIONS (Guest)
4:15-4:30	Q FEVER STUDIES (Veterinary Public Health Services)

WEDNESDAY

(Chairman of the Day: Mr. Hansen)

A.M.	
9:00-10:00	PANEL: MALARIA TRANSMISSION POTENTIAL IN THE UNITED STATES Moderator (Engineering Services)
9:00-9:15	Epidemiological (Epidemiologic Services)
9:15-9:30	Biological (Entomologic Services)
9:30-9:45	Operational (Engineering Services)
9:45-10:00	Discussion
10:00-10:15	HISTOPLASMOSIS STUDIES (Midwestern CDC Services)
10:15-10:25	Intermission
10:25-11:00	PANEL: NEW TRAINING PROGRAMS (Training Services)
11:00-12:15	PANEL: CHEMISTRY AND TOXICOLOGY Moderator (Technical Development Services)
11:00-11:15	Toxicology of Some Pesticides (Technical Development Services)
11:15-11:30	Relationship of Pesticide Laws to Operational Use (Guest)
11:30-11:45	Pesticide Formulations (Technical Development Services)
11:45-12:00	Health Hazards Associated with Agricultural Use of Organic Phosphates (Technical Development Services)
12:00-12:15	Discussion
12:15	ADJOURNMENT

CURBSTONE DISCUSSIONS AND CONFERENCES

Near the registration desk you will note a sign entitled, "Curbstone Discussions and Conferences." Questions pertaining to the activities of the Administrative Services of the Center will be discussed by the following individuals as scheduled:

Morning of first day	Budget and Fiscal Activities	Mr. Leonard B. Abbey In Charge Budget and Fiscal Section
Afternoon of first day	Drafting, Reproduction of Printed Material, and IBM Activities	Mr. Aubrey S. Burrowes In Charge Service Section
Morning of second day	Personnel Activities	Mr. Donald K. Dobyns In Charge Personnel Section
Afternoon of second day	Supply and Procurement Activities	Mr. Edward R. Johnston In Charge Supply Section
Morning of third day	Publications and Library	Dr. Warren F. Abercrombie In Charge Technical Reports and Library Section

Conferences with these individuals at a time other than that scheduled above, will be arranged for you, upon request, by the person on duty.

Recent Publications by CDC Personnel

Frobisher, Martin, Jr., King, E. O., and Parsons, E. I.: A test *in vitro* for virulence of *Corynebacterium diphtheriae*. Am. J. Clin. Path. 21(3): 282-285 (1951).

Lindsay, D. R., and Haines, T. W.: A method of testing the resistance of house flies to residual-type insecticides. J. Econ. Ent. 44(1): 104-106 (1951).

Maldonado, J. F., Acosta-Matienzo, Josefina, and Velez-Herrera, Freddy: Biological studies on the miracidium of *Schistosoma mansoni*. Part 4. The role of pH in hatching and longevity. Puerto Rico J. Pub. Health & Trop. Med. 26(1): 85-91 (1950).

Quarterman, K. D., Parkhurst, J. D., and Dunn, W. J.: DDT for control of stable fly, or dog fly, in northwestern Florida. J. Econ. Ent. 44(1): 61-65 (1951).

Foreign Visitors to CDC

During the month of June the following foreign public health officers and trainees were visitors to CDC:

Dr. Abdul Rahim, Director General, Malaria Society, Kabul, Afghanistan.

Dr. Joseba Kelmendi de Ustaran, Epidemiologist, School of Hygiene, Santa Fe , Argentina.

Mr. Alberto Wachs, Public Health Engineer, Facultad de Higiene & Medicina Preventiva, University of Litoral, Santa Fe, Argentina.

Dr. Mario Sant'Ana, Health Officer, State Department of Health, Sao Paulo, Brazil.

Dr. Gordon H. Josie, Senior Research Assistant, Research Division, Department of National Health and Welfare, Ottawa, Ontario, Canada.

Dr. Llewelyn F. Gunaratna, Medical Officer, Anti-Malaria Campaign, Colombo, Ceylon.

Dr. Kuang Chi Liang, Malariologist, Taiwan Provincial Malaria Research Institute, Taipeh, Formosa, China.

Mr. Prospero Ruiz, Sanitary Engineer, Pan American Sanitary Bureau – WHO, San Salvador, El Salvador.

Dr. Helmi Gerfeldt, Akademie fur Staatmedisin, Dusseldorf–Oberkassel, Germany.

Mr. John M. Costopoulos, Civil Engineer, Division of Sanitary Engineering, Ministry of Hygiene, Athens, Greece.

Mr. Kyriakos N. Doulgeris, Sanitary Inspector, Health Center, Ministry of Hygiene, Salonica, Greece.

Dr. Anastasious Zairis, Health Officer, Greek Ministry of Health, Salonika, Greece.

Dr. Ganga Prasad Chakravarti, District Health Officer, United Provinces Public Health Service, Pratapgart (U.P.), India.

Dr. M. L. Loganathan, Health Officer, Mysore Public Health Service, Bangalore, Mysore State, India.

Mr. Thiruvenkatachary Parthasarathy, Malaria Engineer, Office of the Director of Public Health, Madras 10, India.

Mr. K. R. T. Mertonegoro, Sanitary Engineer, Sanitary Department, Ministry of Health, Djakarta, Java, Indonesia.

Dr. A. Kohn, Bacteriologist, Weizmann Institute of Science, Rehovot, Israel.

Dr. Leonard Jan Bruce–Chwatt, Malariologist, Malaria Service, Medical Department, Lagos, Nigeria, Br. West Africa.

Dr. Consorcia Bautista, Manila, Philippines.

Dr. Pramern Chandavimol, Chief, Communicable Disease Control Division, Department of Public Health, Bangkok, Thailand.

Mr. Froylan Robinson Moitta, Sanitary Engineer, Servico Especial de Saude Publica, Belem, Para' Brazil.

Mr. Odyer Angelo Sperandio, Chief Engineer, Sanitary Engineering Section, Araraquara Rural Health Training Center, Araraquara, Sao Paulo, Brazil.

Mr. Osvaldo Barckhahn, Engineer, Department of Water and Sewage Works, Chilean Government, Valparaiso, Chile.

Mr. Sergio Caballero, Chief of Sanitation Work, Rural Sanitary Unit, Chilean Health Department, Santiago, Chile.

Mr. Patricio Mardones, Sanitary Engineer,

Province of Santiago, Public Health Department, Santiago, Chile.

Mr. Carlos Maldonado, Barranquilla, Colombia.

Mr. Vicente Rubio, Chief Engineer, Departmento de Saneamien, Municipality of Guayaquil, Ecuador.

Mr. Raul A. Saa, Quito, Ecuador.

Mr. George M. Chidiac, Municipal Engineer, Municipal and Sanitary Engineering Depts. of City Planning Department, Beirut, Lebanon.

Mr. Rodolfo Rojas Gonzalez, In Charge, Designing Office, Institute of Inter-American Affairs, Mexico, D. F., Mexico.

New FSA Publication

The Federal Security Agency announces establishment of a new bulletin, *Aging*, devoted to the field of geriatrics. Groups, organizations, and communities across the country are trying to obtain better understanding of the effects of our aging population and to devise programs that will enable older people to maintain useful and satisfying roles. This bulletin represents an experiment in supplying a clearinghouse of information that may be useful in reaching these objectives. Mr. Clark Tibbitts, Chairman of the Federal Security Agency's Committee on Aging and Geriatrics, has expressed the hope that the new bulletin will help to meet the need expressed before and during the recent Conference on Aging, and, more insistently, since that time.

Aging will not be issued on regular schedule. Requests for copies of the first issue and subsequent issues should be addressed to the Office of Publications and Reports, Federal Security Agency, Washington 25, D. C.

DISASTER AID MANUALS

Disaster Aid Manuals covering mosquito, fly, and rodent control, have been developed in tentative form and have been sent for review to Regional Medical Directors, Public Health Service;* State health officers; State sanitary engineers; and to others concerned. These manuals include the recommendations of the Communicable Disease Center for the control of mosquitoes, flies, and rodents during disasters and post-disaster periods and supplement a previously published manual, "Epidemic and Disaster Aid to States—Health and Sanitation—General Information and Policies." Upon the return of the review copies the manuals will be prepared in final form for distribution to those concerned.

*CDC headquarters and field personnel concerned with environmental sanitation.

NEW ISOLATIONS OF VIRUS

The finding of the virus of Eastern equine encephalomyelitis in the mosquito *Culiseta melanura*, previously unreported, is recorded in a paper by Roy W. Chamberlain, Harry Rubin, R. E. Kissling, and M. E. Eidson, of the Virus and Rickettsia Laboratory, Montgomery, Ala. This paper has been accepted for publication in the Proceedings of the Society for Experimental Biology and Medicine.

The authors state that these mosquitoes were taken near Ponchatoula, La., on August 17, 1950, a short distance from the location where a purple grackle with the same type of virus in its blood was shot on June 19, 1950. The latter finding also has not been previously recorded and will appear as an accompanying report by these authors in the same journal.

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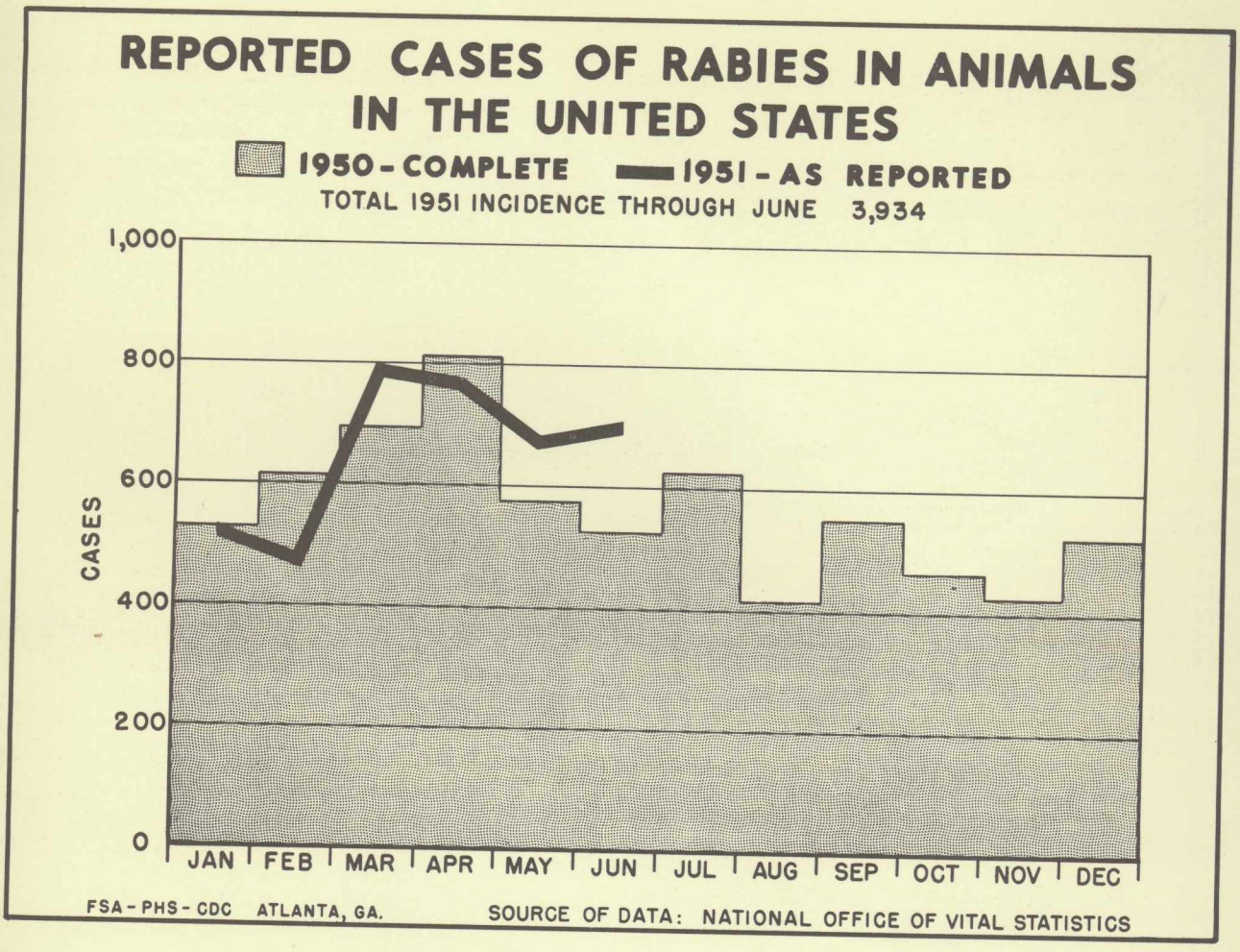


Have you read... ?

BRUCELLOSIS

The problem of brucellosis. J.A.M.A. 145(15): 1136-1137 (1951). This discussion touches on the prevention of human infection, pointing out that the problem is one of eradication of the infection in animals. Symptoms in humans and the treatment of the disease are also mentioned.

DIARRHEA

Wegman, Myron E.: An epidemic of diarrhea among breast-fed newborn infants. J.A.M.A. 145(13): 962-965 (1951). This article discusses an explosive outbreak in a very large newborn service. A possible vector in the form of contaminated boric acid solution used for breast hygiene was implicated.

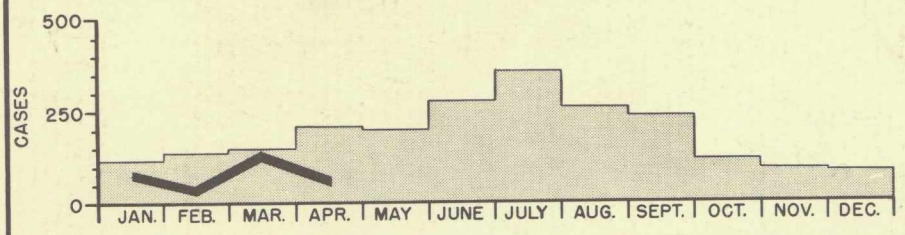
MALARIA

Symposium Issue. J. Nat. Malaria Soc. 10(2): (1951). This issue records a symposium on Nation-Wide Malaria Eradication Projects in the Americas, held at the 33d Annual Meeting of the National Malaria Society, Savannah, Ga., November 8, 1950. Included are the following: "Introductory Remarks," Paul F. Russell; "The Eradication Program in the U. S. A.," Justin M. Andrews; "Progress of the Malaria Campaign in Venezuela," Arnoldo Gabaldon; "Eradication of *Anopheles darlingi* from the Inhabited Areas of British Guiana by DDT Residual Spraying," George Giglioli; "The Nation-wide Malaria Eradication Program in Brazil," Mario Pinotti; "General Principles of the Eradication Programs in the Western Hemisphere," Fred L. Soper; and "Criteria of Malaria Eradication."

MORBIDITY TOTALS FOR THE UNITED STATES *
MALARIA, POLIOMYELITIS, TYPHUS

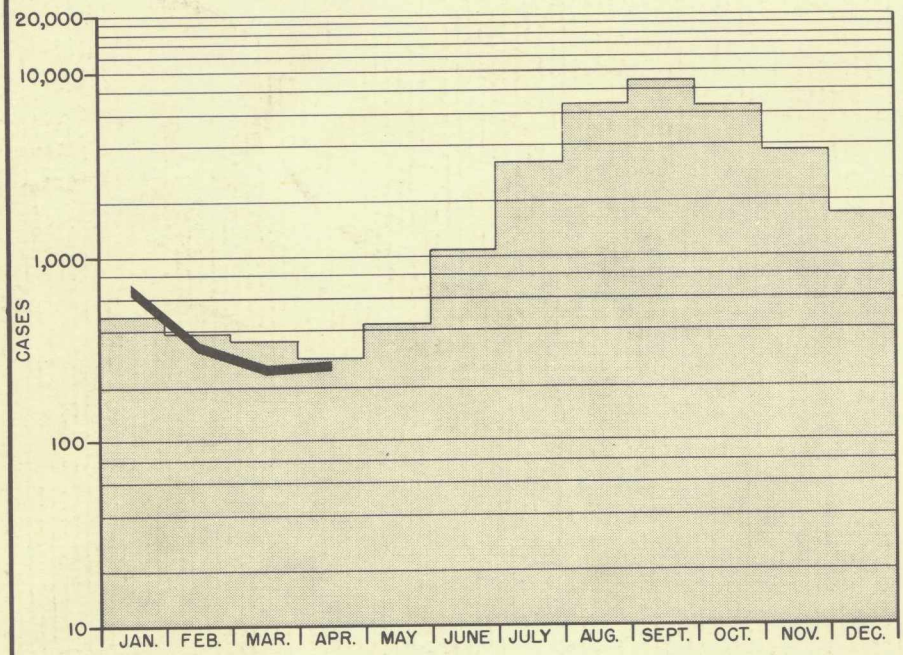
1950 - COMPLETE 1951 - AS REPORTED

TOTAL INCIDENCE THROUGH APRIL 1951 298



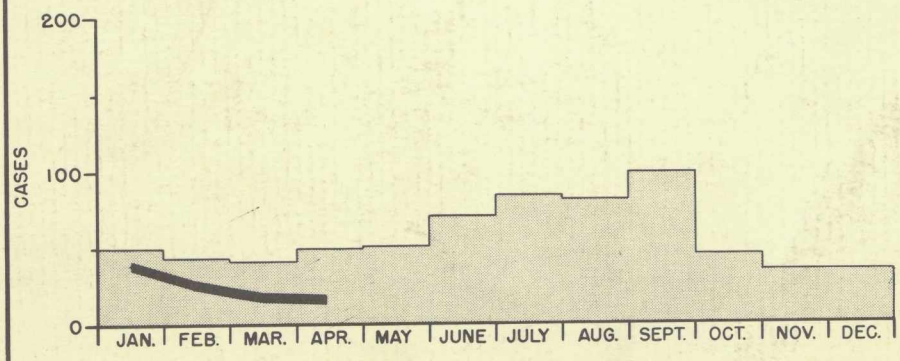
MALARIA
(TENTATIVE DATA)
1950
1951

TOTAL INCIDENCE THROUGH APRIL 1951 1,539



POLIOMYELITIS
1950
1951

TOTAL INCIDENCE THROUGH APRIL 1951 101



TYPHUS
1950
1951

FSA-PHS-CDC ATLANTA, GA.

*SOURCE OF DATA: NATIONAL OFFICE OF VITAL STATISTICS